

How to optimise pasture production off uncultivable hill country

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Around 70 percent (guesstimate) of New Zealand’s sheep and beef population is farmed on uncultivable hill country. There are large areas where individual farms have less than ten percent available for cultivation. Wairere is such a property. Originally the southern end of the “seventy mile bush”, the soils are poor, derived from sandstone and clay, with pHs of 4.9–5.2 and phosphorus (P) levels of 1–2. Following initial land clearing there were several rounds of reversion to Manuka until the mid 1960s when my father John embarked on a programme which included large inputs of lime, at 5 t/hectare, super at 1 t/hectare, and DAP at 100 kg/hectare, all flown on in the first 28 months. This programme took from 1965 to 1982. I personally spent nine months cutting scrub—more recently I have been a shareholder in a manuka honey company planting scrub, how things go round!

This programme was accompanied by subdivision and provision of stock water by the construction of dams. There were invasions of porina and manuka beetle following development, and porina control is still required on a regular basis.

Wairere has run performance recorded sheep since 1967, based on a registered Romney stud started by my grandfather in 1929. We winter around 9500 sheep and 340 cattle on 1070 effective hectares. The 5300 ewes wean 145 percent average; the 2000 ewe hoggets (all in lamb) wean around 1700 lambs. All hoggets have been mated for the past 50 years; the 1800–2000 ram hoggets are culled lightly in late winter, and taken through to private sale in November; the 300 cows (replacements bought in) calve from mid October, with most wearers sold in April.

Added Complexity

Ram hoggets wintered off-farm return to Wairere in late October, and the tally of two-tooth rams rises to 2600. There is a February sale of ram lamb sires, with 1200 composite, Romney and terminals returning to Wairere, adding to the 5000 ram and ewe lambs on our 1070 hectares of hill country pasture in the usual mid summer dry (or drought). Single mating in April and May takes up 35 paddocks cutting across the rotational grazing policy preferred for all stock. Complexity of stock classes and managing many small mobs at times occupies more area than the numbers might suggest is needed, and servicing the requirements of more than 350 ram clients and more than 3000 rams sold requires

some sacrifice of the simplicity of commercial farming. The complexity and large number of lambs summered does take its toll on ewe hogget and two-tooth liveweights at mating, typically 41 kg and 63 kg without wool. We witness our Wairere Romneys achieving higher lambing percentages at higher body weights. We have stubbornly stuck to a high stocking rate, 700–800 kg liveweight per hectare at 30th June. By putting our sheep under pressure we are continually selecting for individuals with better structure and constitution. Wairere sheep have a national reputation for their ability to bounce back fast after a tough time, yet produce at a high level when conditions allow. Our stocking rate is in contrast to the average hill country rate in New Zealand which has reduced by 1–2 stock units per hectare over recent years, but is achieving a much improved output per sheep, and a substantially higher percentage of cattle finished before their second winter. This is all happening despite a lower input of fertiliser—take a bow New Zealand farmers!

Can we have our cake and eat it too? We have animals which will be more productive if we feed them better, so how can we transform our pastures to grow greater quantity and quality?

The basic recipe that has facilitated the improvement in pasture production and the lift in production at Wairere is fairly simple and has a number of “ingredients”.

1. The first ingredient is fertiliser and lime to build soil fertility capable of supporting clover and ryegrass. Olsen phosphorus at 15+ and pH at 5.7+. (Ultimate targets of pH 6 and P of 20+.) Annual maintenance under our current fertiliser and lime regime is around 26 kg N, 30 kg P, 30 kg S, 500 kg lime at an approximate cost of \$250/hectare or \$22/stock unit. Capital fertiliser applications have been used successfully both by my father in early development and more recently. In 1994, in the midst of an autumn drought and while undertaking minimal drenching trial work with AgResearch, our ewe lambs succumbed to a barber’s pole attack. With the drought dragging on and over 5000 lambs on board we were desperate to turn the situation around. A brew of 85 kg P, 52 kg S and 42 kg N was applied. That dramatically turned the feed situation around, allowing stock to recover by the end of the winter. After this capital input the P levels rose by approximately 10 points to mid-twenties on the more fertile mudstone country and mid-teens on the less

fertile sandstone area. Over the following years there was a continuing and sustained improvement in the quality and quantity of feed grown on Wairere as a result of this input. This demonstrated to me that the easiest way to grow more pasture was to apply more fertiliser. We have experimented with fine lime prills from FPF in Waipukurau, the lime particles ground to less than two microns, then reformed into prills for spreading can allow faster reactivity and rises in pH. The prilling technology allows the incorporation of all major nutrients and trace elements. If proven to be effective there is potential benefit in reducing the cost of lime needed to get to a more plant friendly pH.

2. The second ingredient is effective grazing control. Mob stocking and rotational grazing is practised throughout the year, apart from lambing to weaning for ewes and ewe hoggets. This allows plants to perform at their best and assists in maintaining sward quality. Cows play an integral role in this by consuming poorer quality feed that the sheep are reluctant to utilise and by controlling pastures in times of surplus growth. An effective winter rotation which removes all bulk and low quality feed is an essential part of this and ensures that all spring grown feed is of the highest quality. It also encourages the most productive plants to become more dominant and opens up the pasture to allow clovers to flourish.
3. The third ingredient is nitrogen. My father experimented with DAP in 1969, and by 1974 had decided to use it across the whole farm. He recognised the opportunity to kick start growth going into the spring which is usually cold in the north Wairarapa, with wind chill adding to the discomfort of both plants and animals. He also observed that nitrogen-boosted pastures (only 22 kg/ha applied) recovered faster from the usual summer dry. Nitrogen has been used over the whole farm since 1974, usually in the form of DAP plus sulphur. The average rate of use is 26–30 kg/hectare. Several times droughts have prompted the use of N in both autumn and late winter. A neighbour's sealed airstrip allows application in any ground conditions. However the queue for an aircraft plus the waiting time for wind to abate can take many weeks, so early booking is essential to ensure good timing of application. Castlepoint Station ran a nitrogen trial some years ago. The area which received 120 kg N/hectare was still visibly better than the area that received none, 5 years later. Dry hill country gets only a small contribution from clovers fixing nitrogen, and is often nitrogen starved. Individual farms need to find the sweet spot relative to the economics of their livestock enterprises. At Wairere we try to keep (some) things simple. When faced with feed deficits we sell what we can or need to and graze out capital stock. Nitrogen is a key to

getting feed supply back on track. Nitrogen-boosted pasture across the whole farm reduces the need for tractors to cultivate, grow, conserve or feed out supplement seven days per week—a cheaper system, and a much improved lifestyle choice, more prevalent in the North Island.

4. The fourth ingredient is the flexible farm boundary. Apart from often being a cost effective way to consistently grow young stock for hard hill country or creating more room at critical times or when feed supply is limited, sending stock off grazing during times of feed shortage is good for pastures. Wairere has used this policy often. We have seen that by reducing stocking rate and taking grazing pressure off drought stressed plants, the recovery is significantly faster when rain comes. The most palatable and productive plants are the ones to suffer most when being overgrazed. Just as under grazing in the spring/summer causes deterioration in pasture quality, so does overgrazing when feed is short.

R and D. Attempt number one: Hand seeding

Over the years many things have been tried at Wairere with the aim of improving pasture quantity and quality. Starting in the late 1980s there was effort being applied to establishing drought tolerant pastures on dry east Coast country. Led by grasslands scientists Simon Moloney and Derek Charlton they were testing what they called triple mixes made up of cocksfoot, prairie grass and phalaris. Encouraged by the promise of wonderful things we set about break feeding a mob of cattle over a 12 ha area. Each time we moved the break we would hand seed the area that had been grazed with 'Wana' cocksfoot. Over several weeks we covered most of the area. Some days it was easy work but on others it was no fun at all. After 6 months I thought we had wasted our time, but progressively over the next 2 years the cocksfoot became more prevalent. Unfortunately, due to poor palatability I came to dislike that plant intensely. It took over the area and apart from providing cow feed at times it was hard to manage as a sheep feed. However we had shown that we could make a difference.

As a development on the hand seeding theme, on two occasions during the early 1990s we spread 2 kg of clover seed over the whole farm by mixing it in with spring sown fertiliser and aerially broadcast it. We used uncoated seconds so that the cost was kept low (approx \$4/ha). I believe that this approach has some merit but like many things we have done, was not well monitored or real benefit assessed. As recently as autumn of this year we broadcast 3 kg of plantain seed over 150 ha and will wait and see what comes of that. Perhaps a more controlled smaller scale trial would have been a better way to undertake this, however the

cost was relatively low (again seed cost was halved by using seconds) and there was no application cost. The potential benefit could be high. I was encouraged to try this as a result of our “spray and pray” programme when we included 1 kg of plantain seed with the regrassing mix. Both the plant population and the longevity of the plantain was better than I expected.

Attempt number two: Hoof and tooth

Again under the guidance of Simon Moloney in the early 1990s we tried a slightly different approach. We subdivided a 21 hectare block into five smaller paddocks and by intensively stocking these areas when there was sufficient soil moisture in the spring we tried to create a seed bed that would allow improved grasses to establish. Seed was broadcast by helicopter and sheep used to trample the area to enhance germination. Unfortunately, due in part to the relatively dry conditions that year, this was not very successful and I realised that such a method had implications for the animals used in the process. It was hard on them.

Attempt number three: Spray and pray

The initial motivation for trying spray and pray was in fact to remedy the result of the ‘Wana’ cocksfoot experiment from 1989. We just wanted to get rid of the cocksfoot. Our first effort involved spraying the area with paraquat thinking that might kill or severely disable it and allow clovers and other resident species a chance to compete. Knowing that Holmes Warren had been using paraquat to achieve what was called “clover releasing”, we thought it had promise. However the strength of the cocksfoot’s root system proved too strong and it bounced back to full strength in no time. The next year Paul Oliver from H and T Agronomics, suggested that we spray it out with glyphosate (Roundup) and attempt a total cropping and regrassing programme. Paul suggested 3 litres/hectare would do it; we used 5 litres, we were not going to let the cocksfoot get away again. The process involved spraying out in late October and broadcasting brassica seed (rape) and utilising this crop over the autumn and winter periods. Following another spray in late October, turnips were broadcast. Once these were grazed off through February the regrassing was completed. This first attempt gave encouraging results, with useful crops and a good strike from the new grass. Over the next 4 years we fine tuned and repeated the process on a further 45 ha with varying degrees of success. The main issues were dry conditions when trying to get plants established. Poor strikes resulted in more weeds, in higher costs, and pastures that took longer to get to full strength. Following these efforts our enthusiasm for this process was dampened. However the prize was still there and the paddocks that were sprayed and cropped have had

their productivity significantly improved as a result of this process. With Wairere being just 2% flat and 70% Class six and seven country, ground based cropping and regrassing is not physically or economically viable. The potential advantage of this approach is that, although fertiliser and lime applications will improve hill country pastures over time, if the plant genetics are poor to start with, the time frame can be very long. Replacing the existing population with better performing ones quickly is very rewarding. However the success of this process is heavily dependant on striking a good set of environmental conditions throughout the period involved.

Other innovations

We have chemically topped up to 15% of Wairere in some years. Although primarily aimed at controlling excess growth in that season, we have observed that there is a direct and beneficial effect on pasture quality, and that this effect can last for years afterwards. The intent is to control the reproductive behaviour of the grasses and encourage clovers to become more dominant by reducing competition for space and light. This in turn increases nitrogen fixation with the flow on benefit extended to grasses. After years of “learning experiences” with chemical topping we have devised a method that is a little different to the norm. We target small parts of many paddocks. It does result in a somewhat “patchwork quilt” appearance but that is only temporary. In the spring, we, like all farmers, are trying to feed our animals better and typically at lower stocking rates. One of the downsides of this is that it reduces grazing pressure on the lesser favoured areas of paddocks that are steeper and contain mixed aspects. The steeper and colder faces tend to develop rougher feed which, although it can be kept under some control by mixed grazing with cattle, still tends to show a decline in feed quality over the late spring period. By targeting these areas to “chemically top” we get a multitude of “wins”. Firstly they grow quality feed though the spring and into the summer. Secondly we do not require increased numbers of working cattle to assist with control. Thirdly, during our typically dry summers we have increased area of high quality lamb feed available. This is a result of both the improved species composition of the sward but also due to the fact that these areas retain better soil moisture through the summer and hence can continue to grow quality feed when it is at a premium. In a way this is our summer cropping programme. Chemical topping, total dessication or even double spray fallowing may all be ways of developing improved pastures in a hill country environment, but they are risky due to dependence of climatic factors. The principles for successful establishment are the same

as if cultivating a flat paddock. Timing of operations must be good, soil moisture levels have to be right, competition from resident species should be eliminated and weeds need to be controlled. All these factors can be ticked off by good planning and having Lady Luck on your side.

New species

Chicory came and went from our flats in the late 1980s, a victim of root rot and some “learning experiences”. We have debated the sowing of plantain/clover on our small area available, but have decided that the area is too small to be practically useful for the number of lambs carried. Also, because the majority of replacement lambs and young sheep around New Zealand are still grazed on permanent pasture, as a ram breeder I should be selecting sires and ewe lamb replacements while grazing in those conditions, and under a competitive mob stocking policy.

The jury is still out on persistence and management of plantain, and whether it can be adopted to a true hill country situation. Lucerne may be more viable, on the right soils, because it creates its own nitrogen, can last under grazing for 7–10 years and gives a substantial boost to both quantity and quality. Hill country pasture productivity has stood still

for decades. While there has been some success in transforming areas of cultivatable land within the hills, the great percentage of pastures have had no fundamental change of species. When judging the Hawke’s Bay Farmer of the Year competition in 2014, it was mind boggling to observe the steep dry hill country direct drilled by the winner Hugh Ritchie. The definition of uncultivable hill country is changing.

Conclusions

With fertiliser alone we can farm reasonably well, but it is difficult to establish a new sward which is persistent and has a financially viable edge over existing practice. I can remember a team of scientists doing a presentation around New Zealand 20 years ago, saying that pasture renewal didn’t stack up financially because any improvement over existing swards was too short lived. However we live in hope that a wonder plant like lucerne will be discovered for our hills. Perhaps plantain will be that plant, along with improved clovers. There is currently a breeding programme around a deep rooting white clover with tolerance for low available phosphate soils. This and other technologies need funding to accelerate their development and transfer to our hill country.