Slips: pasture production and revegetation
Lower North Combined Provincial Federated Farms Storm Group
SUSTAINABLE FARMING FUND: PROJECT 05/060: Meat and Wool FITT project

Introduction

The information contained in this pamphlet was obtained from research documents and a survey of 81 randomly selected farmers from the SNI 2004 storm event with slip damage. The farmers were asked to describe their slip revegetation practises and their perception of the success or failure of these practises. Two years after the February 2004 storm event researchers visited 444 slips on the farms to assess pasture composition and ground cover on the slip scarp, slip middle and slip tailings. These were compared with adjacent undisturbed ground. The objective of this document is to provide farmers with major slipping events with a concise summary of information needed to plan for feed recovery and to make a decision about regrassing. The full report can be found on http://www.maf.govt.nz/sff and using search engine put in project number 05/060.

Priorities

Once a farm has been hit with slips then the first priority must be to look after the home and family. Second is the need to get access to the farm. Tracks are roughly cleared to allow access to the farm and left to be tidied up later when the soil hardens. Gaps in fences are fixed and wandering stock found and put back into stock-proof paddocks. Records of expenditure should be kept. Once a breathing space occurs the impact of slips on the farm business can be explored and consideration of slip regrassing strategies. (It can be a good idea to keep good records and take photos in case of later compensation).

Slip damage looks worse than it is with respect to loss of DM production

Impact of slips on pasture production

Firstly it is important to try and assess the overall loss in production that has occurred as a result of slipping. Slips are made up of slip face and tailings. The face is where the soil has been removed leaving shallow soil with low moisture holding capacity and little organic matter and very low nitrogen levels. Faces are slow to revegetate. However, the face makes up only about 30% (mud and siltstones 20-25%, volcanic ashes 30%, sandy siltstones 35% and sandstones 40%) of the visible slip damage.

The soil that was lost from the slip is found in the tailings. The tailings are a tumbled mixture of soil and buried vegetation. The tailing debris will revegetate within 6 to 12 months due to existing plant material and from dormant seeds already present in the upper soil layer. In some instances subsequent regrowth on these tailings is higher than equivalent non-eroded slopes. It is appropriate therefore to only consider the slip face as “lost” dry matter.

Only 11% of farmers in the 2004 storm event assessed the loss of farm area lost due to slipping at more than 10%. So for 89% less than 10% of the farm was affected. Mudstone and sandstone soils were worse affected by slips.

When calculating the immediate loss in farm dry matter (Table 1), firstly estimate the percentage of slip face on each of the slope classes. Slips often only occur on the steeper slopes (>28 degrees) which only have 60% (Figure 1) of the productive capacity of flat/rolling country also both pasture utilisation and quality is also lower on these steep slopes.

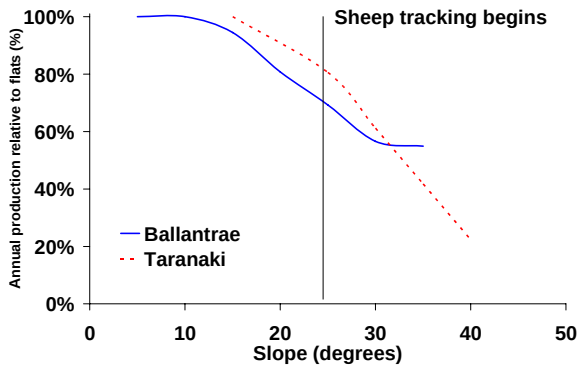


Figure 1: Relationship between slope and pasture production in the Tararua and Taranaki districts.

Table 1: Estimated loss in consumable dry matter as a result of varying slip damage on a Central North Island farm of average topography (27% flat/rolling, 48% hill and 27% steep hill)

%slip face on hills	0	2	3	5	8
% slip on steep hills	3	9	15	25	42
Loss in annual consumed dry matter (%)	0.6	2.6	4.2	7	11.7

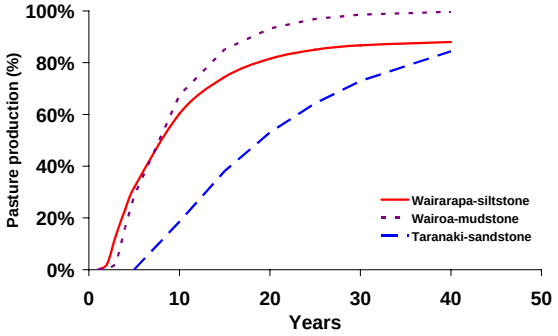
Implement normal "poor" season strategies in response to loss of DM production

It is important to note that moderate slip damage often only produces the same loss in dry matter as a poor "growth" year. Very similar strategies can be used to offset this loss in feed as would be used in a poor year. For example having calculated the loss in dry matter, a new feed budget can be implemented. Depending on the outcome, farm strategies may include application of nitrogen, culling stock early, bringing forward sale dates of stock, or not mating hoggets etc.

There will be an ongoing loss in pasture growth due to slips. The slip scar will naturally revegetate over time, becoming colonised initially predominantly by legumes and low fertility tolerant pasture species. As time passes the amount of bare ground gradually disappears but soil depth is only slowly reformed. The shallow soil is prone to drying out and is not fertile. It takes 20 years or more for substantial recovery (Figure 2) and, in some soils, full recovery never occurs because soil depth and organic matter content remains less than that of non-eroded sites.

But it is important to realise that while you have been hit with an exceptional "slip" event, slips and erosion occur continuously on our hill country. There will be many places on your farm where old slips have occurred and are now revegetated.

Figure 2: Pasture production on naturally revegetating slips on three different soil sites



In the study conducted after the 2004 storm event in the Southern North Island, two years after the event slip scarps had regained 30% total ground cover, the middle of the slip had 50% recovery and tailings had completely revegetated to levels comparable with undisturbed ground (Figure 3). Ground cover will overestimate the productive capacity of the slip so this is comparable to the research results in Figure 2.

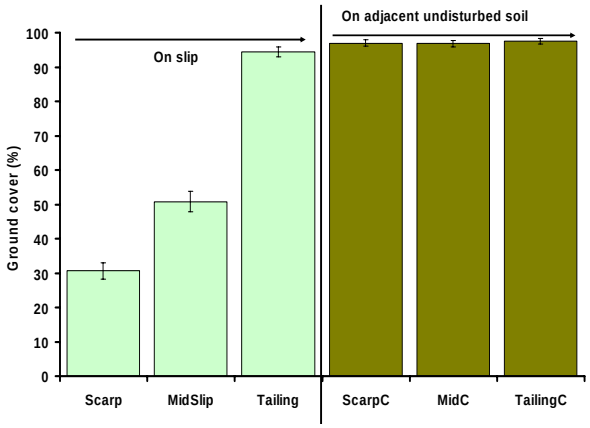


Figure 3: Image analysed total ground cover for scarp, middle and tailing of slips and adjacent undisturbed ground. Bars indicate the spread of 95% of the data points.

Slip faces revegetate slowly but slip tailings recover very quickly

Regrassing slips

The survey of farmers revealed a polarisation of opinion between farmers who regrass slips and those that don't. But even farmers who regrass slips only mildly agree that this practice was effective at improving vegetation of slips. Farmers that didn't regrass slips believe it to be ineffective.

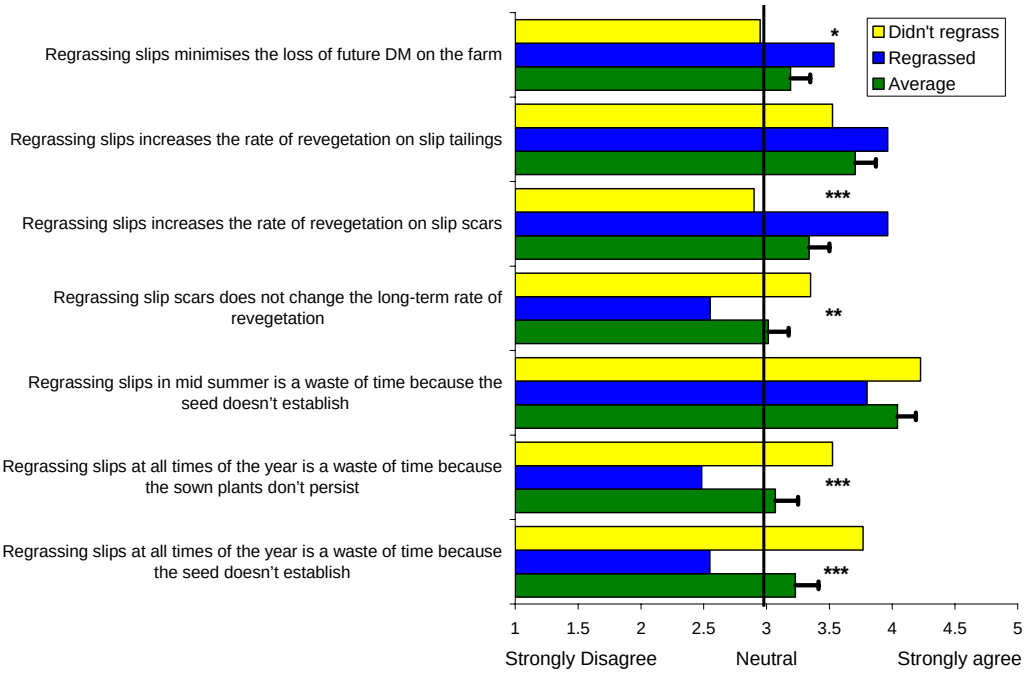


*Figure 4: The perceptions of biological successfulness of regrassing slips grouped by whether farmers regressed slips or didn't and overall average. Bars are standard error. ***P<0.001, ** P<0.01, *<P<0.05 is statistical difference between farmers that did or didn't regrass slips*

All farmers believe that the economics of regrassing slips was marginal, and is associated with an element of risk, especially compared with other expenditure items after storm events. It appears that farmers regrass slips for reasons such as "maintaining capital value on the farm", "it is the right thing to do", "reduces run off into waterways", "is proactive" and "reduces the ugliness of scars".

Farmers regrass for many reasons; some of them not based on economics

Following the 2004 storm event, of the randomly surveyed farmers 40% had regrassed slips. The conditions for seed establishment were good and both natural, but more so sown seed, established reasonably well. But consequently ¾ of farmers indicated that persistence of the new pasture was poor. Regrassing tailings did not further improve their revegetation. There were minor benefits to regrassing on the slip scar. Regrassed slip scars (scarp + middle) had 3% more clover, 7% more green grass leaf, 6% less dead matter, and 11% more total ground cover (Figure 4) than non regrassed slips. Regrassing was more effective on slips on less steep slopes. Regrassing, improved ground cover by 20% on slips of less than 30 degrees (moderate), by only 10% on steep slopes and not at all on very steep slopes. Ground cover is likely to overestimate the difference in DM production because the shallow soils will reduce growth rate of the existing ground cover. In the few research trials conducted to date, oversowing slips has been shown to add about 1500 kg DM/ha/yr to the productive capacity of a slipped area over the first few years after slippage.

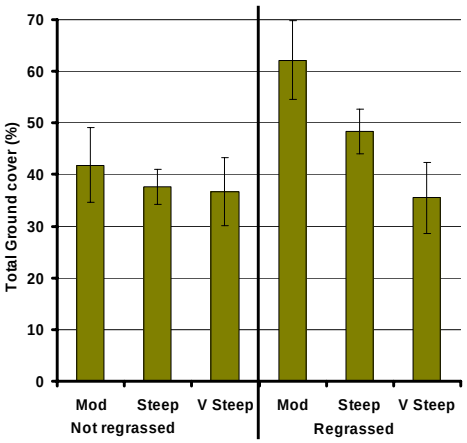


Figure 5: Effect of regrassing on total ground cover assessed by image analysis on different slopes on slips (scarp+middle). Bars represent the spread over which 95% of the data was found. Where bars do not overlap differences are statistically significant.

Regrassing slips increases revegetation on moderate and steep slops but not on very steep slopes

In the survey there was no benefit gained from regrassing mudstone soils (Figure 5). Possibly because both in this study and other studies, natural revegetation of slips on mudstone soils is faster than on sand stone based soils.

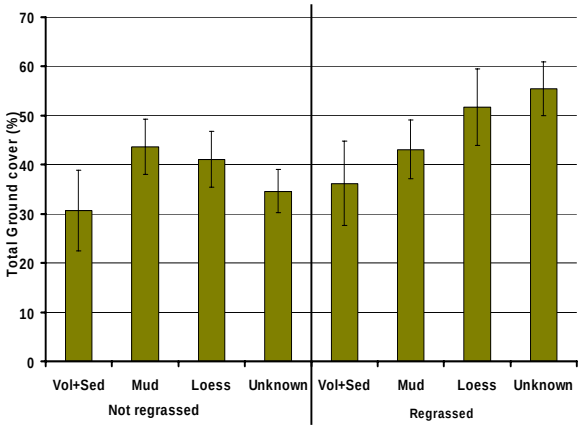


Figure 6: Total ground cover as assessed by image analysis on slip faces (scarp+middle) on different soil types (scarp+middle). Bars represent the location of 95% of the data and where bars do not overlap differences are statistically significant.

Recommended best practise for regrassing slips is to use only coated legume seed. Legumes have the greatest chance of colonising the low nitrogen environment that exists on slips. However, after the storm event the most common practise by farmers was to use a helicopter to fly on uncoated grass and legume seed without fertiliser more than 30 days after the slipping. Farmers indicated that putting seed on at a time that gives the seed the greatest chance of germinating and establishing in the hostile slip environment was the most important key success factor. Research has shown that the success of oversowing will be increased if the area can be spelled to allow good establishment. However, after the storm event most farmers couldn't do this due to the lack of intact fencing. Once a slip face has recovered some vegetation, phosphate and sulphur and possibly lime will be important for supporting the legume growth as it develops. In trials, fertiliser boosted the benefit of oversowing by a further 600 kgDM/ha/year. However the normal farm fertiliser applications that occur in the modern era should be sufficient to support growth on slips. Nitrogen will only be of benefit once grass species become established.

Given the expected improvement in revegetation rate of only 10% in steep slopes and 20% in moderate slopes found after the 2004 storm due to regrassing slips farmers will need to keep resowing costs low if they wish to achieve a positive economic outcome from regrassing slips (see Figure 7). The economic outcome is far less than other expenditure items on the farm such as fertiliser.

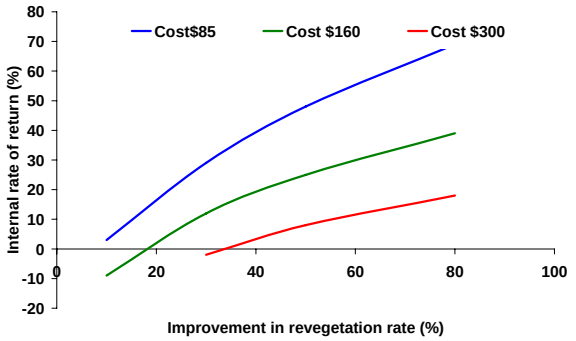


Figure 7: Internal rate of return (interest rate) earned from oversowing assuming varying rates of vegetation given costs of oversowing of $85/ha (clover sown by hand), $160 (clover and grass seed sown by hand), $300 (clover and grass seed sown by helicopter).

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This information has been compiled by the Manawatu/Rangitikei, Wanganui, Ruapehu and Tararua Combined Federated Farmers Storm Group with funding from Manawatu Wanganui Regional Disaster Fund, MAF sustainable farming fund, Meat and Wool New Zealand, Farmlands, Dairy Insight and Federated farmers. Information was provided by farmers from the 2004 storm event, research findings and rural professionals. For expanded information see MAF and SFF website.