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OVERSOWN GRASSES AND THEIR MANAGEMENT ON SOUTHLAND HILL COUNTRY

C.D. MEURK and J.D. TURNER
Grasslands Division, DSIR, Gore

Abstract

Infertile hill country grasslands are a vastly under-utilised pastoral resource in New Zealand. Three years of trial results on this class of land in eastern Southland are summarised. Five grasses (Grasslands Nui ryegrass, Wana cocksfoot, Matua prairie grass, Roa tall fescue and Maru phalaris) were oversown together with Huia white clover and subterranean clover. These were compared with a resident pasture, all under two fertility levels and two rotational grazing managements, and with unimproved pasture.

The use of fertiliser and rotational grazing doubled the productivity of the unimproved rangeland to ca. 10,500 kg DM/ha/year. The addition of white clover increased yield to 12,000 kg, and improved grasses increased this further to 14,000 kg.

Keywords: agronomy, fertiliser, grasses, grazing management, hill country, oversowing, pasture composition, pasture yield.

INTRODUCTION

Hill country grasslands are an under-utilised resource in New Zealand. While it is important to protect some natural soils and vegetation as benchmarks against which agronomic trends can be judged, intensification of farm management can greatly enhance production on this class of land.

Hill country has a number of serious limitations to high production; topography and access are barriers to economic subdivision and to frequent movement of stock; high intensity rainfall, causing rapid runoff and soil erosion; intensified summer drought on sunny faces; leached soils of low natural fertility, especially on shady faces; and the problems of achieving uniform seed lodgement on steep and broken country. These difficulties are compounded when terrain is stepped with gentle "tread" surfaces and steep "risers". This promotes nutrient transfer through stock camping on flats, with consequent trampling, fouling and under-utilisation of those swards. Compensatory overgrazing ensues on the drier, less fertile and unstable steep slopes on which it is also most difficult to establish high producing species.

A series of grazing trials was initiated by Grasslands Division, DSIR in hill country throughout New Zealand to determine the most suitable pasture species and the most appropriate managements for optimising farming operations on ostensibly summer-dry land. We report here a summary of the first three year's results of the southernmost trial of this series, established on the Hokonui Hills in eastern Southland.

METHODS

A site on "Fairplace Station", 30 km WNW of Gore, on the north slopes of the Hokonui Hills, was chosen as being representative of summer-dry hill country in Southland. Resident vegetation is fescue-silver short tussock grassland. The underlying yellow-grey earth soils have natural, moderate acidity (pH = 5.6), high base status (60%) and moderate P and severe S deficiency (McIntosh & Bruce, 1983). Although rainfall is ca. 1100 mm, the 20° slope, warm aspect and impervious

fragipan ensure that much of the rain is lost to runoff and evaporation. However, the tread/riser micro-topography results in considerable local variation in soil moisture.

The trial layout comprised 6 pasture types; NUI ryegrass, MATUA prairie grass, WANA cocksfoot, MARU phalaris, ROA tall fescue — all with Huia white clover and sub. clover' — and RESIDENT spp. as a "control". Superimposed were two fertiliser regimes (HI — 500 kg/ha superphosphate at establishment + 250 kg/ha annual maintenance, LO — 500 kg/ha at establishment, no maintenance) and currently two grazing managements (MEDIUM — rotationally grazed for 7 days on and spelled for 30-80 days, SLOW — for 30 days on and 40-90 days spell).

Establishment of individually fenced pasture types was effected six weeks after glyphosate treatment, by hand application of seed* and fertiliser in March 1981, followed by mob stock "cultivation". Resident paddocks were fenced and fertilised but not sprayed. In addition, cages outside the fenced trial area were used to estimate production of unimproved rangeland at the site.

For the first two years, pastures were grazed for 2-3 days (quick rotation) every 4-10 weeks. Stocking rate was adjusted to the herbage on offer in each paddock. Contrasting managements were not initially imposed because of wet summers. However, in the third (also wet) year MEDIUM and SLOW rotational managements were introduced to evaluate practical alternatives for farmers on large blocks of run country. This also aimed to improve utilisation and reduce erosion.

Total yield and botanical composition were measured before each grazing by cutting herbage from quadrats. Regrowth under cages was used to estlmate yield during grazing periods. Yield varied considerably with slope, thus sampling was stratified according to slope classes; flat (O-15"; 26% of area); moderate (15-25"; 46%); and steep (>25°; 28%). Paddock yields were derived from area-proportioned slope data.

RESULTS AND DISCUSSION

Table 1 shows average annual paddock yields for the pasture types over the three years of study. There was no significant difference between years, although dead matter from the herbicide pretreatment made up 30-40% of the yields in the first six months after sowing. It declined to 4-7% by year 3 in all but the RESIDENT pastures (11%). Regression analysis of slope yields indicated that production was reduced 3% per degree of slope, from a base of 100% for the flat slope class (median slope = 7.5").

RESIDENT pastures showed a 94% increase in yield over UNIMPROVED, attributable to subdivision, controlled rotational grazing, and fertiliser stimulating the initially unobtrusive wild clover. ROA and MARU showed a modest 14% increase over RESIDENT. Essentially this was a response from Huia white clover since the sub. clover failed and the sown grasses established only on some of the flats. WANA yielded 18% better than RESIDENT, and cocksfoot establishment was uniform between treatments and across slopes. MATUA produced 22% more than RESIDENT, but this was greatly influenced by MATUA's extremely high yields on the flat and moderate slopes (22,900 and 15,900 kg/ha/year respectively) of the HI fertiliser treatment in the third year. NUI pastures performed best in terms of total yield (33% better than RESIDENT) and uniformity of establishment. Whereas 4% of total sown grass yield was from the steep slopes in WANA and NUI paddocks, these slopes contributed Only 2% in ROA and MARU and 1% in MATUA.

• The "Grasslands" cultivars and seeding rates (kg/ha viable seed) used were: Nui (*Lolium perenne* L.) (20), Matua (*Bromus catharticus* Vahl) (15), Wana (*Dactylis glomerata* L.) (8), Roa (*Festuca arundinacea* Schreb.) (30), Maru (*Phalaris aquatica* L.) (19), Huia (*Trifolium repens* L.) (3), Woogenellup and Mt Barker (*T. subterraneum* L.) (4 each).

Table 1: 3 YEAR AVERAGE TOTAL YIELDS FOR SEVEN PASTURE TYPES (kg/ha/year); PERCENT SOWN (OR RESIDENT) GRASS, WHITE CLOVER AND DEAD MATERIAL OVER THE 3 YEARS; AND GRAZING DAYS IN THIRD YEAR EXPRESSED AS S.U./ha.

	Nui	Matua	Wana	Maru	Roa	Resident	Unimproved
Yield	14000	12800	12400	12100	11900	10500	5400
C.V.	11	14	10	13	18	10	12
% Grass							
Year 112	10.4	8.3	0.2	2.4	2.8	42	72
Year 1	33.1	6.4	7.2	1.5	1.2	47	72
Year 2	65.4	42.0	27.2	7.2	10.6	59	72
Year 3	76.3	26.9	49.7	21.7	20.3	75	72
% Clover							
Year 1/2	13.2	17.1	14.6	13.9	11.2	16.2	1.5
Year 1	25.0	30.0	22.7	24.1	26.0	22.2	1.5
Year 2	11.9	14.3	17.7	22.1	24.9	19.5	1.5
Year 3	6.9	19.2	11.6	18.4	20.5	12.2	1.5
% Dead							
Year 1/2	33.4	27.7	31.2	31.6	38.2	39.7	25
Year 1	16.7	19.2	27.5	26.6	25.0	28.8	25
Year 2	12.3	11.1	11.3	12.6	9.9	19.4	25
Year 3	3.9	6.1	5.2	7.4	6.0	11.0	25
SU/ha	44.3	33.1	37.8	32.2	33.3	27.6	ca. 6

A yield effect due to fertility emerged in the third year as P and S levels in the LO fertiliser paddocks declined. The HI pastures averaged 2000 kg/ha/year more than LO. It also seemed that SLOW rotation was detrimental to pasture (1100 kg/ha/year less yield than for MEDIUM).

Sown grass content generally increased over the three years (Table 1) with Nui achieving 33% by the end of the establishment year and appearing to have stabilised at 75% by the third year. Matua established quickly on the flats (20% and 54% in years 1 and 2 respectively), but declined sharply in the third year to 40% on the flats, from 39% to 14% on moderate slopes, and from 20% to 3% on steep slopes. This dramatic reversal was most pronounced under LO fertility and/or SLOW management treatments. Wana improved (7%, 27% and 50%) in successive years, becoming second only to Nui in all respects, but, unlike Nui has probably not yet reached its potential. Other sown grasses have slowly increased on the flats, but because of their less aggressive establishment had not yet attained the contribution found in NUI and WANA.

Generally, HI fertility treatments had, at the end of the third year, a 9% greater sown grass content than LO. Clover content, which varied inversely with the vigour of the grasses, became greatest on steep slopes (15%) and in ROA and MARU pastures (20%). The HI fertility treatment had a higher clover content (17%) than LO (14%) during the last year.

Herbage dry matter results are generally supported by the relative sheep grazing days (Table 1) of the different pasture types. However, grazing-days cannot be equated with sustainable carrying capacity. In the third year HI (fertility) carried 17% more sheep than LO, and MEDIUM rotation 10% more than SLOW.

CONCLUSIONS

On P- and S-deficient yellow-grey earths in Southland hill country, subdivision, fertiliser and rotational grazing increased total dry matter yield by almost 100% or 5000 kg DM/ha/year. With the additional oversowing of white clover a further 10% increase can be expected (115% or 6000 kg above UNIMPROVED) and, by sowing Nui ryegrass as well, another 30% (175% or 10,000 kg above UNIMPROVED). This pattern is similar to that reported by White et *al.* (1972), but here the yields have been higher, presumably reflecting the favourable summer moisture conditions during this evaluation. The successive Increases in yield, over UNIMPROVED, we have reported above correspond to 5.5, 6.5 and 10.9 s.u./ha/year at 60% herbage utilisation (after Jagusch & Coop, 1971).

Wana cocksfoot demonstrated a potential in hill country pastures, although it is slower to establish than Nui ryegrass. However, the performance of both these species under truly dry conditions has yet to be ascertained in Southland. The first three years of the trial have been characterised by record rainfall.

The non-establishment of Roa and Maru on the slopes greater than 15°, and the rapid decline of Matua after two years, suggest these cultivars have little value in hill country with extremely uneven topography.

This trial is continuing, in order to quantify the downward trend observed after withholding maintenance fertiliser and increasing the grazing period. Furthermore, the trial has been expanded to evaluate improvements associated with the addition of white clover and fertiliser alone; and from a Nui, Wana, clover and fertiliser combination; and also to see if these improved pastures can be successfully established without herbicide pretreatment.

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REFERENCES

Jagusch, K.T.; Coop, I.E. 1971. *Proc. N.Z. Soc. Anim. Prod. 31: 224-34.*

McIntosh, P.D.; Bruce, J.G. 1963. Soil Bureau District Office Report GG5 (unpublished).

White, J.G.H.; Meijer, G.; Langer, R.H.M. 1972. *Proc. N.Z. Grassld. Ass. 34:* 139-146.