DROUGHT PASTURE RENEWAL PROGRAMME

G. Milne[1], T. Fraser[2]

DSIR Grasslands
[1]Palmerston North
[2]Lincoln, Canterbury
New Zealand

ABSTRACT

The Drought Pasture Renewal Programme involved 81 farms in North Otago and South Canterbury, with an average 19.7 hectares per farm, and total area of 1,595 hectares. During the drought cocksfoot, lucerne, tall fescue, chicory, wheat grass, red clover, and prairie grass all performed better than ryegrass. Ryegrass was not used in the programme because it is not drought and grass grub tolerant.

Ten different species of grass clover, lucerne, and herbs comprising sixteen different cultivars were used. Half the area was sown in February and March 1989, by either full cultivation, minimum tillage, or direct drilling. There was a 92 % success rate, despite a dry, mild autumn.

BACKGROUND

In November 1988, Parliament approved a programme to renew 1,500 hectares of drought affected pasture in North Otago and South Canterbury.

The purpose was to demonstrate the benefits of drought tolerant species available. These species have been available for many years, but are still not commonly used by farmers in the area. The programme aimed to give as many farmers as possible the knowledge and confidence to use the species.

A total of 81 farms were chosen. The aim was to give the farmers some practical examples of these species in their local area. This gives them more confidence to use them than viewing demonstrations in other areas. To produce local demonstrations, selection ensured that all localities had sites in the programme. The 81 farms gave an average area treated per farm of 19 hectares. It was felt that most farmers would not be able to establish any more than this at one time. Successful pasture establishment is largely dependant on the farm manager. Spreading the programme decreased the chance of failures due to managers.

The total area in the programme was 1,595 hectares, an average of 19.7 hectares per farm.

Farmers contributed 22 % of the total cost of the operation on their farms. This was felt necessary to gain a strong commitment from farmers to manage the established pastures correctly.

A total of 316 farmers applied for the programme, approximately 25 % of the eligible farms in the area. Federated Farmers, MAF, Catchment Boards, and the Rural Trust, assisted in selecting the most suitable sites.

Tenders were called for the supply of seed, fertiliser, insecticides, herbicides, and contractors. All materials were delivered to, and dispatched from, seed stores in Timaru and Oamaru.

OBSERVATIONS OF EXISTING PASTURES

The area had a severe drought which begun in March 1988 and ended in May 1989.

For the 12 months from March 1988 to February 1989, only 269 mm of rain fell in North Otago (Figure 1). This was only 50 % of the average annual rainfall of 537 mm. Over the same period, potential evapotranspiration (PET) totalled 782 mm, and soils were at wilting point for most of that time.

As a result of this, there was no measurable pasture growth from May 1988 to January 1989 (Table 1). Some growth in summer and autumn of 1989, gave a total yield of 2,076 kg DM/ha for the 12 months from June 1988 (ryegrass-cocksfoot sward) which was only 31 % of the annual average. On average, farms destocked 50 % by November, and were still down 31 % in July 1989 (MAF, 1989).

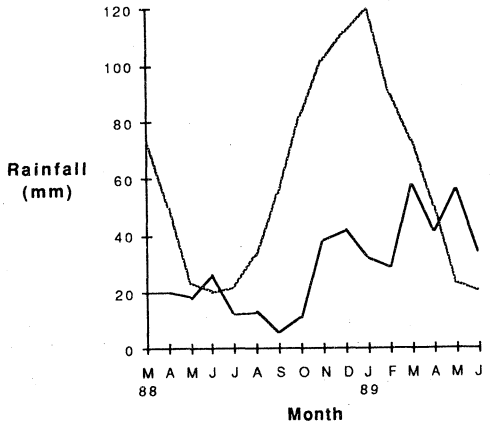

Figure 1: Rainfall and ET at Richmond, North Otago, March 1988 - June 1989 (..... average evapotranspiration, _____ rainfall).

The decline in pasture production was magnified by widespread and severe grass grub damage, through autumn, winter, and spring 1988. This fact has been forgotten by most observers, as it was also a major cause of pasture death during this period.

During the drought (Figure 1) ryegrass paddocks produced very little feed (Table 1).

Species that showed better growth were: cocksfoot, lucerne, tall fescue, chicory, wheat grass, red clover, and prairie grass. The MAF pasture growth site consisted of 70 % ryegrass and 30 % cocksfoot, yet they contributed 848 and 834 kg DM/ha respectively to the total yield (Table 1). If these figures are adjusted to pure swards, cocksfoot (Apanui) yielded 230 % more than the ryegrass.

Between January and March of 1989, Light showers of rain were sufficient to produce a growth response from cocksfoot, lucerne, tall fescue, chicory, wheat grass, prairie grass, and subterranean clover. There was less response from most ryegrass paddocks. By August 1989, farmers have been unable to restock because of very slow drought recovery from pastures, almost all of which are ryegrass. This prolongs the financial affects of the drought, with most farms probably not back to full stocking until 6 - 10 months after the drought has broken climatically.

Damage to ryegrass was most severe in pastures less than five years old, while ten year old pastures seemed to recover much better. This is most likely caused by natural selection of stem weevil tolerant plants over time. These plants usually have high levels of endophyte, which is confirmed by farmer observations of more ryegrass staggers from these old pastures.

WHY USE ALTERNATIVES TO RYEGRASS

As we have already outlined above, ryegrass has magnified and prolonged the effects of the 1988-89 drought.

The South Canterbury and North Otago areas have several aspects that make ryegrass less than ideally suited to their environments. The main one is that the areas experience drought frequently, and pest infestation from grass grub and stem weevil are very common.

Over the years farmers have accepted that pastures generally only last until the first drought, and need to be renewed every 3-5 years. This is because ryegrass is not drought tolerant, and large plant deaths have lead to weedy run out pastures. The problem has often been compounded with severe grass grub damage, as in the good years stock numbers are too low to prevent rank growth.

The introduction of ryegrass cultivars with high endophyte (e.g. Ellett, Yatsyn, Droughtmaster, SuperNui) has overcome the susceptibility to Argentine stem weevil damage. They are still susceptible to grass grub damage, they suppress clover production, and can cause ryegrass staggers.

The problems of drought have been made worse because pastures have not been in a condition to respond to rain when the drought finally breaks.

Some alternatives of ryegrass offer drought tolerance, pest tolerance, quick drought recovery, persistence, and increased animal production, without an ongoing input. They can provide higher amounts of quality feed at times of the year when ryegrass production is poor. Animal production increases of 30 % have been measured ('Roa' tall fescue versus ryegrass).

SPECIES USED

Ten different species of grass, clover, lucerne, and herbs were used. Among these species, there were sixteen cultivars (Table 2).

Table 1. **Pasture growth at Windsor of a ryegrass (70 %)/cocksfoot (30 %) sward during the 1988-89 growing season.**

	Ryegrass	Cocksfoot	Clover	Weeds	Totals
Winter 88	0	0	0	0	0
Spring	0	0	0	0	0
Summer	321	443	0	245	1,009
Autumn 89	527	391	11	135	1,067
Total	848	834	11	380	2,076

Table 3. **Species and cultivars used.**

Cultivar	Total Kg	Percentages By Weight	Percentages Adjusted
Grasslands 'Roa' tall fescue	15,418	44.6	21.6
'AU Triumph' tall fescue	1,745	5.1	2.4
'S170' tall fescue	40	0.1	0.1
'Grasslands 'Wana' cocksfoot	4,493	13.0	10.5
'Saborto' cocksfoot	258	0.7	0.6
Grasslands 'Maru' phalaris	1,345	3.9	3.8
Grasslands 'Huia' white clover	1,786	5.2	16.7
Grasslands 'Tahora' white clover	1,813	5.2	16.9
Woogenellup subterranean clover	1,342	3.9	7.5
Grasslands 'Pawera' red clover	1,688	4.9	9.5
Grasslands 'Oranga' lucerne	764	2.2	2.1
'Otaio' lucerne	926	2.7	2.6
Yarrow	17	0.0	0.5
Grasslands 'Matua' prairie grass	1,990	5.8	2.2
Grasslands 'Hakari' brome	648	1.9	0.7
Lotus corniculatus	25	0.1	0.2
Grasslands 'Puna' chicory	154	0.4	1.4
Wheatgrass	56	0.2	0.3
Sheep's burnet	40	0.1	0.3
Total	34,548		

All grasses and herbs used were drought tolerant and either tolerant or resistant to grass grub and stem weevil. Of the legumes used, only white clover is susceptible to drought, although it does seem to survive from buried seed. White clover was included for its nitrogen fixation and high feed value. Where subterranean clover did not already exist in the paddock, it was included in the seed mixture.

ESTABLISHMENT METHODS

Drilling: Pastures were established by either full cultivation, minimum cultivation, or direct drilling. The

decision on which method to use was based on the erosion risk of each paddock. Several of the paddocks were fallowed before the programme began.

In most cases farmers used their own drills, and for a small number contractors were used. Contractors were mainly used for direct drilling. Most of the spraying for minimum tillage, direct drilling, and post emergence, was done by local contractors.

Timing: All autumn sowings had to be completed by 20 March, to allow slow species to establish before the expected hard winter frosts. Sowing did not commence until there were good soil moisture levels.

Half the sowings had to be delayed until spring 1989 as soil moisture was not adequate before 20 March. These were mainly paddocks that were to be direct drilled or minimum tilled, most of the cultivated and fallowed ground was sown in the autumn.

Spring sowings occured between 10 and 30 September, with some paddocks sown the following autumn.

Fertiliser: Soil tests were taken from all sites, and fertiliser rates used based on the results. Nitrogen based fertiliser (20:10:0:13) was used in most cases, with the balance as superphosphate.

AUTUMN SOWING EVALUATION

Approximately 50 % of the 1,595 hectares was sown in the autumn, 514 hectares in South Canterbury (Waimate to Rangitata River), and 321 in North Otago (Shag Point to Waimate).

Soil moisture levels remained very low until 25 February in South Canterbury, and until 12 March in North Otago (Table 1). Sowings in South Canterbury took place between 25 February and 30 March, and between 15 and 30 March in North Otago.

During the month following sowing (April), only 41.2 mm of rain fell in North Otago, when PET values average 50 mm (Table 1). This placed some of the new pastures under stress. Paddocks sown after rain on 20 March had an incomplete strike, with the balance of seed striking in May. Those paddocks sown earlier suffered more from moisture stress, as they had established before the moisture stress occurred and were at a more vulnerable growth stage.

Weeds were very thick in some paddocks, due to the moisture stress on the sown plants, and the mild autumn which favoured weed growth. Problem weeds were chickweed, speedwell, nodding thistle and stinging nettle. A small number of paddocks were sprayed for weeds between May and July.

Despite the unfavourable conditions after sowing, there was a 92 % success rate. Most failures were due to deep drilling, or lack of insecticide use on organic farms.

Some paddocks established extremely well, a paddock of 'Matua' prairie grass was grazed three times before June, and a tall fescue pasture grazed twice.

'Maru' phalaris established very well, and was faster than 'Wana' cocksfoot, and some 'Roa' tall fescue stands.

The most successful stands tended to be those sown into fallowed soil. This practice allows rainfall to accumulate over summer without being evaporated through plants. Next most successful were those stands sprayed, cultivated, and drilled ("minimum tillage"). Least successful were direct drilled paddocks, although there were no failures. Pastures with vegetation in the summer were unable to accumulate moisture, so conditions were drier for direct drilling. This is why the majority of delayed pastures were to be direct drilled. Moisture can be accumulated for autumn direct drilling by spraying vegetation in early summer, with a further application prior to drilling.

ACKNOWLEDGEMENTS

Richard McNamara, MAFTech Oamaru - Rainfall, ET, and pasture data.
Phil Tither, MAFTech Oamaru - Farm Monitoring data,

REFERENCE

MAF. 1989. A Review of 1988/89. *Farm Monitoring Report - Farm Class 7 - June 1989.*