EFFECT OF VEGETATION SUPPRESSION ON RYEGRASS ESTABLISHMENT BY DIRECT DRILLING

G.M. BARKER¹, P.J. ADDISON¹, A.C. FIRTH¹,
and L.N. ROBERTSON²

¹MAF Technology, Ruakura Agricultural Centre, Private Bag, Hamilton

²Department of Primary Industries, P.O. Box 81 Emerald, Queensland

Large areas of pasture in New Zealand are renovated annually. Direct drilling techniques are replacing conventional cultivation as preferred methods of pasture renovation. A common farming practice in the northern North Island is the direct drilling of perennial ryegrass (*Lolium perenne* L.) into pasture without the use of herbicide to suppress competition from resident vegetation. A series of six trials were established in the Waikato-Bay of Plenty in March 1985 to investigate the benefits of herbicide use for vegetation suppression.

Three methods of turf treatment before direct drilling were compared viz (i) no herbicide; (ii) glyphosate (2.16 kg/ha) as a cover spray 14 days before drilling, and (iii) glyphosate (2.16 kg/treated ha) as a 75 mm band over the drill row at the time of planting. "Ellett" perennial ryegrass seed (96% seed infection by *Acremonium lolii*) was direct drilled at 12.5 kg/ha to 20 mm depth and 150 mm row spacing through a Duncan triple disc seed drill. A fourth treatment consisted of unrenovated old pasture.

Plots were arranged in a randomised block design with four replications. Each plot was four drill widths (9.6 m) wide by 15 m long, with 8 m buffers between blocks. Pasture was grazed to approximately 500 kg DM/ha residual before drilling.

Six trials were established: site 1 at Manawaru on a Waihou silt loam; site 2 Tātuanui, Te Pūnanga sandy loam; site 3 Ruakura, Bruntwood clay loam; site 4 Kaharoa, Kaharoa sandy loam; site 5 East Reporoa, Kaingaroa loamy sand; site 6 West Reporoa, Taupo sandy silt.

Fig. 1: Survival of perennial ryegrass seedling cohorts under three pasture renovation treatments at intervals from seedling emergence.

● — ● — ● no herbicide; ● — ● — ● banded glyphosate; ● - - - ● blanket glyphosate.

Proc. 43rd N.Z. Weed and Pest Control Conf. 1990: 289-291

At full emergence, ryegrass seedlings were counted within the drill furrow in twenty 100 mm diameter soil cores (2 m total row length) per plot. A permanent 5 m transect was established in each plot and a cohort of 50 seedlings was marked by a loop of coloured wire. At intervals over the subsequent 5-7 months, the survival and growth (tiller number) of these marked seedlings was recorded. Pasture yields were estimated by harvesting herbage regrowth with a rotary mower from a 5 m pre-trimmed transect per plot prior to each grazing.

Numbers of emergent ryegrass seedlings were not affected by the herbicide treatments. Trends in seedling survival (Fig. 1) and growth (Fig. 2) reflected the degree of competition from the resident swards. At all sampling dates, seedlings from the blanket herbicide treatment had significantly more tillers ($P < 0.01-0.001$) than seedlings from untreated plots. Survival rate of seedlings between consecutive sampling dates was generally high for the blanket herbicide treatments but was variable, and often significantly lower, where no herbicide had been used. Seedlings in banded herbicide plots had tiller numbers intermediate to that of no herbicide and blanket herbicide treatments. Survival of seedlings in the banded herbicide treatments varied with site; at

Fig. 2: Growth of perennial ryegrass seedling cohorts under three pasture renovation treatments at intervals from seedling emergence. Legend as for Figure 1.

sites 1, 2 and 4 where the old swards were rather open, survivorship patterns were similar to that under blanket herbicide treatment, while at sites 3, 5 and 6 the high density of grass tillers (*Poa trivialis* L; *Agrostis capillaris*, *Holcus lanatus* L.) resulted in plant survival more similar to that with no herbicide.

There were significant effects of site ($P < 0.001$), treatment ($P < 0.001$) and site $\times$ treatment interactions ($P < 0.001$) on total herbage and ryegrass yields accumulated over a 9 month period from sowing (Table 1). With the exception of site 5 (strongly browntop dominant), blanket herbicide treatment prior to drilling increased ryegrass yields. Only at site 1 were ryegrass yields significantly increased by drilling seed into untreated or banded herbicide treated swards. Averaged, over all sites, there was a significant ($P < 0.01$) increase in ryegrass yields in all three drilling treatments.

The success of pasture renovation by direct drilling depends on the degree of competition from resident established plants experienced by seedlings. Direct drilling seed without herbicide will only increase yields if the resident sward is very open (as at site 1), allowing seedlings to established in the bare areas. Therefore, direct drilling seed

TABLE 1: Ryegrass yields (kg DM/ha) for the period March (sowing) through to December (1985).

Site	1	2	3	4	5	6	Mean
Old pasture	1900	2960	4850	1890	1720	2430	2630
Undersown							
No herbicide	2650	3790	5000	2110	1610	2680	2970
Undersown							
Banded herbicide	3560	3460	5010	2130	1330	2670	3030
Undersown							
Broadcast herbicide	5810	4610	7280	2430	1100	3885	4190
SED	315	435	479	229	188	258	137

into living swards is a useful technique for repairing pastures severely affected by drought or pests. There is a tendency, however, for farmers to underestimate the regenerative capacity of swards and hence the degree of competition they will impose on young seedlings.

Pasture renovation is most effective if all potentially competitive vegetation is eliminated prior to direct drilling by blanket applications of broadspectrum herbicides such as glyphosate (e.g. Kunelius *et al* 1982; Thom 1988; this study). Recent cost-benefit analyses (Underwood and Ussher 1987) show that the use of herbicide in pasture renovation is economic, with first year returns on investment ranging from 80-164% for subtropical grass dominant pastures, 102% for open perennial ryegrass pastures, to 48% when browntop is dominant.

Band spraying of herbicide represents a compromise approach to pasture renovation. The cost of herbicide is substantially reduced, and competitive vegetation temporarily suppressed. The present trials support earlier studies (e.g. Baker *et al* 1979; Barr 1980; Blackmore 1962; Kunelius *et al* 1982) which showed seedling establishment under a banded herbicide treatment to be intermediate between that of a no herbicide and a blanket herbicide treatment. The level of seedling establishment with banded herbicide is very dependent on the botanical composition of the resident sward.

ACKNOWLEDGEMENTS

We thank T. Ballard for technical assistance, Ms B.W. Dow for statistical assistance, and to the following who allowed us to conduct trials on their farms; S.T. and M.G. Borkin, C.K. and D.K. Sing, G. Jenkins, M. Gold., D. Leslie, B. Wyllie and A.R. Napper.

REFERENCES

- Baker, C.J., Thom, G.R. and McKain, W.L., 1979. Developments with seed drill coulters for direct drilling. IV. Band spraying for suppression of competition during overdrilling. *N.Z. J. Exp. Agric.* 7: 411-416.
- Barr, S.J., 1980. Some factors affecting the success of pasture renovation using overdrilling with band spraying. B. Agr. Sci. (Hons) Thesis, Massey Univ.
- Blackmore, L.W., 1962. Bandspraying: a new overdrilling technique. *N.Z. Agric.* 104: 13-19.
- Kunelius, H.T., Harris, W., Henderson, J.D. and Baker, C.J., 1982. Comparison of tillage methods on red clover and ryegrass establishment and production under grazing in the establishment year. *N.Z. J. Exp. Agric.* 10: 252-263.
- Thom, E.R., 1988. Changing seasonal growth of paspalum pastures by overdrilling ryegrass and white clover. *Proc. N.Z. Grassld Assoc.* 49: 135-140.
- Underwood, R.A. and Ussher, G.R., 1987. Pasture renovation: Costs and benefits. pp. 115-120 *In* Pottinger, R.P., Lane, P.M.S. and East, R. (eds). Pasture Renovation Manual. Ruakura Agricultural Centre.