

Improved soil management in NE Victoria

T.G. Reeves, A. Ellington, D.R. Coventry, J.R. Hirth and G.R. Steed

Department of Agriculture, Victoria, Rutherglen Research Institute

A survey, conducted in 1980, with the objective of investigating reasons for chlorotic and stunted growth in wheat crops on 50 farms in N.E. Victoria, found soil hardpans in 63% of the affected paddocks, with associated defects in root systems of the crops. In 54% of the paddocks a legume had not been grown for three years or more. These findings were a further indication that reduced tillage and legumes are important factors in preserving soil fertility. Whilst their use seeks to minimize damage to soil, where problems already occur, they must be overcome if productivity is to be increased. Two experiments being conducted at Rutherglen Research Institute (rainfall 560mm 3.a.) have provided results to support these hypotheses.

Methods

Experiment 1. A continuous wheat rotation and a lupin-wheat rotation were compared under either normal cultivation or direct drilling at three sites. Cropping commenced in 1977 and measurements made include soil nitrogen, soil structure and soil moisture. Crop measurements include dry matter production, grain yield, herbage nitrogen and disease incidence.

Experiment 2. In a paddock where soil pH (1:5 water) values were 0-10 cm 5.0, 10-20 cm 4.5 and a marked hardpan (bulk density 1.7 g/cc) was detected at 10-20 cm, lime and deep ripping treatments were applied before cropping with wheat. Lime was topdressed and incorporated and half the plots were deep ripped to 40 cm. Plots were sown to Oxley wheat.

Results and Discussion

At all sites the inclusion of lupins in the rotation increased wheat yields by approximately 40%. At two sites direct drilling and normal cultivation gave equal yields but at the third, direct drilling was significantly better than cultivation after five years (Table 1).

Table 1 Effect of combining direct drilling and lupin/wheat rotations on wheat yields at Rutherglen, 1981.

Rotation 1977-1981†	Establishment method	Wheat grain yield t/ha 1981
W W W W W	CC	1.05 ^c
W W W W W	DD	1.91 ^b
W L W L W	CC	2.92 ^a
W L W L W	DD	3.18 ^a

W = Wheat, L = Lupins, CC = Conventional Cultivation, DD = Direct Drilling with modified combine.

The increased wheat yields due to direct drilling and the inclusion of lupins appear to be associated with increased soil nitrogen levels and a reduced incidence of fungal diseases.

In Experiment 2, lime application increased wheat yields significantly when applied at 1 t/ha or above. These increases were associated with reduced levels of extractable aluminium and soluble manganese in the soil.

Table 2 Effect of lime and deep ripping on wheat yields at Rutherglen, 1981.

Lime t/ha	Wheat grain yield t/ha		Mean
	No Rip	Ripped 40 cm	
0	1.34	1.26	1.33 ^c
0.5	1.23	1.62	1.42 ^{b,c}
1.0	1.76	2.53	2.14 ^{ab,c}
2.5	2.16	2.66	2.41 ^a
5.0	2.15	2.38	2.26 ^{ab}

Ripping increased wheat yield on average by 21% ($P < 0.05$). It is interesting to note that no response to ripping occurred in the absence of lime.