

A survey of soil bulk densities occurring under grazed and ungrazed situations in NE Victoria

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Soil compaction has been shown by many workers (1,2) to adversely affect plant growth. Little data on the levels of compaction in the soil of the Victorian permanent pasture zone are available.

Methods

Seventeen pasture paddocks and five cemeteries were sampled for bulk density in the Wodonga district of NE Victoria in November 1980. Many of the paddocks selected were those where soil compaction problems were anticipated. In addition, pasture paddocks adjacent to the cemeteries were sampled to investigate the effect of long-term grazing on soil density. Bulk densities of these sites were determined from the oven-dry weight of 15 undisturbed cores taken at depths of 0-75 mm and 75-150 mm.

Results and Discussion

Table 1 shows the distribution of soil bulk densities of the pasture soils.

Table 1 - Bulk densities (g/cc), pasture soils

Depth (mm)	.9-1.0	1.0-1.1	1.1-1.2	1.2-1.3	1.3-1.4	1.4-1.5	1.5-1.6	1.6-1.7	1.7-1.8	>1.8
0-75	2	2	2	2	4	3	2			
75-150		2		2		5	3	4		1

The bulk density varied from 0.94 g/cc to 1.52 g/cc in the 0-75 mm depth and 1.07 g/cc to 1.81 g/cc in the 75-150 mm depth. With one exception, all 75-150 mm samples had higher bulk densities than their corresponding 0-75 mm samples.

A comparison of the sample bulk densities from the cemeteries and the adjacent paddock are shown in Table 2.

Table 2 - Bulk densities (g/cc) from cemeteries and adjacent paddocks

Location	0 - 75 mm		75 - 150 mm	
	Cemetery	Paddock	Cemetery	Paddock
Kiewa	1.38	1.43	1.73	1.59
Sandy Creek	1.34	1.32	1.56	1.81
Talgarno	1.13	1.30	1.35	1.53
Tallangatta	1.23	1.09	1.31	1.50
Tawonga	1.27	1.37	1.45	1.44

At both depths, the paddock samples were generally as dense or more dense than the corresponding cemetery sample.

The importance of soil bulk density for plant growth depends on many factors. The bulk density at which plant growth is limited depends at least on the silt and clay content (3) and organic matter content (4). Recent work in NE Victoria (5) has shown reduced clover growth when the bulk density (0-100 mm) was 1.33 g/cc. It is likely therefore that plant growth is limited by adverse soil physical condition in some of the soils sampled.

1. Fryrear, D W and McCully, W G 1972. J Range Man 25:254.

2. Lindemann, W C et. al. 1982. Agron J 74:307.

3. Jones, A C 1983. Soil Sci Soc Am J 74:1208.

4. Hughes, G D 1977. ADAS Advisory Paper No. 18 MAFF London HMSO. 5 Reeves, T G et. al. 1984. Plant and Soil (In Press).