

SOILS REPORT “O”

**REPORT (ON SOILS) OF THE
MID-NORTHERN AREA OF VICTORIA**

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To the south are the well-know Harcourt apple orchards. To the north and west, where the land is flatter and soils more suitable for cultivation, wheat ad sheep are the main industries, and there are small areas of irrigated land for dairying and sheep.

However, considerably more than half the agricultural area under survey is undulating or hilly country, and this is almost exclusively devoted to sheep raising, mainly for wool production. As will be described in the following section, it is this latter country which is the main problem in the districts visited.

Soils and Geology

The geology of the country around Bendigo is perhaps the most variable in the State, and it is interesting to relate a geological map of the area to the tour arranged by the Research Farm Committee.

Some 44 sites were examined in area extending from the Goulburn River to the Avoca River, and approximately from Bagshot and Inglewood in the north to Maldon in the south. The routes traversed and the locations of the sites examined are shown on the map with this report. The map also shows eight broad soil units delineated on the basis of geological information. It will be noted that all the sites demonstrated by the Mid-Northern Research Committee are confined to the three major soil units described below and actual problems were restricted to Unit 1 and, to a much lesser extent, Unit 2 soils. Descriptions of the surface soil and the depth to the clay subsoil were recorded at each of the 44 sites; these are given in Appendix 3.

Unit 1

Unit 1 comprises soils residual on both Silurian and Ordovician sandstones, shales and slates. They range from extremely stony loams and sandy loams with rock close to the surface to slightly gravelly loams and, occasionally, clay loams overlying clay subsoils at a shallow depth and with rock at variable depths below the clay. The very stony soils occur on the crests and upper slopes of undulating to rolling hill land, while the less stony soils are found on the lower gentle soils varies from two to twelve inches. In Appendix 3, the sites examined are grouped into those which are shallow with four inches or less of surface soil and those which are deeper with five to twelve inches.

The stone in the surface soil consists principally of fragments of the underlying shale and sandstone, but quartz and ironstone are variably present. Also, the shale and sandstone fragments may be more or less impregnated with iron oxide. The stone varies considerably in size, as well as in amount, and may interfere with cultivation. In the less stony soils, the stone is usually smaller and, in such cases, the soils have been described as gravelly instead of stony.

Areas of deeper and non-gravelly soils occur within Unit 1 in valley bottoms and adjoining the intermittent creeks where these are present in the valleys, but these particular soils seldom present problems.

As far as can be calculated on the information available, there are approximately 693,000 acres of Unit 1 soils in the area surveyed. This is by far the most extensive group of soils in the Bendigo district; consequently, it is not surprising that the great majority of the problem sites (31 out of 41) put before the Departmental Committee are in this group of soils. However, most of the 230,000 acres of State forest occur in Unit 1, and, if this and other land not used for agriculture is deducted, about one-third of the agricultural land in the area traversed is in the Unit 1 group of soils. This emphasises the preponderance of problem sites on the gravelly soils formed from shales and sandstones and suggests that these soils may present the main difficulties to agricultural development in the area.

Reference to Appendix 3 shows that, of the 31 sites in Unit 1 alleged to be problem areas, 24 have either stony or shallow soils or both. The soils classified as shallow have a clay subsoil usually at two or three inches from the surface. Surface textures are loam at 17 sites, fine sandy loam at 5 sites and clay loam at 2 sites. The soils are poorly structured and most of them tend to set hard when dry.

Besides having obvious disabilities for cultivation and root development, the shallow and stony soils have a low capacity for storing moisture. Hard setting characteristics may engender some run-off of rainfall; nevertheless, low moisture storage capacity means that the soils become waterlogged in

winter. This leads to considerable run-off and erosion on slopes. A further consequence of low moisture storage capacity in the soils is that they dry out rapidly, so that seasonal rains are likely to be particularly important in the initiation and maintenance of autumn and spring growth of crops and pastures.

The association of molybdenum deficiency with ironstone shaley soils in the Central Highlands and experiments already conducted by the Department strongly suggest that Unit 1 soils are molybdenum deficient, and the major nutrient deficiencies for subterranean clover based pastures are molybdenum, phosphorus and sulphur. The phosphate requirement for pastures is sometimes higher than usual on ironstone gravelly soils.

Whilst no laboratory tests were made on the present occasion, it is known that the pH of Unit 1 soil is largely in the range 5.2-5.8, a range in which lime may influence the availability of phosphorus and molybdenum and also be important in nodulation of legumes. Little is known of liming in relation to these aspects in the present soil.

Potash is unlikely to be a fertiliser requirements for pastures on Unit 1 soils, but this still needs to be demonstrated in field trials.

Unit 2

This unit comprises soils on the more extensive areas of alluvium associated with the rives and creeks that flow northward from the highlands. The parent alluvium includes that laid down by prior stream activity as well as that from recent stream deposition.

Ten sites listed in Appendix 3 were examined. Six of these are brown loams and sandy loams, to 16 inches, overlying reddish brown clay. These soils are red-brown earths, which normally are not problem soils for pastures. Phosphorus is a known deficiency, but potash, molybdenum and lime do not benefit pastures. Under irrigation, water penetration is sometimes poor in the shallower soils.

Shallow greyish soils were recorded in Unit 2 at sites 1 and 6. These soils appear to be similar in their physical characteristics to shallow hard setting soils at sites 22 and 33 in Unit 1.

Unit 7

The soils in this category are derived from granite. They are commonly deep, gritty, sandy loams overlying sandy clay subsoils with rock at variable depths. Three sites are recorded in Appendix 3. The soils appear not to present any specific problem to pasture establishment.

Appendix 3 – Description of Soils at Sites shown during Survey

Site No.	Landholder	Surface Soil	Problem Stated	Assessment of Problem
Unit 1 – Soils on Silurian and Ordovician Sandstone and Shales				
(i) Shallow, stony soils (on upper and middle slopes)				
2	(a) M and R Clay, Bagshot North (b) T H Carlisle, Bagshot North	Shallow (3”), stony grey-brown loam Do.	Poor pasture establishment Do.	Old cropping paddock – poor drainage – needs investigation New area – pasture just germinating
3	Shearman, Bagshot North	Shallow (2”), stony, brown fine sandy loam.	Poor pasture development.	Whipstick Mallee development, needs time and fertilizer.
4	M and R Clay, Bagshot North	(a) Shallow (2”) stony, brown loam (b) Do – Very stony	Failure of clover and phalaris to persist.	Needs investigation
20 21	A and R Cummings Inglewood	(a) Shallow (4”), very stony brown loam (b) Quartzite areas. Stony knolls, with 6” grey stony loam in depressions.	Poor pasture development	Pasture good for this class of soil. Soil very poor here.
28	J J A Freemantle	Shallow (3”) very stony, grey-brown loam	Native pasture	Requires information on development.
29	H A Flett, Dunolly	Shallow (3”) stony, brown fine sandy loam	Deterioration of clover	Weeds investigation
(ii) Deeper, stony soils (on upper and middle slopes)				
12	G Petherick, Bagshot	Stony, brown sandy loam (6”)	Small areas of poor pasture	Pastures generally good except for small patches.
14	S C A Plots, Redcastle	Very stony, dark brown fine sandy loam (12”)	Pasture problem	This area developing well with time.
15	E S Weppner, Redcastle	Variable stony, grey loam (12”)	Poor clover development	New area – poor soil – needs a lot of fertilizer.
16	Le Deu, Baillieston	Very stony, brown to grey loam (5”)	Inspect new pasture.	No problem at present.
17	J. Kettle, Baillieston	Very stony, grey-brown fine sandy loam (6”)	New land development	Cultivation and sowing depth too deep – needs time.
(iii) Shallow, non-stony (sometimes gravelly) soils (on lower gentle slopes)				
5	Plots, M and R Clay, Bagshot North	Shallow (3”), brown to grey-brown loam	Failure of clovers to persist.	Needs investigation.

Site No.	Landholder	Surface Soil	Problem Stated	Assessment of Problem
19	A H Symes, Marong	Shallow (4"), grey-brown loam	Requires information on sowing.	Advice required on pasture species, etc.
22	J W Ramsey, Newbridge	Shallow (3"), grey clay loam	Poor clover development	Investigation needed. Clover stunted. May be virus.
24	H Price, Newbridge	Shallow (3"), gravely, brown loam	Small patches of poor development	Only few acres involved. Possibly virus. Needs investigation.
26	B Harrison, Newbridge	Shallow (4"), gravely, grey-brown loam	Poor regeneration of clover on part of paddock.	Possibly due to hay cut on new pasture.
27	J Galway, Laanecoorie	Shallow (3"), brown loam	Native pasture.	Required information on development.
33	J P Edwards, Eddington	(a) Shallow (3"), brown loam (b) Shallow (3"), grey-brown clay loam	Stunted clover development	Shallow heavy soils Problem needs investigation
34	J Leversha, Kangaroo Flat	Shallow (4"), slightly gravely, grey-brown loam	Poor pastures	No real problem here. Clover density okay. Fertilizer needed.
(iv)	Deeper non-stony (sometimes gravely) soils (on lower gentle slopes)			
6A	Plots. T C Read, Goornong	Grey-brown sandy loam (5")	Poor clover development.	Appears to be some response to molybdenum
7	T C Read, Goornong	Grey loam (6")	Failure of clover to persist.	Need for investigation.
8	Miss M Shaw, Goornong	Grey-brown sandy loam (7")	Do	Do
10	T C Read, Goornong	Brown sandy loam (6")	Poor clover development	A lot of clover present. Earth mites persist. No molybdenum
11	G Petherick, Bagshot	Gravelly, grey-brown sandy loam (6")	(a) Invasion of Chinese scrub (b) Pasture development	Due to cultivation. No pasture sown. Good pasture. No problem.
30	J McCoy, Moliagul	Gravelly, grey-brown fine sandy loam (12")	Old pasture	No problem. Good pasture persistence.
37	J W Leversha, Kangaroo Flat	Brown fine sandy loam (12") (hill wash)	Poor clover development	Small clover plants present. Possibly molybdenum deficient.
Unit 2 – Soils on Alluvial Plains and Hill Colluvium				
1	J McGauchie, Bagshot North	(a) Shallow (2"), grey-brown loam	Poor pasture development	Needs investigation
		(b) Yellowish-brown fine sandy loam (7"+)	For information only	No problem
		(c) Shallow (2"), grey clay loam	Do	Do
6	R Crane, Bagshot North	(a) Shallow (3"), grey loam (b) Shallow (3"), grey clay loam	Failure of clover plants to thrive	Needs investigation

Site No.	Landholder	Surface Soil	Problem Stated	Assessment of Problem
9	R Somerville, Goornong	Grey loam and clay loam (14")	Invasion of good pasture by Erodium botrys	Management problem.
13	A H Jones, Fosterville	Brown sand (15")	Pasture development	Incorrect species. Earth mites present. Insufficient fertilizer.
18	P Finnegan, Wirate	Grey-brown sand (18"+)	No problem.	
22A	J W Ramsay, Newbridge	Brown fine sandy loam (8")	Irrigated pastures dominated by annual grasses.	Management investigation
23	H Price, Newbridge	Brown loam (8")	Water penetration on irrigated lucerne.	Soil condition.
25	B Harrison	Brown loam (12")	Water penetration on irrigated pastures.	Soil condition.
35	J. Leversha, Kangaroo Flat	Brown fine sandy loam (16")	Poor clover development and Oxalis purpurea.	Clover appeared okay. Difficult weed.
36	MJ and AJ Smith, Kangaroo Flat	Brown loam (12")	Pasture development.	Clover present. Should improve in spring.
Unit 7 – Soils on Granite or Hill Wash from Granite				
32	K Jardine, Dunluce	Brown gritty sandy loam (8"+)	Poor clover development.	A lot of clover present. Stocked heavily and many earth mites present.
39	B J Flood, Shelbourne	Brown sandy loam (12"+)	Do	Evidence of very good growth last season. Little present now.
41	L Balmer, Maldon	Brown gritty sandy loam (18"+)	For information only.	Example of improved pasture with high carrying capacity.