Soils Section
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Soils of the

MACALISTER RESEARCH FARM

In the Central Gippsland

Irrigation District

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SOILS OF THE MACALISTER RESEARCH FARM

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The area of 120 acres described in this report covers allotments 42, 42A, 43, Parish of Tinamba, County Tanjil. It closely adjoins earlier surveys of part of the Parishes of Tinamba, Winnindoo, Denison and Woundellah by Skene and Walbran in 1948 (Dept. Agric. Vic. Tech. Bull. No. 7).

The present report should be read in conjunction with Bulletin No. 7, and also with Technical Bulletin No. 8 (Skene and Walbran 1949), covering parts of the Parishes of Nuntin and Bundalaguah, and with Soil Survey Report No. 26 (T. Poutsma 1956) covering a further part of the Parish of Nuntin.

A soil map showing the distribution of soil types on the Farm accompanies this report. Brief profile descriptions and some laboratory data for a number of representative profiles are given in an Appendix.

Landscape and Soil Pattern.

The Farm has a complex soil pattern, occupying as it does both level flood plain, and the ridges and winding depressions associated with the courses of former distributory streams which are no longer functioning ("Prior Streams"). The soils are formed on the sediments laid down by these streams which are broadly classed as post-Pliocene.

Five soil types have been described and mapped, of which only four are important on the Farm. However one of the four has two variants from the normal, and in addition three other unclassified soils were recorded in depressions, but not examined further.

The "brown" soils, Types I, II and III, occupy the higher positions on the levees and near flood plain of the prior stream.

Type IV is the main "plain" soil of the Farm. It is duller coloured and slightly lower-lying than Type III. Type V is a grey soil found in slight local depressions on the plain.

The winding depressions of a prior stream course is a major feature of the Farm. Two different soil profiles were recorded in the stream bed, but as this is largely occupied by drains and spoil banks, it was not surveyed in detail.

THE SOILS

Summary of Main Characteristics

The soils are formed on a rather limited range of sediments. Coarse sand is negligible throughout, but silt is an important fraction of all horizons, except in the deep subsoils of the heaviest and lightest types. The amount of silt present is usually between 30% and 45%.

Most of the surface textures are closely grouped in the loam to silty loam classes, with occasional clay loam or very fine sandy loam. The surface colours of the levee soils are reddish grey-brown to grey-brown while those of the "plain" soils are brownish grey to grey.

Subsoils vary from red-brown light clay to dark grey heavy clay, and the deep subsoils from sandy loam to heavy clay.

The pH and lime content of the soils are variable, but in every case there is a marked increase in pH with depth. All the surface soils examined ranged from strongly to slightly acid (pH 5.3 to 6.4), the subsoils from slightly acid to slightly alkaline, (pH 6.7 to 7.6) and the deep subsoils from moderately to strongly alkaline (pH 8 to 9) with variable amounts of lime.

The Soil Types

Type I Area: 21 ½ acres.

This is the lightest and most permeable soil on the Farm, found on the levee banks of the prior stream. Slopes are short and variable. Under present conditions the sandy deep subsoil is usually saturated with water.

Representative profile:

0-12 in. reddish grey-brown to grey-brown (6YR 5/4 to 7.5YR 5/4) very fine sandy loam; sharp transition to:

12-20 in. dull reddish brown (5YR 5/5) loam; sharp or gradual transition to:

20-34 in. dark red-brown (2.5YR ¾) light clay; crumbly; passes gradually to:

34-44 in. red-brown or reddish brown and reddish grey (2.5YR 5/1) fine sandy clay loam; trace of lime concretions; passes gradually to:

48-84 in. dull brown fine sandy loam.

Type II Area: 14 ½ acres.

The profile of Type II is similar to that of Type I, but is slightly heavier and probably slightly less permeable.

It is found in similar or lower positions on the levees, and on the near flood plain. The deep subsoil is less often saturated than Type I, and lime is more variable in amount.

Representative profile:

0-8 in. reddish grey-brown to grey-brown loam; passes gradually to:

8-18 in. dull reddish brown clay loam or loam; passes gradually to:

18-40 in. red-brown light or medium clay; passes gradually to:

40-48 + in. reddish brown, or reddish brown and reddish grey mottled clay loam; trace to heavy lime.

Type III Area: 22 ½ acres.

This is the heaviest of the soils with reddish or red-brown clays. It occurs on the near flood plain and on some of the levees of the prior stream. Slopes are gentle to very gentle, and profiles appear to be moderately permeable.

Representative profile:

0-10 in. grey-brown (7.5YR 5/2) silty loam.

10-20 in. dull reddish brown to grey-brown silty clay loam; sharp or gradual transition to:

20-36 in. reddish or red-brown medium (or light) clay; sharp or gradual transition to:

36-48 + in. reddish brown or reddish grey light clay or silty clay, often variously mottled; variable limestone concretions.

Type IV Area: 46 acres.

This is the extensive "plain" soil of the Farm, lower, greyer and slightly heavier than Type III and browner, higher, and lighter than Type V. Surfaces are silty; slopes are very gentle, and permeability fair.

Representative profile:

0-10 in. brownish grey silty loam; passes gradually to:

10-18 in. light grey-brown silty clay loam; passes gradually to:

18-33 in. dull or yellowish brown medium clay, with dark mottles; sharp transition to:

33-48 + in. reddish grey silty clay or yellowish brown light or medium clay; slight limestone concretions.

Shallow surface variant: occurs as part of a Type IV-V Complex.

0-7 in. brownish grey clay loam; sharp transition to:

7-12 in. light brownish grey clay loam; clear or diffuse boundary with:

12 + in. dull brown or yellow-brown medium clay.

Grey surface variant: occurs as part of the Type IV-V Complex.

0-7 in. grey or brownish grey clay loam; passes gradually to:

7-15 in. yellowish grey or dark grey-brown mottled clay loam; passed gradually to:

15 + in. dark brown, greyish brown finely mottled medium clay becoming browner with depth.

Type V Area: 2 acres.

This is the heaviest and greyest soil on the plains section of the Farm, occupying some slight local depression in the almost level plain.

Representative profile:

0-14 in. grey clay loam, sometimes paler or yellower below; sharp transition to:

14-30 in. dark grey medium or heavy clay, yellow-grey mottling increases below 24 in.; very diffuse boundary with:

30-48 + in. yellow-grey heavy clay.

Unclassified Depression Soils Area: 11 acres.

The soils in (a) a small depression between the flood plain and prior stream levee, and (b) in the prior stream bed have not been mapped in detail. The following three profiles (numbers refer to sites on soil maps) have been recorded:

(a) No. 1: A strongly bleached grey soil in a depression subject to waterlogging.

0-5 in. grey clay loam to fine sandy clay loam; sharp transition to:

5-12 in. similar but very light grey

12 + in. dark grey and yellow-grey mottled medium clay.

(b) Prior stream bed soils.

(i) No 2: Occurs in a land-locked depression or billabong.

0-3 in. dark greyish brown loam; sharp transition to:

3-8 in. dark grey clay loam; passes gradually to:

8-12 in. light grey clay loam; sharp transition to:

12-30 in. light grey and yellow-grey mottled light clay; very diffuse boundary with:

30-48 + in. yellow-grey light clay; trace lime.

(ii) No. 3 Occurs in the major winding depression or last active prior stream course. The surface soil is deep, heavy, and of good structure.

0-24 in. dark brownish grey clay loam to light clay; crumbly

24 + in. very dark brown mottled clay.

Type IV-V Complex Area: 5 ½ acres.
This is a slightly depressed area which contains grey and shallow surface variants of Type IV together with its normal profile and some Type V.

Relationship of Farm Soils to District Soil Types

From their position in the landscape, and their general colour and texture, Types I, II, and III may be expected to compare with Heyfield clay loam, Acre clay loam, and Type D of the neighbouring Nambrok-Denison soil survey, and with Clydebank clay loam and Type L of the Nuntin-Bundalaguah survey.

Types IV and V have topographical position similar to Denison clay loam and Type E described in the Nambrok-Denison survey, and to Bundalaguah clay loam in the Nuntin-Bundalaguah survey.

Actually only one of the soil types previously described has been recorded on the Research Farm. This is Denison clay loam which is here described as Type V. However, Type III closely resembles and may in fact be the same as the minor soil, Type D found near Tinamba township.

The lack of closer agreement between the other soil types is possibly related to the differences in their parent materials. Although this aspect has not been investigated, the sediments on which the Farm is situated appear to derive from a precursor of the Macalister River, where as the corresponding sediments south of the present Thomson River derive from a "prior Thomson" stream, while the Clydebank deposits appear to be part of a "prior Avon" system.

Type I is lighter textured in the surface and deep subsoil than the normal range of Heyfield clay loam and Acre clay loam. Some areas of Acre clay loam west of Tinamba township have been recorded with a "light deep subsoil" in which the deep subsoil textures are similar to those found in Type I. Although these occurrences are not typical of Acre clay loam as a whole, they also differ from Type I in having a shallower surface and heavier textures in the upper part of the profile and are therefore likely to be less permeable. On the other hand, Heyfield clay loam is normally by far the most permeable soil type in the Nambrok-Denison area and in this respect Type I probably resembles it.

Type II is texturally similar to Heyfield clay loam, but usually has a sharper transition from surface to subsoil. It also differs in having a grey-brown instead of a brown surface and often much more lime before 3 feet, with associated higher pH.

Type III differs from Acre clay loam mainly in having a very silty profile. In this regard it is similar to the minor soil type, Type D recorded near Tinamba.

On the other levee soils mentioned, Clydebank clay loam has more sand, particularly coarse sand, through-out the profile than any soil on the Research Farm. Type L is of small area and information is too scanty for useful comparisons. Bundalaguah clay loam, although not a levee soil, has a wide range of deep subsoil textures corresponding to those in Types I and II. However, it is a greyer soil, with yellowish brown colours in the subsoil, resulting from its position in an almost level plain.

Type IV, the main soil type on the Farm, has no counterpart amongst the soil types of the other areas. The colour of its profile is intermediate between that of Acre clay loam and Denison clay loam. Texturally, it is not unlike Denison clay loam, but it has a deeper surface and a more gradual transition from the A to the B horizon. The lower lying parts and the shallow and grey surface variants can be considered very near to Denison clay loam and would probably have been mapped as such on a broader soil survey.

Of the plain soils, Type V is equivalent to Denison clay loam. The surface is lighter in texture than that recorded in Nambrok-Denison, and is slightly heavier than the "light phase" mapped in Nuntin-Bundalaguah.
The soils in areas east of Boggy Creek including Maffra and Riverslea have not been surveyed, consequently in these districts there is no indication of the extent of the soil types found on the Research Farm.

Salinity

No systematic survey was made for salt, but 50 soil samples were examined from 17 sites, taken at various depths. The salt content is low almost everywhere. No surface soil contained more than 0.007% sodium chloride. The only record above 0.03% for any depth in the irrigated soils was 0.050% at 2 to 3

ft in Type V. In the non-irrigated soils a few sites had values just above 0.03%, but two sites, both Type II had values slightly higher, namely 0.07% in the second foot at a site just above the swamp (this site had very little salt in the fourth foot), and 0.09% in the fourth foot on a high bank growing lucerne.

None of these concentrations suggest any likelihood of salt trouble developing.

Soils and Land Use

On the Research Farm, points of importance are the variable slopes and mostly short runs for irrigation water.

This applies particularly to Types I and II in allotment 43. These soil types are probably very permeable since deep subsoil water, apparently adequate to support lucerne without irrigation, was found in the above allotment.

There are unlikely to be irrigation problems arising from poor permeability in view of the deep surfaces of all the soil types. Moreover, experience in the Nambrok-Denison area with Denison clay loam, the heaviest soil type on the Research Farm, has shown that this soil type has adequate permeability for pastures. On the other hand, high permeability may lead to excessive water usage on Type I and perhaps on Type II as has been the case with Heyfield clay loam.

The silty surfaces of Types III, IV and V do not appear to present any special problems, at least under pasture.

At the time of the survey the fodder crops in allotment 42^{A} were extremely patchy in survival, growth, and in dominant weed species. Type IV and V, and variants of Type IV were all involved which suggests that the problem is one of grading and surface drainage rather than soil type. Under permanent pasture the problem is not so acute.

Appendix - Detailed Profile Records

The following descriptive and laboratory data for a number of selected profiles will help relate the soil types to those recorded elsewhere, and also to indicate the details of some profiles.

Hor	Depth	Colour	Text	Remarks	CS %	FS %	Si %	C %	pH	LAT %	Na Cl %	No *
Type I Site I												
A_1	(0-7	dkrGB	VFSL		2	51	29	14	5.6	.6	.003	65
	(7-14	"	"									
A_2	14-22	GB	FSL	clear bdy	Not Sampled							
B	22-30	RBcdkG	MC	grad.bdy	2	54	29	13	6.0	.5	.003	66
C	30-40	dRB	CL	diff. Bdy	1	33	18	47	6.7	1.3	.007	67
	40-50	dRB	FSCL		1	43	15	39	7.6	1.2	.008	68
	50-80	drB	FSCL	becomes rGB	2	52	14	31	8.0	.9	.007	69
					1	62	12	22	8.3	.9	.002	70
Type I Site VI												
A	0-14	GB	L	sharp bdy	Not Sampled							
B	(14-24	dkrB	LC	crumbly, ½	0	32	32	33	6.6	1.3	.007	71
	(24-33	"	"	peds								
C	33-44	"	FSCL		Not Sampled							
	44-84		SL		0	50	20	27	8.9	1.2	.024	72
					1	77	11	9	9.1	.8	.032	73
Type II Site II												
A_1	0-7	dkGB	L		2	39	38	19	5.3	1.0	.006	74
A_2	?	-24 gB	CL		Not Sampled							
AB	24-28	dkdrB	LC	Bk. Incl.	"	"						
B	28-36	RB	MC		1	21	27	51	7.2	1.5	.007	75
C	36-44	RB	LC		2	33	25	40	7.7	.6	.009	76
	44-52	rB	CL		Not Sampled							
	52-80	drB, rG	FSCL	diff. mott	4	50	18	27	8.7	1.0	.008	77
	80-84	rG, YG	SiLC		1	17	46	36	9.0	1.0	.015	78
Type III "light surface" Site VII												
A	0-12	GB	L	grad.bdy	0	41	31	22	5.9	1.2	.006	79
	12-20	"	"		Not Sampled							
B	20-36	rB	LC		"	"						
C	36-42	rB	CL	trace lime								
	42-48	rG, YG	SiLC		0	16	41	39	9.6	2.7	.024	81
Type III Site III												
A_1	0-7	GB	SiL		1	22	49	24	6.0	1.2	.005	85
A_2	7-17	dB	CL		1	21	46	29	6.3	.9	.006	86
B_1	17-24	rB	MC									
B_2	24-32	RB, dB	MC	mod.str. 0.2"	0	10	36	51	7.3	1.1	.011	87
C	30-36	rG	LC	Bk. faces	Not Sampled							
	36-48	rG	LC		1	11	41	46	9.0	1.4	.023	88
Type IV Site IV												
A_{11}	0-6	GB	SiL		4	29	41	22	5.7	1.2	.004	89
A_{12}	6-8	GB	SiL	Cr 0.3" peds								
A_2	8-15	yGB	SiL		4	29	40	25	6.4	.9	.004	90
AB	15-21	YB	LC		4	24	34	36	6.7	1.0	.005	91
B_1	21-36	yBcRB	MC	faint mott.	2	13	26	59	7.6	1.0	.011	92
	36-48	yB	LMC		2	15	25	58	8.7	1.1	.015	93
Type V Site V												
A_1	0-12	G	CL		1	34	42	21	6.4	0.8	.006	95
A_2	12-15	G, YG	CL	diff. mott	Not Sampled							
B_{11}	15-30	dkG, YG	HC	tough super plastic								
B_{12}	30-36	YG	HC		0	15	28	56	8.9	2.1	.050	97

* Sample Numbers, series 9865 to 9897/62.

Notes

Colour

RB=red-brown; B=brown; GB=grey-brown; G=grey; YB=yellow-brown; YG=yellow-grey; r=reddish; y=yellowish; dk=dark; d=dull.

Texture

Sl=sandy loam; FSL=fine sandy loam; VFSL=very fine sandy loam; L=loam; SiL=silty loam; CL=clay loam; FSCL=fine sandy clay loam; LC=light clay; MC=medium clay; HC=heavy clay; SiLC=silty light clay;

Remarks

bdy=boundary; grad.=gradual; diff.=diffuse; incl.=inclusions; mott=mottled; Bk=black; Cr=crumbly.

Analysis

CS=coarse sand; FS=fine sand; Si=silt; C=clay; LAT=loss on acid treatment; NaCl=sodium chloride calculated from chloride figure.