

Department of Agriculture.12th April, 1948.

Memorandum for:-

Agricultural Research Chemist**Report on the Soils of the Glenormiston Estate**

The Glenormiston Estate is situated in the Parish of Glenormiston, County of Hampden, and lies about 7 miles north-north-east of Terang. The sub-division of the Estate is shown on the accompanying lodge plan, the area under consideration being outlined in red. This is comprised of two separate sections, viz., the homestead block of about 491 acres and an area of 202 acres further north.

Investigation of the soils of the Estate was requested with two primary objectives in view; firstly, to determine the general nature of the soil types, their extent, and their suitability for dairy pasturage; and secondly, to indicate the relation of the soil types found on the estate with the soils of the principal dairying areas of the Western District. These two aspects have been considered and this report deals with each individually.

Soils of the Estate**1. Geology and Topography**

Geologically, the area lies within the Newer Basalt which covers a great deal of Western Victoria. However, variation in the age of lava flows belonging to the Newer Basalt and in the nature of volcanic materials erupted, has had a strong influence on the morphology of soils developed in different parts of the Newer Basalt of the Western District. Such influences are apparent in the Glenormiston area where there is evidence of three periods of effusive activity. The oldest basaltic lava flows have given rise to grey plains in the northern block. Probably later activity has been responsible for the formation of a stony barrier which occurs in the western section of the homestead block but also encroaches into the northern block. Elsewhere on the homestead block are scoriaceous materials and volcanic ash, representing most recent effusive activity, and derived from Mt. Noorat, a volcanic cone situated less than 1 ½ miles south-west of the southern boundary of the Estate. These deposits rapidly fade out towards the north, apparently somewhere slightly beyond the northern boundary of the homestead block.

2. Description of the Soil Types

Three broad groups of soils related to the geological categories described above can be recognised, viz.:-

- (i) **Stony Soils** These soils are designated Type A. They are associated with the stony barrier or stony rises. The surface soil is a grey-brown "puffy" loam with large floaters of vesicular basalt which may be slightly decomposed. Denser stone is encountered below 12 in.

Outcrops of stone are typical of the whole occurrence although there is some variation in their density. Even in the areas with less stone at the surface, the depth of surface soil is shallow and stone is usually present before 12 in

- (ii) **Friable Dark Grey-brown Soil** These are the soils derived from scoriaceous materials and volcanic ash. At least two soil types (Types B and C) in this group are indicated from the reconnaissance. The types have not been delineated at this stage since they are closely related, differences being due to the nature of the surface soils over the whole of this occurrence, but the soil profile below the surface is generally of lighter texture in the area towards the south of the Estate (Type B). Here the area is in closest proximity to Mt. Noorat and scoria are present

in the subsoil. These disappear from the soil profile about ½ mile north of the southern boundary of the Estate where Type B gradually merges with Type C.

Features of the soil profiles are as follows:-

Type B

- | | |
|-----------|---|
| 0-12 in. | Dark grey-brown clay loam; granular structure and friable. |
| 12-36 in. | Dark grey-brown with black and yellow mottling, friable light clay with decomposing scoria. |
| 36-54 in. | Light yellow clay loam passing to fine sandy loam with cemented decomposing volcanic ash. |
| 54-72 in. | Black and dark grey cemented volcanic ash. |

Type C

- | | |
|-----------|---|
| 0-14 in. | Dark grey-brown clay loam; small nutty structure and fairly friable. |
| 14-36 in. | Dark brown or chocolate heavy clay; nutty structure and slightly friable. More friable with depth and becoming mottled with black and rusty shades of yellow and brown. |
| 36-48 in. | Greyish yellow light clay with mottled rusty yellow-brown-grey decomposing volcanic ash. |

- (iii) **Heavy Grey Soils** These are the soils of the grey plains (Type D) and associated depression (Type B) in the northern block and are derived from older and denser volcanic materials than the previous categories).

The soil profiles are as follows:-

Type D

- | | |
|-----------|--|
| 0-12 in. | Grey clay loam with some small iron concretions from 8 in. |
| 12-30 in. | Dark grey and dark yellow-grey heavy clay with black staining on cleavage planes. Large nutty passing to massive structure. |
| 30-48 in. | Dark grey and yellow-grey heavy clay passing to yellow-grey heavy clay with slight iron concretions; massive structure and plastic when moist. |

Type E

- | | |
|-----------|--|
| 0-4 in. | Dark grey, with organic staining, light clay. |
| 4-12 in. | Black, with dark yellow-grey, heavy clay with much iron concretions. |
| 12-36 in. | Black very heavy clay with slight iron concretions. |

3. Extent of the Soil Types

The distribution of the soil types is shown on the attached plan whilst their areas are as follows:-

	Homestead Block	Northern Block	Total
<u>Stony Soils</u>			
Type A	162 ac.	50 ac.	212 ac.
<u>Friable DGB Soils</u>			
Types B and C	329 ac.	-	329 ac.
<u>Heavy Grey Soils</u>			
Type D	-	133 ac.	133 ac.
Type E	-	19ac.	19 ac.

4. Agricultural Characteristics of the Soils

This report only briefly indicates the relation of the soil types to agriculture. Mr. Golding has studied the agricultural situation on various sections of the Estate and it is intended that this aspect of the soils shall be considered more fully in a joint report.

Stony Soils These soils appear to possess low moisture holding properties and this, together with their shallowness, determines the type of pasturage that they can support.

Friable Dark Grey-brown Soils These soils are said to absorb water rapidly after rain, and in this connection there is no evidence of stock puddling the surface. The structural properties of the soils are conducive to good internal drainage. This characteristic would be expected to be more pronounced in the lighter Type B than in Type C, and it was noted that some situations in Type B were very moist, even approaching free water, at 3-4 ft. below the surface. Rainfall has been low in the district during the last month, consequently free water can be expected to develop in the Type B deep subsoils in wetter periods if the moisture observed at present is the result of natural drainage. However, the subsoil water may originate from the adjoining Trufood factory. In either case, lucerne established on this section of the Estate may be benefiting from these favourable moisture conditions.

Rye grass is alleged not to persist on the soils of this group. Certainly there is an absence of rye from the southern paddocks, but rye grass is evident in the herbage of the northern sections of the homestead block. It appears that the incidence of rye grass can be related to the soil type. Type C, on which rye is established, has a more retentive subsoil for moisture than Type B, consequently conditions probably are more favourable for rye growth during the summer period than on Type B. Another factor is the root hold established by the grass, as it is claimed that stock readily pull up the plants by the roots when the soil dried out.

The fertility of the soil is high and good pastures are grown without manure. Whilst super has been used in the past, response is doubtful. In this connection, it is noteworthy that the P. I. L. plots on the property of Mrs. I. Black, Noorat, which have given no response to added manures or lime, are within ½ mile of the Estate. The soil on these plots, whilst more scoriaceous and “puffy”, is allied to Type B.

Heavy Grey Soils In contrast to the previous group, these soils are not friable nor is the physical state of the subsoils favourable for the rapid downward penetration of water, consequently the removal of surplus water is dependent on surface drainage rather than on percolation into the deeper subsoil. Therefore, temporary surface water logging can be expected on these soils after excessive rain, but this is normal to many soils of the Western District.

Under the heavy growth of herbage existing at present, the surface soils give no indication of setting, and with good pastures management this should not be a problem. Conditions would be different under cultivation and with low supplies of organic matter.

General Soil Relationship

Reference to map No. 16 of the Report of the State Regional Boundaries Committee shows that dairying in Western Victoria is principally concentrated within a roughly rectangular area defined by Winchelsea, Casterton, Portland, and Apollo Bay. In the absence of systematic soil survey data from within this area, other criteria must necessarily be used to assess the soils. The geological materials from which the soils originated is a useful guide to broad soil differences.

The soils within the area indicated are derived from a variety of geological materials, e.g.; volcanic materials, some of which have been described; Tertiary sands, clays, and limestones in the coastal regions; and Jurassic felspathic sandstones and mudstones in the Coleraine and Otway regions. The relation between geology and dairy cow distribution can be clearly seen by superimposing the attached tracing of the geology of the Western District over Map No. 16. Each of the categories referred to has given rise to a multiplicity of soil types. The soils of the Glenormiston Estate, therefore, cannot possibly be representative of all this large area.

However, Map No. 16 indicates that the more intensive dairying areas are, (a) within a rather narrow zone extending from Colac to Port Fairy, (b) in the Merino District. The Estate is situated on the northern boundary of the former area and approximately midway between Colac and Port Fairy. The geological sketch shows that this area is one of volcanic materials except for an important zone extending along the coast from Port Fairy to Port Campbell. Any considerations of the question for how representative the soils of the Estate are to those of the principal dairying districts must necessarily be confined to the area with soils derived from volcanic materials. This area is outlined in red on the basalt shown on the geological sketch map.

The true place of the Glenormiston soils within the pattern of soils in this area can only be obtained by systematic soil survey of the whole of the area - a major project in itself, but necessary if results from soil and pasture investigations carried out at a Research Centre established within the district are to be applied intelligently elsewhere within the area. This aspect of added importance since Departmental field investigations show that there are differential responses to phosphorous, potassium, and lime throughout the Western District. The following consideration of the soil types of the Glenormiston Estate is based on such general information as available.

Stony Soils These are probably representative of the extensive stony occurrence with the area.

Friable Dark Grey-brown Soils Soils such as these are found only in the immediate vicinity of the volcanic cones, and although there are quite a number of these focal points, the total area of these soils (not necessarily all of the same soil type) would represent only a small proportion of the area under consideration.

The soils are certainly attractive dairy soils and probably would present few problems of management, particularly in regard to manurial practices. Whilst there may be an advantage for a successful Dairy College, it may not be the case for a Research Centre in a district which is known to have its manurial problems.

Heavy Grey Soils *Type D.* these soils are found in the extreme north of the Estate and probably extend still further northward into areas not under intensive dairying. However, it is considered that similar soils may be extensive within the area under consideration.

Type E. Soils such as this are probably associated elsewhere with soil types similar to Type D. It is unlikely to represent a major group of dairy soils.

Examination of soils from Departmental plots of the Pasture improvement League within the area, viz., at Cudgee, Garvoc, Cobrica and Pirron Yallock show that these soils do not conform to the types described on the Estate, but the soil of the Noorat plot is closely allied to Type B.

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Soil Chemist