

BEN Benbournie Land System

Complex of outwash fans, rises and low hills between Blyth and the Clare Hills

Area: 130.7 km²

Annual rainfall 420 – 560 mm average

Geology: The land system comprises two broad geological features. Rising ground is formed on basement siltstones and occasional sandstones and quartzites, partially overlain by clays derived from rock weathering or localized reworking. Intervening fans and flats are underlain by clayey sediments of the Pooraka Formation (often sandy and gravelly), and Blanchetown Clay equivalent (coarse blocky heavy clay). Alluvial flats are formed on more recent mixed sediments. All geological materials are mantled by carbonates of aeolian origin, most of which are soft, but rubbly forms also occur.

Topography: Undulating rises and low hills with slopes of 2 - 12%, flanked by gently to very gently sloping outwash fans and plains with slopes of 2 - 5%. Ephemeral watercourses cross the fans flowing in a westerly direction. Many of these are severely eroded as a result of heavy flows from the ranges to the east.

Elevation: 360 m at the highest point on the eastern margin, to 180 m in the south west

Relief: Maximum relief is 60 m

Soils: The most common soils are deep loams to clay loams, usually with a more clayey subsoil. Many are calcareous throughout.

Main soils

A6 Calcareous clay loam - rises and fans

C3 Gradational clay loam - fans

Minor soils

D3 Hard loam over poorly structured red clay - fans

D2 Hard loam over red clay - fans

A4 Calcareous loam - fans and rises

E2 Red cracking clay - fans

C2/C3 Rubbly gradational loam - fans and rises

A2 Shallow calcareous loam - rises

C2 Shallow gradational red loam on rock - rise

D1 Shallow loam over red clay on rock - rises

L1/B3 Shallow stony loam - rises

Main features: The Benbournie Land System is characterized by deep, well structured and moderately fertile soils (gradational and calcareous loams and clay loams). High subsoil boron and salt levels may be a problem in places, while the high pH of the calcareous soils may affect nutrient availability to some extent. Least favourable of the main soils are the sodic texture contrast soils with hard setting surfaces and dispersive clay subsoils which tend to run water and impede uniform emergence and root growth. These soils are also highly erodible. Overall productive potential is high.



Soil Landscape Unit summary: 8 Soil Landscape Units (SLUs) mapped in the Benbournie Land System:

SLU	% of area	Main features #
ESD	2.1	Moderately inclined slopes: 8-20%; relief to 50 m and 10-20% rocky outcrop coverage. Main soils: all shallow to moderately deep over basement rock, and include <u>shallow gradational red loam on rock</u> - C2 (E), and <u>shallow calcareous loam</u> - A2 (E) with <u>shallow stony loam</u> - L1/B3 (L). Rocky reefs, shallow stony soils and sometimes moderate slopes limit cropping of these areas. The arable land is generally confined to strips between the reefs of rock. Water erosion is a potential problem because of the moderate slopes and high runoff from the shallow soils and rocky areas.
IZB IZC	6.4 20.4	Rises and low hills formed on a complex of weathering basement rock and clay deposits derived from decomposition of underlying rocks or localized alluvial reworking. IZB Rises with slopes of 2-3%. IZC Rises and low hills with slopes of 3-12%. Soils: shallow types over rock (about 25%) and deeper profiles over clay (about 75%). Main soils on clay deposits and deeply weathered rocks: <u>calcareous clay loam</u> - A6 (E), with <u>gradational clay loam</u> - C3 (C), <u>hard loam over red clay</u> - D2 (C) and <u>calcareous loam</u> - A4 (M). Where basement rock is close to the surface, soils are <u>shallow gradational red loam on rock</u> - C2 (E), <u>shallow calcareous loam</u> - A2 (C), <u>shallow loam over red clay</u> - D1 (C) and <u>shallow stony loam</u> - L1/B3 (C). <u>Rubbly gradational loam</u> - C2/C3 is minor throughout. The land is fully arable, although some slopes require contour banking to control water erosion. The soils are generally medium textured and calcareous, affecting fertility (through induced nutrient deficiencies) to some extent. The main soil limitations are moderate to high levels of boron and salt, sometimes at moderately shallow depth. Poor soil structure resulting in waterlogging and difficult workability occurs on some lower slopes.
JDC JDH	0.9 13.0	Gently inclined outwash slopes formed on alluvial clays derived from the escarpment of the Clare Hills to the east. Slopes: 3-8%. In JDC , watercourses are weakly to moderately well defined; in JDH , watercourses are eroded. The soils are mostly non calcareous and deep. Main soils: <u>hard loam over poorly structured red clay</u> - D3 (E) and <u>hard loam over red clay</u> - D2 (E) with <u>gradational clay loam</u> - C3 (L) and <u>calcareous clay loam</u> - A6 (L). Although the entire unit is arable, potential for water erosion is high. Runoff from the adjacent escarpment has the potential to cause serious erosion, particularly in watercourses. Hard setting surface soils which are common in the unit are the main soil management problem, because of their adverse effects on runoff / erosion, workability, seedling emergence and moisture retention. Most soils are reasonably fertile, deep and well drained.
KBB KBG	13.8 41.9	Gently inclined outwash fan slopes formed on alluvial clays derived from the escarpment of the Clare Hills to the east. Slopes are 2-5%. In KBB , watercourses are weakly to moderately well defined; in KBG , watercourses are eroded. The soils are characteristically gradational and mostly calcareous. Main soils: <u>calcareous clay loam</u> - A6 (E) and <u>gradational clay loam</u> - C3 (C), with <u>calcareous loam</u> - A4 (L), <u>hard loam over poorly structured red clay</u> - D3 (L) and <u>hard loam over red clay</u> - D2 (M) (D3/D2 near water courses) and <u>red cracking clay</u> - E2 (L). The land is generally highly productive; most soils are naturally fertile, deep and well structured. High levels of boron and sodium within potential root zones, slight salinity and some localized waterlogging are the only limitations. 10-15% of soils are poorly structured with hard setting surfaces. These are difficult to work and are prone to patchy seedling establishment, waterlogging and runoff. Water erosion potential on the long gentle slopes, and protection of existing unstable watercourses are the other significant land management issues.
KUB	1.5	Gently inclined fans: slopes: 1-3% formed on clayey alluvium. Soils generally fine textured. Main soils: <u>gradational clay loam</u> - C3 (E) and <u>red cracking clay</u> - E2 (E), with <u>calcareous clay loam</u> - A6 (L). Land is potentially highly productive with deep, fertile, moderately well drained soils. Salinity, temporary waterlogging and erosion potential are slight limitations.

PROPORTION codes assigned to soils within Soil Landscape Units (SLU):

- (D) Dominant in extent (>90% of SLU)
- (V) Very extensive in extent (60–90% of SLU)
- (E) Extensive in extent (30–60% of SLU)
- (C) Common in extent (20–30% of SLU)
- (L) Limited in extent (10–20% of SLU)
- (M) Minor in extent (<10% of SLU)



Detailed soil profile descriptions:

- A2** Shallow calcareous loam (Paralithic, Calcic / Lithocalcic Calcarosol)
Calcareous stony loam over a Class III A, B or C carbonate layer merging with weathering basement rock within 75 cm.
- A4** Calcareous loam (Regolithic, Hypercalcic / Supracalcic Calcarosol)
Calcareous loam, more clayey with depth grading to a Class III A or B carbonate rubble layer within 40 cm, over clayey alluvium (fans) or weathering rock (risers).
- A6** Calcareous clay loam (Regolithic / Pedal, Hypercalcic Calcarosol)
Calcareous clay loam to clay grading to a well structured red clay with a soft Class I carbonate layer within 50 cm, over clayey alluvium.
- C2** Shallow gradational red loam on rock (Hypercalcic, Red Dermosol)
Medium thickness loam to clay loam grading to a well structured friable red clay loam to clay, calcareous at the base, grading to weathering rock at depths of between 50 and 100 cm.
- C2/C3** Rubbly gradational loam (Supracalcic / Lithocalcic, Red Dermosol)
Loam to clay loam grading to a well structured red clay overlying Class III B or III C carbonate rubble merging with weathering rock or alluvial sediments.
- C3** Gradational clay loam (Hypercalcic / Hypocalcic, Red Dermosol)
Loam to clay loam grading to a well structured red clay overlying fine carbonate within 50 cm over alluvial sediments.
- D1** Shallow loam over red clay on rock (Calcic, Red Chromosol)
Medium thickness sandy loam to loam abruptly overlying a red well structured clay, calcareous at base grading to weathering rock at depths of between 50 and 100 cm.
- D2** Hard loam over red clay (Calcic / Hypercalcic, Red Chromosol)
Hard setting sandy loam to clay loam abruptly overlying a well structured red clay with fine Class I carbonate deeper than 50 cm, over clayey alluvium.
- D3** Hard loam over poorly structured red clay (Calcic / Hypercalcic, Red Sodosol)
Hard setting sandy loam to clay loam abruptly overlying a coarsely structured and dispersive red clay with soft Class I carbonate deeper than 50 cm, over clayey alluvium.
- E2** Red cracking clay (Epipedal, Red Vertosol)
Seasonally cracking clay, becoming more clayey and coarser structured and calcareous with depth.
- L1/B3** Shallow stony loam (Calcareous, Paralithic / Petrocalcic, Leptic Tenosol)
Stony loam grading to weathering rock within a metre, capped by soft or rubbly carbonate, or a thin calcrete sheet.

Further information: [DEWNR Soil and Land Program](#)

