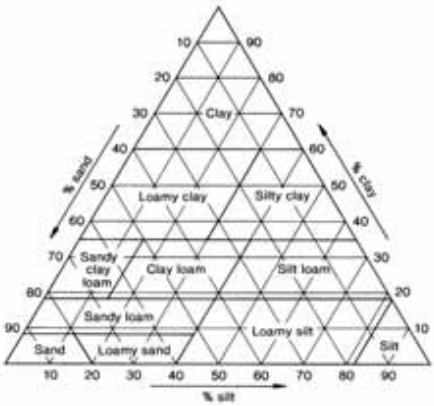
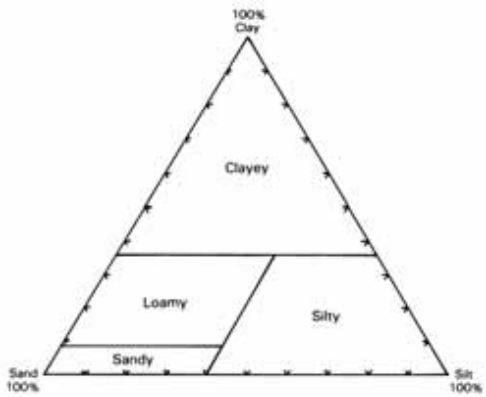
FIGURE 2 **Soil texture classes and groups**



Textural classes.



Textural groups.

TABLE 1 **How to score soil texture**

Visual score (VS)	Textural class	Description
2 [Good]	Silt loam	Smooth soapy feel, slightly sticky, no grittiness. Moulds into a cohesive ball that fissures when pressed flat.
1.5 [Moderately good]	Clay loam	Very smooth, sticky and plastic. Moulds into a cohesive ball that deforms without fissuring.
1 [Moderate]	Sandy loam	Slightly gritty, faint rasping sound. Moulds into a cohesive ball that fissures when pressed flat.
0.5 [Moderately poor]	Loamy sand Silty clay Clay	Loamy sand: Gritty and rasping sound. Will almost mould into a ball but disintegrates when pressed flat. Silty clay, clay: Very smooth, very sticky, very plastic. Moulds into a cohesive ball that deforms without fissuring.
0 [Poor]	Sand	Gritty and rasping sound. Cannot be moulded into a ball.

PLATE 2 **How to score soil structure**

GOOD CONDITION VS = 2
Soil dominated by friable, fine aggregates with no significant clodding. Aggregates are generally subrounded (nutty) and often quite porous.

MODERATE CONDITION VS = 1
Soil contains significant proportions (50%) of both coarse clods and friable fine aggregates. The coarse clods are firm, subangular or angular in shape and have few or no pores.

POOR CONDITION VS = 0
Soil dominated by coarse clods with very few finer aggregates. The coarse clods are very firm, angular or subangular in shape and have very few or no pores.

PLATE 3 **How to score soil porosity**

GOOD CONDITION VS = 2
Soils have many macropores and coarse micropores between and within aggregates associated with good soil structure.

MODERATE CONDITION VS = 1
Soil macropores and coarse micropores between and within aggregates have declined significantly but are present on close examination in parts of the soil. The soil shows a moderate amount of consolidation.

POOR CONDITION VS = 0
No soil macropores and coarse micropores are visually apparent within compact, massive structureless clods. The clod surface is smooth with few or no cracks or holes, and can have sharp angles.

PLATE 4 **How to score soil colour**

GOOD CONDITION VS = 2
Dark coloured topsoil that is not too dissimilar to that under the fenceline.

MODERATE CONDITION VS = 1
The colour of the topsoil is somewhat paler than that under the fenceline, but not markedly so.

POOR CONDITION VS = 0
Soil colour has become significantly paler compared with that under the fenceline.

PLATE 5 **How to score soil mottles**

GOOD CONDITION VS = 2
Mottles are generally absent.

MODERATE CONDITION VS = 1
Soil has common (10–25%) fine and medium orange and grey mottles.

POOR CONDITION VS = 0
Soil has abundant to profuse (>50%) medium and coarse orange and particularly grey mottles.

PLATE 8 ***Lumbricus rubellus***

A very active surface litter and dung feeding earthworm; commonly red-brown or red-purple in colour with a paler underside; has a distinctly flattened tail; commonly 25–220 mm long.

PLATE 9 ***Aporectodea caliginosa***

A medium-sized (40–90 mm) topsoil dwelling earthworm; commonly grey-pink on both the dorsal and ventral surfaces; does not have a flattened tail.

PLATE 10 ***Aporectodea longa***

A long (90–180 mm) deep burrowing earthworm; commonly dark grey-brown with a black head; tail end is paler and slightly flattened. Underside is paler than the dorsal surface.

Photos of *L.rubellus* and *A.caliginosa* – courtesy of Ross Gray, AgResearch Ltd.

PLATE 6 **(a): earthworm casts under crop residue; (b): yellow-tail earthworm (*Octolasion cyaneum*)**

PLATE 7 **Sample for assessing earthworms**

TABLE 2 **Visual scores for earthworms**

Visual score (VS)	Earthworm numbers (per 200-mm cube of soil)
2 [Good]	> 30 (with preferably 3 or more species)
1 [Moderate]	15–30 (with preferably 2 or more species)
0 [Poor]	< 15 (with predominantly 1 species)

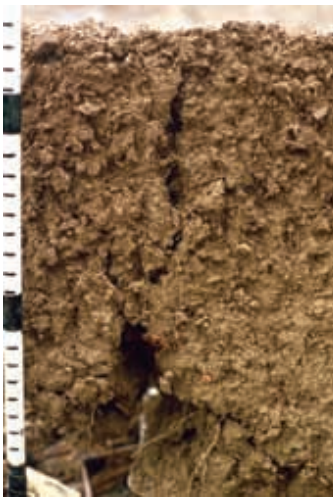
PLATE 8 **Hole dug to assess the potential rooting depth**

The potential rooting depth extends to the bottom of the arrow, below which the soil is extremely firm and very tight with no roots or old root channels, no worm channels and no cracks and fissures down which roots can extend.

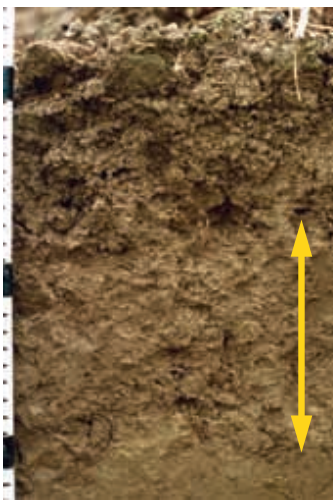
TABLE 3 **Visual scores for potential rooting depth**

VSA score (VS)	Potential rooting depth (m)
2.0 [Good]	> 0.8
1.5 [Moderately good]	0.6–0.8
1.0 [Moderate]	0.4–0.6
0.5 [Moderately poor]	0.2–0.4
0 [Poor]	< 0.2

PLATE 10 **Identifying the presence of a hardpan**



NO HARDPAN
The soil has a low penetration resistance to the knife. Roots, old root channels, worm channels, cracks and fissures may be common. Topsoils are friable with a readily apparent structure and have a soil porosity score of ≥1.5.



MODERATELY DEVELOPED HARDPAN
The soil has a moderate penetration resistance to the knife. It is firm (hard) with a weakly apparent soil structure and has a soil porosity score of 0.5–1. There are few roots and old root channels, few worm channels, and few cracks and fissures. The pan may have few to common orange and grey mottles. Note the moderately developed tillage pan in the lower half of the topsoil (arrowed).

STRONGLY DEVELOPED HARDPAN
The soil has a high penetration resistance to the knife. It is very tight, extremely firm (very hard) and massive (i.e. with no apparent soil structure) and has a soil porosity score of 0. There are no roots or old root channels, no worm channels or cracks or fissures. The pan may have many orange and grey mottles. Note the strongly developed tillage pan in the lower half of the topsoil (arrowed).

PLATE 11 **Surface ponding in a field**

TABLE 4 **Visual scores for surface ponding**

VSA score (VS)	Surface ponding due to soil saturation	
	Number of days of ponding *	Description
2 [Good]	≤1	No surface ponding of water evident after 1 day following heavy rainfall on soils that were at or near saturation.
1 [Moderate]	2–4	Moderate surface ponding occurs for 2–4 days after heavy rainfall on soils that were at or near saturation.
0 [Poor]	>5	Significant surface ponding occurs for longer than 5 days after heavy rainfall on soils that were at or near saturation.

* Assuming little or no air is trapped in the soil at the time of ponding.

PLATE 12 **How to score surface crusting and surface cover**

Surface cover photos: courtesy of A. Leys

GOOD CONDITION VS = 2
Little or no surface crusting is present; or surface cover is ≥70%.

MODERATE CONDITION VS = 1
Surface crusting is 2–3 mm thick and is broken by significant cracking; or surface cover is >30% and <70%.

POOR CONDITION VS = 0
Surface crusting is >5 mm thick and is virtually continuous with little cracking; or surface cover is ≤30%.

PLATE 13 **How to score soil erosion**

GOOD CONDITION VS = 2
Little or no *water erosion*. Topsoil depths in the footslope areas are <150 mm deeper than on the crest.
Wind erosion is not a concern; only small dust plumes emanate from the cultivator on a windy day. Most wind-eroded material is contained in the field.

MODERATE CONDITION VS = 1
Water erosion is a moderate concern with a significant amount of rilling and sheet erosion. Topsoil depths in the footslope areas are 150–300 mm greater than on crests, and sediment input into drains/streams may be significant.
Wind erosion is of moderate concern where significant dust plumes can emanate from the cultivator on windy days. A considerable amount of material is blown off the field but is contained within the farm.

POOR CONDITION VS = 0
Water erosion is a major concern with severe gullying, rilling and sheet erosion occurring. Topsoils in footslope areas are more than 300 mm deeper than on the crests, and sediment input into drains/streams may be high.
Wind erosion is a major concern. Large dust clouds can occur when cultivating on windy days. A substantial amount of topsoil can be lost from the field and deposited elsewhere in the district.

Water erosion photos: courtesy of J. Quinton and A. Leys