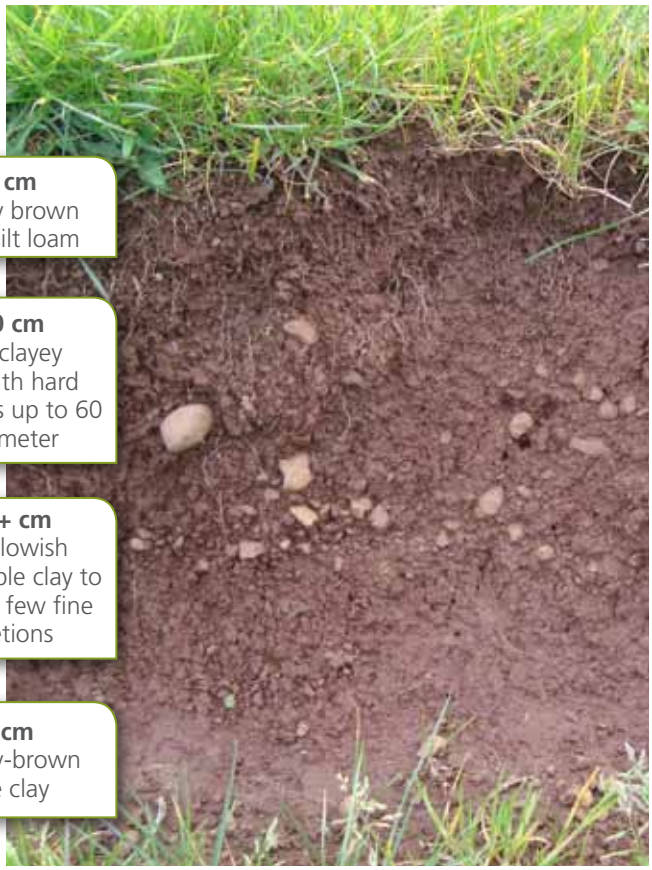
Old basalt volcanic soils

Soil types in this group

- Ōkaihau gravelly friable clay - OK
- Ōkaihau gravelly friable clay with dull brown subsoil - OKu
- Ōkaihau very gravelly friable clay - OKg
- Otaha clay – OD, ODH*
- Otaha gravelly clay loam - ODg
- Pungaere gravelly friable clay - PG
- Taraire gravelly friable clay - TA

This fact sheet uses NZ Soil Bureau map series soil type names and abbreviations.

The H* denotes the hill variant of this soil type, which occurs on slopes over 20° and has a shallower profile.



Okaihau gravelly friable clay (OK) soil profile *Photo by Ian Hanmore*

Features of old basalt volcanic soils

- These soils formed on basalt lava low in silica and rich in iron and aluminium
- They are part of the Kiripaka soil suite
- Old soils on basalt became laterites or 'ironstone soils' as water filtering through kauri produced acids that leached nutrients and clays from the upper horizons
- Leaching is strong to very strong, and the process left an infertile friable topsoil over ironstone nodules
- Heavy dressing of lime and superphosphate by the Lands and Survey Department in the 1950s made farm development possible
- Some soils are bouldery, typical of the edges of lava flows where the igneous rock cooled quickly into the hard balls we call boulders today
- All old basalt volcanic soils are generally free draining, requiring few drainage structure improvements

Structure and drainage management

Issues	Management tips
Old basalt topsoils are very thin and have a strongly developed nutty structure that is stable when wet but easily destroyed when dry	To avoid compaction, soils should be allowed to dry after rain for a few days before running heavy equipment or stock over them
This makes old basalt soils 'brittle' and easily damaged by over-cultivation or compaction in summer	Shallow ripping shatters cultivation pans/surface compaction and aerates soils, maintaining structure and reducing fungal root diseases
Topsoils can become a fine powdery surface layer known as a 'dust mulch' that seals the surface, repelling water and increasing runoff	Careful crop-pasture-crop rotations retain topsoil structure
Because soils are generally free draining, they are drought prone; subsoils toxic to plant roots make both pasture and crop species shallow rooted, exacerbating drought problems	Avoid exposing plant-toxic subsoils because replanting any vegetation and/or reinstating topsoil layer is very difficult

Nutrient management

Soil type	Nutrient status	Management strategies
All old basalt volcanic soils	Water filtering through ancient kauri leaf litter left friable, infertile topsoils sitting over ironstone, aluminium and manganese nodules in subsoils; at low pH, free iron and aluminium fix phosphate and other elements and create a hostile environment for plant roots Ōkaihau gravelly friable clay soil can theoretically fix 100+ tonnes of superphosphate/ha	Soils should be well limed to raise pH and decrease free iron/ aluminium; phosphate should be applied little and often Applying dairy effluent as sludge or spray will build organic matter and buffer against nutrient loss
All old basalt volcanic soils	Phosphate fixation by iron/aluminium is irreversible, so leaching of phosphate to groundwater is unlikely; however, sediment and nutrient runoff into lakes and rivers is common	Avoid overgrazing and exposing soil surface to drying to retain nutrients in topsoil and keep plant-toxic subsoils well below the surface
All old basalt volcanic soils	Free iron/manganese upsets the balance of many micronutrients, causing deficiencies in both plants and animals	Micronutrient supplements will probably be required for livestock, even when not necessary for plant growth

Erosion control

Erosion risks	Soil type	Specific problems	Possible solutions
Shallow slipping	Rolling hill country soil variants	Slips occur because of more pronounced leaching and extremely friable (crumbly) topsoil Exposed red subsoils are difficult to revegetate because of toxic levels of free iron, manganese and aluminium Slipping is often associated with seepage areas at the heads of gullies	Manage water discharge and flow from higher elevations Plant and cultivate on the contour Break the slope by working in 'protected lands' Form 'protected lands' by grassing water diversion channels at intervals down the slope with runoff directed to protected waterways Investigate using sediment traps in frequently or continuously cropped areas Open plant poplars where groundwater is surfacing to control slipping Mulching exposed red subsoils on road cuttings and where erosion has occurred, with old hay, silage, or effluent pond sludge prior to planting, will assist revegetation Exclusion of stock from revegetated areas is essential for recovery Fence bush enclaves in gully heads to allow ground cover to regenerate and hold soils in place
Sheet erosion	All old basalt volcanic soils	Dry powdery summer surfaces shed water and form a dust mulch The dust mulch seals soil surfaces and repels water, especially under compaction, making sheet erosion after drought more likely Loss of topsoil exposes unproductive, plant-toxic, gravelly ironstone subsoils below, and increases loss of sediment-bound nutrients into waterways	
Rill erosion	All old basalt volcanic soils	Water runoff from compacted land above runs downslope, gouging channels or rills into topsoils Bare, cropped soils are especially susceptible to rill erosion Rills become deeper with successive rainstorms	

Okaihau soils, Okaihau Photo by Ian Hanmore

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Drainage classes

Soil symbol	Full name	Drainage class
KIRIPAKA SUITE Basement rock: volcanic basalt lava flows		
OKg	Ōkaihau very gravelly friable clay	5 - Somewhat excessively drained
ODg	Otaha gravelly clay loam	5⇌4 - Somewhat excessively to well drained
OK	Ōkaihau gravelly friable clay	5⇌4 - Somewhat excessively to well drained
TA	Taraire gravelly friable clay	4⇌3 - Well to moderately drained
OD, ODH	Otaha clay	4 - Well drained
OKu	Ōkaihau gravelly friable clay with dull brown subsoil	4 - Well drained
PG	Pungaere gravelly friable clay	3 - Moderately drained

Northland soil factsheet series

- Northland's climate, topography, historic vegetation and mixed geology have combined to form a complex pattern of soils across the region. There are over 320 soil types in Northland. Other regions in New Zealand average only 20 soil types per region.
- The information in this fact sheet is based on a 1:50,000 mapping scale. Therefore, it is not specific to individual farms or properties. However, it may help you to understand general features and management options for recent alluvial soils.
- Knowing your soils' capabilities and limitations is the key to sustainable production in Northland. Northland Regional Council (NRC) land management advisors are available to work with landowners to provide free soil conservation advice, plans and maps specific to your property.
- Regular soil tests are recommended. If you are concerned about your soil structure or health, the Visual Soil Assessment test could be useful. Contact the land management advisors at Northland Regional Council for more information.
- Further background information about the processes that have formed these soils can be found here: **www.nrc.govt.nz/soilfactsheets**