

● Runoff Management on Pastures

Introduction

The deep volcanic ash soils found throughout the Bay of Plenty are highly susceptible to erosion by running water. This applies to overland flows as well as flow in streams. Overland flows arise during heavy rainstorms when soils can not absorb all the rain falling upon them, resulting in the following types of soil erosion.

Sheet Erosion occurs when thin layers of soil are washed downslope in a dispersed pattern. Bare ground is especially susceptible to sheet erosion, which becomes more pronounced as rainfall intensity increases.

Rill Erosion occurs when overland flow begins to concentrate in small channels and has a downcutting action. Sediment washed out of rills accumulates on pasture and finds its way into streams. Erosion rills often damage farm tracks or result in blocked drains.

Gullyhead Erosion occurs in floors of (normally) dry gullies where overland flow from the surrounding hillsides concentrates during heavy rainstorms. A vertical bank (gully head) develops in the channel floor and is continuously undercut by high flows, causing the gully head to migrate upstream. Lateral collapse around gully heads creates major erosion damage.

Environmental Influences Topography

The erosive power of flowing water is derived from the energy it gains as it flows downhill. The velocity of overland flow increases with slope angle, and the volume of

runoff increases with length of slope.

Vegetation

On pastoral land the predominant vegetation cover is made up of grass and legume species. This vegetation mat has the effect of filtering and slowing down overland flow. Any disruption or removal of this cover creates the potential for higher runoff rates and more erosion.

Rainfall Intensity

Rainfall intensity refers to the amount of rain that falls within a period of time and most erosion damage is caused by high intensity rainstorms. As rainfall intensity increases, rain drops strike the soil with more frequency, dislodging more particles for removal by sheet erosion.

Infiltration Rate

This is the rate at which soils absorb rainfall and is a function of soil type and depth, and to a lesser extent slope angle and vegetation cover. The deep ash soils of the Bay of Plenty have relatively high infiltration rates, but these can be affected by management practices (see below). Where infiltration rate is less than rainfall intensity, overland runoff will occur. Overland flow moves faster on high gradient slopes so even moderate storm events can result in high runoff on steep catchments. Gentle slopes allow more opportunity for infiltration, and vegetation cover will assist infiltration by providing drainage corridors along root channels or through the voids in organic litter.

On bare surfaces, soil particles dislodged by raindrop impact tend to block soil pores and lower infiltration rates.

Management Influences Stocking Rates

Increasing stocking rates increases the density of animal treading on pastures. Voids in the soil which allow air circulation and water drainage are compressed or eliminated. This not only lowers the infiltration rate of the soil, it also limits root transpiration and slows down pasture growth. Heavy stocking rates increase erosion risk while reducing pasture production, and these effects are more pronounced on wet soils.



Pasture damaged by high grazing pressure in summer, with limited recovery by late autumn.

Grazing Pressure

High grazing pressure may be used as a management tool to control weeds but if not managed with care will result in lost pasture production and increased erosion.

While pasture forms a continuous mat, individual plants of grass and legume species grow from a clump (crown). Where pastures are grazed hard, gaps between the plant crowns become apparent and bare soil is exposed.

Pasture recovery is also checked because removal of a high proportion of the green plant material reduces the amount of chlorophyll available to perform photosynthesis, the essential process of plant growth.

Stock Tracks

Animals form regular pathways, particularly for access to water or between preferred grazing areas. Tracks are usually bare of vegetation and are recessed into the soil surface. As a result they function as drainage channels (rills) where runoff concentrates during storm events.

Cattle and deer often track along fencelines. Where fences are angled across a slope, a combination of stock-induced sheet and rill erosion can either bury fences down hill of a stock track, or undermine fences up slope of a track.

Stock Camps and Wallows

These are areas where stock congregate, usually to the detriment of pasture health. This generally results in bare ground, especially if a tree is present which may attract stock for shade and scratching purposes. Bare ground is frequently created around troughs. Stock may also wallow in shallow depressions or rub against embankments, also damaging the pasture layer.



Stock induced rill erosion along fence line. Posts in background are completely exposed, fence in foreground has been half buried by outwash sediment.

Managing Runoff

Management factors can be controlled to ensure the on-farm erosion risk is minimised, while the pasture base of the farm enterprise is maintained at its most productive level. These objectives can be attained by using the following strategies.

- Maintain vigorous pasture growth: soil test regularly and apply fertilisers as required; control pasture weeds.
- Fence sidlings for grazing management.
- Oversow with improved, high yielding cultivars and/or those selected for specific sites types.
- Consider oversowing rilled areas and stock camps with coarse, clump-forming grasses like *Phalaris aquatica*.
- Discourage soil compaction by stock treading, avoid high stocking rates and manage wet soils carefully.
- Monitor soil compaction with a Visual Soil Assessment kit (available from Environment Bay of Plenty).
- Try to avoid high grazing pressure at all times of the year. If necessary destock, provide feed supplements or seek grazing off the property.
- Site fences, troughs and gates to minimise stock tracking issues. Use deflector rails on problem fencelines.
- Site vehicle access tracks carefully and manage their runoff (see **Sustainable Options LM04: Farm Tracks: Planning, Construction and Maintenance**).
- Site trees in paddocks with care. Avoid planting in the centre of ephemeral (runoff) channels on hill slopes or gully floors. Plant trees at 5 - 7 m off the centre of such channels.
- Use narrow-crown deciduous trees (eg hybrid poplar) for spaced plantings in paddocks.

- Plant several trees per paddock, but no more than 40/ha (ie at spacings of at least 15 m) and prune to reduce shading.
- Retire and tree plant eroding gully floors.
- Use detention dams or drop structures to control headward erosion in gully floors. (see **Sustainable Options LM10: Detention Dams and Drop Structures**).



For further information and advice, contact your local land management officer at Environment Bay of Plenty:

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