

Keeping soil in its place

Improving soil cover and managing drainage



STRAWBERRY
INNOVATION

The movement of soil from strawberry farms can result not only in a loss of valuable top soil and available nutrients, but can also cause off-farm environmental impacts, particularly to waterways.

One of the main ways soil moves off farm is due to water erosion. Water erosion can occur when heavy rain or excess irrigation flows across exposed soils and/or soils with poor structure in farm blocks and tracks, or is captured without adequate drainage on hard surface areas such as protective cropping structures, packing sheds and buildings.

You might see evidence of water erosion on your farm, such as:

- Formation of rills, gullies and tunnels
- Turbid water in farm dams or leaving the property
- Built up soil on fence lines, adjacent roads to the farm or at the bottom of slopes



Water erosion

BEST PRACTICE GUIDELINES

Practices which can reduce and manage the movement of soil off-farm include:

- Maintaining effective vegetated ground cover across the farm
- Establishing vegetation between strawberry rows and managing it to maximise root establishment and leaf density
- Preventing irrigation and/or rainfall run-off from hitting or moving over bare soil
- Creating stable pathways that slow run-off water and allow any nutrient-laden sediment to drop out before it leaves the property or enters watercourses or dams
- Using structures such as grassed headlands and buffers to intercept and treat run-off water
- Constructing and maintaining sediment traps to filter excess sediment out before run-off water leaves the farm
- Forming and maintaining good farm tracks

Soil cover

Vegetation cover between rows

The establishment of grass in between strawberry rows is an effective way of managing soil movement. Vegetative grass cover holds together inter-row soil, while the top growth protects the soil surface from water droplets. It also slows and filters sediment from incoming rainfall or irrigation run-off, improves traffic movement, offers a cleaner environment for workers and promotes cleaner fruit by reducing soil splash.

Growers can stabilise soil between rows by:

- Establishing vegetation between strawberry rows and managing it to maximise root establishment and leaf density.
- Sowing a quick establishing grass between the rows and

Improving soil cover and managing drainage

killing it off before planting. The residual mulch stabilises the soil between the rows. Other stabilisation options between rows include the use of sawdust or straw.

If the use of a grass inter-row is not an option, maintain vegetative cover in critical areas such as steep slopes and rows located closest to dams and watercourses, in conjunction with other drainage management strategies.



Oats and radish grown between strawberry rows

Drainage management

At times water runoff is unavoidable, and structures and management practices need to be employed to ensure soil and nutrient losses are minimised. You can do this by:

- Managing water run-off coming onto your property
- Preventing irrigation/rainfall runoff from hitting or moving over bare soil
- Creating stable vegetated drain lines that slow run-off water and allow any sediment to drop out before it enters watercourses or dams

A good way to understand your drainage needs is to observe water movement and review the performance of existing drains during a rain event. It is the ideal time to see whether your soil is moving off farm, whether the rate of run-off is greater than the capacity of your drainage system and whether intercepted water is being effectively delivered to drainage lines and watercourses.

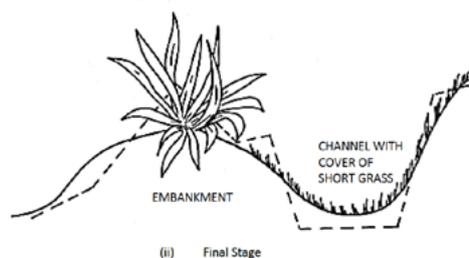
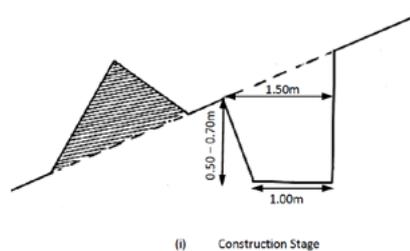
Grass headlands and buffers

When located above and below strawberry blocks, permanently grassed headlands and buffers can reduce the speed of water flow and filter sediment out of run-off. You can manage permanent headlands and buffers by:

- Determining headland and buffer width based on slope. The steeper the slope, the wider the headland or buffer will need to be.
- Locating headlands and buffers across the slope where water is concentrated, this includes around dams and adjacent to waterways. Buffers aren't as effective on slopes greater than 15%. Diversion banks should be used on steeper slopes.
- Sowing headlands and buffers with perennial grasses that are maintained (slashed) to encourage deep rooting and dense and vigorous growth. A swathe height of 15 cm is recommended for maximum filtration capacity. Grasses should be selected based on their ability to handle traffic, as well as wet and dry spells.
- Controlling broadleaf weeds in headlands and buffers using a selective herbicide.
- Minimising traffic on headlands and buffers, particularly when it is wet.

Cut-off drains and diversion banks

Cut-off drains and diversion banks intercept water and divert it away from the natural drainage course to protect cultivated or bare soil areas. They cut across the slope, intercepting run-off water flow and should discharge into grassed waterways or vegetated buffer strips.



Cross section of cut-off drain

Improving soil cover and managing drainage

The design and dimensions of cut-off drains or diversion banks will vary from site to site. They need to be built on a grade which will ensure water flows in the required direction, but not so fast that it erodes the structure, or so slow that sediment accumulates. They also need to be constructed so that they can cope with the volume of water that would be generated by a 1-in-10 year storm event.

Cut-off drains

When constructing cut-off drains:

- Use side slopes (batters) that are stable for the soil type and allow easy maintenance - preferably no steeper than 3 (horizontal): 1 (vertical). Make them wide with a flat floor, and establish good ground cover on the batters and floor.
- Direct drainage to a stable discharge area such as a vegetated waterway.

Diversion banks

A cut and fill or all-fill diversion or graded bank, sown to grass, is an alternative to grass headlands on steep slopes greater than 10%. Banks should be located more frequently across steeper slopes to ensure runoff water between one bank and the next does not develop an erodible velocity. Diversion banks can cause some inconvenience when working a paddock but can be constructed to accommodate traffic. The best shapes, for minimum interference, can be constructed using a grader. Direct water from a diversion bank to a stable discharge area, such as a vegetated waterway.

Grassed waterways

Grassed waterways (drainage lines), either built or naturally-occurring, carry run-off from up within the catchment or cut-off drains, diversion banks and other structures into farm dams or watercourses. They can also be used to safely direct water through a cultivated area if diversion of water around a block is impractical. Grassed waterways should be wide and shallow with a flat base. This form allows water to spread out and is easy to maintain.

- Where appropriate, establish wide, shallow grassed waterways to safely carry water to dams or water courses.
- Do not use grassed waterways as a road, this will make

them prone to erosion.

- Maximise grass density in waterways by slashing. Control broadleaf weeds using a selective herbicide. It is recommended that grass height be maintained at 20 cm.
- Select grasses that can survive flooding and are suitable for waterlogging soils.



Grassed waterway

Sediment traps

Sediment traps hold run-off water long enough to reduce velocity and allow larger eroded soil particles and attached nutrients to settle out. Sediment traps should be used in conjunction with the other approaches as they will not prevent soil and nutrient loss by themselves.

- Traps should be designed to suit the soil type and catchment area to be treated
- Trap design should also consider your available machinery for periodic maintenance and cleaning of accumulated sediment deposits in dry weather.
- Runoff water from a sediment trap should flow along stable non-erodible pathways, such as a grassed waterway.
- 'Treatment trains' including several sediment traps, strategically sited within a well-planned erosion control system are better than a large single trap, acting as a last line of defense, at the bottom of the property.

Improving soil cover and managing drainage



STRAWBERRY
INNOVATION



The installation of sediment traps at the end of rows can significantly help to trap sediment and runoff while maintaining row access.

Farm tracks

The compacted and exposed nature of farm tracks make them vulnerable to erosion, and if not well designed, constructed and maintained, can be a significant source of sediment and nutrients discharged to dams and watercourses.

Track siting and design

- Build tracks on the most stable ground. Ideally, they should be located on ridge tops or on areas with little slope.
- Farm tracks should be gently crowned or sloped to shed water and minimise the time and distance water travels down them. They should also be supported by table drains to carry run-off from the track.
- On steep grades, place earthen banks (whoa-boys) 20-30 cm apart and build them on an angle across the track to avoid water ponding or concentrating and eroding trackside drains.
- Discharge diversion banks or run-off into drains or vegetated areas.
- Where possible, establish hard-wearing grass on low use tracks. On high use tracks, crushed rock or surface gravel should be used, even if only in steep sections.
- Restrict major traffic to designated hard-wearing tracks, particularly in wet weather.
- Wheel ruts concentrate water flow and start erosion. Change wheel tracks to prevent ruts forming.

Culverts or pipes

- Culverts must be large enough to handle peak flows. They should be spaced at an interval that will prevent water building up to levels that generate erosion (the steeper the track, the more culverts will be required). Culverts should also discharge into dense vegetated areas or sediment traps, to reduce the velocity of runoff, encourage infiltration and trap sediment.
- Sumps or box inlet structures can be used at the entry of culverts to prevent erosion around the culvert and reduce blockages from sediment build-up.

Maintenance

- Track maintenance should focus on keeping the road crown or slope and drains effective, avoiding V-shaped or U-shaped clearing of table drains and damage to discharge areas. Indicators for maintenance include eroding batters or track surface, wheel ruts, boggy patches and blocked culverts.



Culvert

References

Department of Natural Resources and Environment, Vic (2002) Improving Environmental Management for the Victorian Strawberry Industry

Horticulture for Tomorrow (2014) Guidelines for Environmental Assurance in Australian Horticulture

Queensland Department Primary Industries, (2008) Queensland Strawberry best soil, water and nutrient management practices