Runoff control measures for erosion control in cropping land

Soil erosion in cropping land causes a loss of productivity, sedimentation in downstream areas and reduces water quality. It can be controlled by maintaining as much cover on the surface of the soil as possible and by managing run-off.

When run-off occurs, it concentrates as it moves downslope towards drainage lines, creeks and rivers. Whenever run-off concentrates, its potential to cause erosion greatly increases.

There are a number of measures that manage run-off in cultivated paddocks in order to minimise erosion including:

- diversion banks
- contour banks
- constructed waterways
- strip cropping.

To work effectively, these measures involve careful planning, design and implementation.

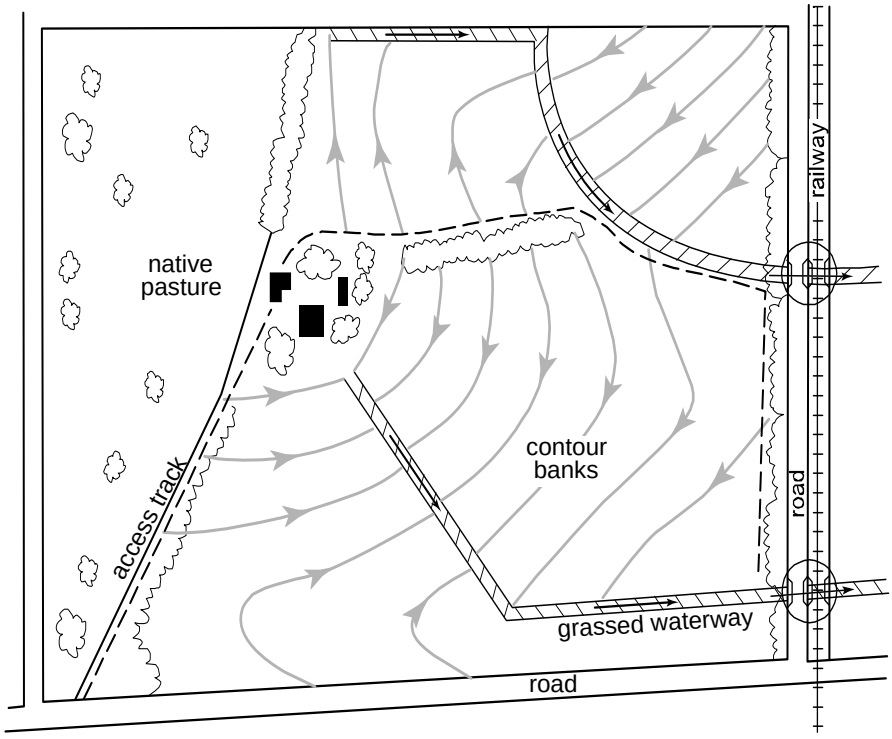

Figure 1. A property plan showing examples of run-off control measures

Diversion banks

Run-off from the land above a cultivated paddock can cause erosion as it flows over the paddock. To prevent this, a diversion bank can be constructed on the top side of the paddock to intercept the run-off and direct it along a grassed channel to a waterway or drainage line.

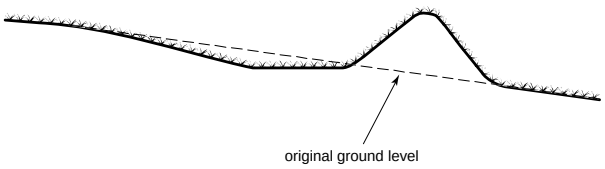

Figure 2. A diversion bank

Contour banks

Contour banks are earthen banks constructed at intervals across a slope to intercept and channel run-off into waterways or natural depressions. They have a slight gradient which is close to the natural contours of the land. Any crop or stubble in a contour bank channel will filter run-off as it moves slowly along the channel.

Contour banks are either:

- narrow-based—grassed batters that are too steep to cultivate. They cover 2–7 per cent of the total cultivated area and are not suited to cracking clay soils.
- broad-based—batters that can be easily cultivated and planted to crops. They are more costly than narrow-based banks and may be impractical to construct once land slopes exceed five per cent.

Figure 3. A narrow-based contour bank (left) and broad-base contour bank (right)

Contour banks play a useful role in dry seasons when there is no crop and minimal stubble in the contour bay. If a heavy rainfall event occurs, soil losses of up to 50 tonnes per hectare could occur. Well maintained contour banks can trap up to 80 per cent of this soil that may be otherwise lost from the paddock.

Contour banks may fail in big rainfall events especially if they are poorly maintained and there are low spots where they cross old gully lines. Well maintained contour banks should rarely fail when their channels are bare because they can handle a considerable amount of run-off under these conditions.

If the channel is restricted by a crop or standing stubble, contour banks are more likely to fail by overtopping but the erosion risk will be minimal because of the good cover conditions.

In horticultural areas a variety of structures are used instead of contour banks to intercept and manage run-off—including mounds for crops like bananas and papaws and raised beds for fruit and vegetable crops.

Constructed waterways

Waterways for soil-conservation purposes collect run-off from contour bank systems and convey it at a safe velocity to a grassed disposal area, road cross drainage structure, drainage line or creek system.

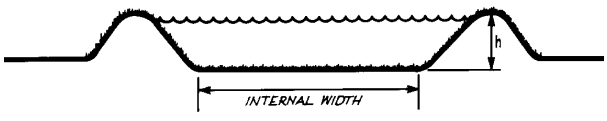

Figure 4. A typical waterway cross-section

Waterways are wide, flat-bottomed structures and usually need retaining banks on both sides. The channels are planted with grass to protect them from erosion. Waterway design takes into account the size of the catchment area, soil type, land slope, land-use, and expected grass cover.

Ideally, waterways are built in natural drainage lines. If none exist, then a waterway may be constructed adjacent to a fence or some other suitable location.

Waterways are especially vulnerable to erosion because of the concentrated flows that they need to accommodate. They should be carefully designed, constructed, stabilised and maintained to reduce the risk of failure by gullying or by overtopping.

Strip cropping

Strip cropping (Figure 5) is used on parts of the Darling Downs floodplain that are subject to erosive flooding. The most vulnerable areas are where creeks flowing from the uplands meet the floodplain.

Strips of summer and winter crops are grown on the contour to encourage flood flows to spread. Strip cropping should be combined with zero tillage and crop rotation techniques to ensure that there is always a crop or standing stubble in every strip to help spread water and reduce flow velocity. Because the strips reduce velocities, they act like a filter and deposit sediment.

Figure 5. Strip cropping on the Darling Downs floodplain

Legal aspects

Run-off control measures require careful planning to ensure the coordination of run-off as it flows between properties and across road and rail reserves towards natural drainage lines

Proposed run-off control measures may change the manner in which run-off flows between properties and across roads and railway lines. Should there be the possibility that runoff water may impact neighbouring properties or infrastructure, land owners are encouraged to discuss with their neighbours and seek professional advice.

Maintenance

Run-off control measures require regular maintenance if they are to carry out their role effectively, including:

- removing silt from channels and waterways
- maintaining the recommended bank height
- repairing any breaks or low spots in banks
- maintaining grass cover in waterways.

By ensuring that contour bays are protected from erosion by either a crop or crop residues, there will be minimal movement of sediment into the contour banks channel and maintenance costs will be greatly reduced.

Further information

This and other science notes are available from the Queensland Government website www.qld.gov.au – search ‘science notes’. For further information about this science notes series phone **13 QGOV** (13 74 68) – Ask for science notes – Land series L35. Other science notes related to this topic include:

- L13—Erosion control in cropping lands
- L83—Soil conservation planning in cropping lands
- L205—Contour bank specifications
- L202—Maintaining contour banks

For further information on soil erosion visit <http://www.qld.gov.au/environment/land/soil/erosion/> or email soils@qld.gov.au.