Sediment

INTER-ROW MANAGEMENT

The run-off resulting from storm rainfall is a principal cause of erosion in Queensland's cropping systems. Without adequate ground cover, water flow across bare ground can be significant and will affect run-off potential. Soil erosion results in the loss of productivity of agricultural lands, causes sedimentation in downstream areas and has a negative effect on water quality.

There are three important principles to consider in the control of erosion:

- land should be used in accordance with its capability
- the surface of the soil needs to be protected by surface cover involving stubble management practices on cropping land and careful stocking strategies on grazing land
- run-off needs to be controlled before it develops into an erosive force.

Adequate levels of surface cover play an important role in erosion control by avoiding the effects of raindrops falling on bare soils. Surface cover also encourages run-off to spread rather than to concentrate. However, there is a natural tendency for run-off to concentrate as it moves down-slope.

Groundcover is any material that protects the soil. The most efficient groundcovers for large land areas are living plants because:

- foliage reduces the impact of raindrops
- foliage and stems reduce the speed of overland flow
- roots bind the soil
- soil organisms feeding on dead vegetation produce gums that aggregate soil particles, making them less erodible.

Plants protect the soil by providing canopy cover (more than 5 cm above the soil surface) and contact cover (up to 5 cm above the soil surface).

Canopy and contact cover both protect the soil against raindrop impact. However, contact cover is more effective in protecting soils because it slows runoff so that water infiltrates the soil and deposits any dislodged sediment around the plants. Good contact cover is crucial on sloping country.

A complete and permanent cover will usually reduce erosion to a negligible level. Any activity that disrupts vegetation cover on the land usually results in accelerated erosion rates. On cultivated soils, the nature of the canopy, the proportion and time of the year that the soil is covered and the amount and nature of residues left on the soil between crops are all significant.

Groundcover is a good indicator of farm productivity and sustainability. Without it, up to 85% of rainfall from storms can run off into creeks and streams rather than soak into the soil and be available for plant growth. When groundcover is thin, patches of bare soil provide a path for runoff to build up speed and erode the soil.

Reduce the potential of water to cause erosion by:

- stopping external water flowing onto and through paddocks
- removing water safely from paddocks
- reducing water speed flowing across the land
- creating stable seedbeds that resist erosion
- maintaining a protective ground cover.

Examples of good practices:

- Grow a mulch crop in the inter-row after laying plastic mulch.
  - This can be sprayed out prior to going to seed and form a dead mulch layer
- Grow a green manure crop between vegetable cropping cycles.
  - This will provide soil cover and add organic matter to improve soil health.
- Grow a permanent mulch cover and never cultivate.
  - Sow crops through the mulch layer with appropriate machinery.

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There are design features and practices that affect the velocity of flow in drains between beds:

FEATURE OF DRAINS BETWEEN BEDS	PRACTICES THAT AFFECT VELOCITY OF FLOW IN DRAINS BETWEEN BEDS
Gradient	Beds can either be aligned to the contour, across the slope or up and down the slope. Gradients are required that provide adequate drainage but not excessive velocities which lead to erosion. To avoid water ponding and poor drainage, a minimum grade of 1% is normally used for the bed direction.
Depth of flow	Flow depth has a significant effect on velocity. On steeper gradients, velocities and the rate of discharge increase dramatically as run-off rates and the depth of flow increases. Run-off rates depend on the width of beds, cropping practices and row length. Plastic in the beds would increase the rate of runoff.
Shape	The wider the drain, the greater the capacity and the less potential for erosion to occur. A flat base (trapezoidal, parabolic or 'U' shaped) in the drain between the beds is preferred to a V-shape. Flat bases make better walkways and have lower runoff velocities for better erosion control. The shape of a drain profile can change after a series of rainfall and runoff events. This is especially so in crops such as pineapples which have a crop cycle of three to five years.
Length	As row length increases, the depth of flow and rates of erosion are likely to increase. Row length can be reduced by modifying the bed design, by using contour banks or by installing cross drains or interceptor drains after the crop has been planted. Row length also affects the efficiency of farming operations. Long rows have advantages, but if a crop is harvested by hand, using buckets, the length of row needs to be taken into account so that full buckets do not have to be carried a large distance. The ends of furrows/walkways must drain freely and should not be blocked by the presence of raised roads, rills from recent road grading or the accumulation of silt.
Presence of vegetation or mulch	On a smoothly tilled, bare soil, velocities can become erosive once they exceed 0.5 m/sec. However a cover crop in the drain greatly reduces flow velocities and provides protection from erosion.
Soil tilth	A compacted drain can tolerate higher velocities and has more resistance to erosion. Soil strength can be increased by compaction of the drain with a rubber tyred vehicle.

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