



Consultant John Day, Landowner Heather Fricke and BMRG's Emma Baker.

# GULLY REMEDIATION

## Heather Fricke

### BACKGROUND

Over the last decade, the Burnett Mary region has been ravaged by a sequence of severe floods and prolonged droughts. These events have created a range of erosion issues for farmers and has put pressure on farm infrastructure and fragile topsoils.

Heather Fricke manages a breeding operation on a property in the Rosedale district. Since 2013, several gullies have developed rapidly: one in a failed dam by-wash, and two downstream in the same drainage line. The rate at which these gullies were expanding made completion of this project before more soil was lost, a high priority.

### THE ISSUE

Black clays and yellow texture contrast soils dominate the bottom of the valley where the gullies were eroding.

In their natural, stable state, these soils can be highly erosive as the subsoil (below 10cm) tends to become sodic and will break apart upon contact with water. These soil properties can make it extremely difficult to manage once exposed. Therefore it is important to ensure topsoil is not unnecessarily disturbed and that good groundcover is maintained.

Once the gully has broken through the stable topsoil, the sodic subsoils quickly wash away and undercut the surrounding topsoil. As a consequence, the gully head moves upstream at an ever-increasing rate.

## THE SOLUTION

The Burnett Mary Regional Group (BMRG) was able to support Heather's aspirations to fix the erosion by providing funding and technical advice through its 'Better Beef for the Reef' project.

BMRG's soil conservation officer, John Day, designed a practical, low-cost solutions for each site that would withstand a 1 in 10-year rainfall event. The final solution was based on best practice design principles (ref.1) and utilised existing infrastructure (e.g. bywash) as well as local materials and contractors.

**Site 1** - The current dam's water holding capacity was insufficient throughout extended dry years. As part of the project, the earthmoving contractor was able to dig out the dam, which in this instance, provided suitable material to use in further remediation.

To repair the eroded by-wash, the gully head and walls were battered at a 3:1 ratio. The depression was then filled with spill from the dam and used to create a new by-wash.

Design principles (ref. 1) suggested that a by-wash should be approximately 10m wide to accommodate the expected flows, calculated using *Equation 1*.

### Equation 1.

*by wash width* =  $2 \times \sqrt{\text{catchment (ha)}}$

*by wash width* =  $2 \times \sqrt{23}$

*by wash width* = 9.5m

The extension of the dam by-wash ensured water could spread over a wide, gentle slope. Due to the size of the catchment it was important to ensure the water could re-enter the drainage line in a slow and controlled manner to avoid further erosion downstream.

The following design principles, regarding the construction of dams in gullies, were applied to site 1:

- Check that there are sufficient quantities of suitable clay to ensure the dam would hold water.
- Use contractors who have experience working with dispersive and slaking soils.
- Consider the peak water flow when building the by-wash or use the 'rule of thumb' in Equation 1 to calculate length. Add a few metres to the width for safety. The by-wash should return to the drainage line at a stable area, away from the dam wall. A diversion bank can help keep flows away from the dam wall.
- If safe, place the wall across the gully, to reshape the gully head during construction and flood the gully head area.



**Site 2** - To rehabilitate the gully at Site 2, the gully head and walls were battered back and then filled with the remaining spoil from the dam deepening.



Site 2 (before).

To protect the filled and compacted site, a short diversion bank was constructed to divert water onto a well-grassed, stable area.



Site 2 (after).

**Site 3** - The paddock containing this gully did not have a water source except the creek, so a dam was constructed to provide stock with water and flood the eroded area.



Site 3 (before).

Similar to Site 2, the gully head and walls were battered, and the upper reaches of the gully were filled with spoil to level out the channel and spread the flow of water. In the lower section, a dam was built to flood other eroded sections of the gully. The new dam will also capture any soil which is lost from the other sites higher up in the catchment.



Site 3 (after).



Site 3 (after, showing gully dam).

The following design principles, regarding gully repair, applied to Sites 2 and 3:

- A diversion bank moving water to a spreader structure or broad, flat grassed area should be used to protect the site.
- Filling a gully may be all that is required if it is relatively small.
- A batter of at least 3:1 can be used on the gully head and walls if the valley floor is wide.
- All exposed areas should be seeded, fertilised and mulched. If possible, stock should be excluded from revegetated areas until well established.

After earthworks were completed, all sites were seeded with a grass legume mix including Signal grass, Siratro and Rhodes grass. Fertilise and mulch was also applied. Mulching has the added benefit of slowing overland flows and reducing the erosive effect of rain striking the bare soil surface.

Areas which were exposed through the earthworks were fenced off to improve the sites' ability to revegetate. Cattle will likely be excluded from these areas until the vegetation has been through a full growth phase and is well established.

## RESULTS

All three gullies have been successfully repaired and water capacity is improved. Heather is very happy with the results and is committed to monitoring and maintaining the structures, so the long-term benefits continue to be reaped.

Heather said, "Although my gully sites are only minor in the scheme of things, I feel have made some change". "If we are all to make change then that should help to improve the outcomes on the reef".



Landowner Heather Frick and BMRG's Emma Baker.

Reference 1: This project was designed and constructed in accordance with principles outlined in "*Gully Erosion – Options for Prevention and Rehabilitation – Experiences from the Burnett and Mary River Catchments, Queensland*" - John Day and Bob (RN) Shepherd, 2019.

**The Better Beef for the Reef project is funded through the Queensland Government Reef Water Quality Program and is delivered by the Burnett Mary Regional Group.**

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