
MANAGING NATURAL ASSETS ON FARMS:

Enhancing farm dams



Enhancing farm dams by controlling livestock access and increasing vegetation cover can have many benefits for water quality, water security and farm productivity, while also supporting biodiversity and ecosystem services. This management guide details the benefits of enhancing farm dams and provides guidance on how to undertake a dam enhancement project.



**SUSTAINABLE
FARMS**

Well-managed farm dams have the potential to improve water quality, water security and animal health. These management issues are of increasing concern as climate change drives hotter temperatures and increased rainfall variability.

Enhanced dams also become a green oasis on a farm, supporting an abundance of native wildlife such as frogs, turtles, insects, water birds, and woodland birds.

What is an enhanced dam?

Enhanced dams typically have three key features:

1. Fencing to restrict livestock access
2. Revegetation with native trees and shrubs
3. Other habitat features such as logs, islands, or shallow wading areas

When stock have unrestricted access to dams, they often congregate around the water's edge, contaminating the water with faeces and urine, preventing the growth of vegetation through trampling and grazing, and pugging the edges of the dam.

By fencing a dam to restrict livestock access, the grasses, sedges and rushes around the dam will gradually re-establish. This creates a natural 'buffer zone' that helps to filter sediment and nutrients from inflowing water, improving water quality and reducing dam siltation.

Plantings of native trees and shrubs beside a dam will slow wind speeds and help to reduce evaporation from the dam.

Both the improved water quality and vegetation around an enhanced dam also provide habitat for native wildlife – creating a biodiversity hotspot on the farm.



Example comparison of unfenced (left) and enhanced (above) dams on the same property at Bowna NSW. These photos were taken on the same day in early 2019, during an extremely dry period. Photos: David Smith.

Six reasons to enhance a farm dam



Improve water quality

Dam water will be cleaner and clearer with reduced nutrient levels, faecal bacteria, and sediment. This can have significant benefits for stock health and weight gain, contributing to a farm's overall productivity.



Increase water security

Evaporation is the principal source of water loss from farm dams and is predicted to increase under climate change. Strategically placed revegetation around a dam reduces wind speeds and can reduce evaporation by up to 30%. Reduced siltation also helps to maintain the capacity of a dam.



Support biodiversity

Enhanced farm dams can be a proxy for natural wetlands, providing important habitat and an abundance of resources for many native plant and animal species, including threatened species.



Increase provision of ecosystem services

Nutrient cycling, water filtration, pollination and integrated pest management are examples of services provided by a healthy natural environment. These ecosystem services are supported by farm dam enhancements and can benefit agricultural production in the surrounding landscape.



Reduce greenhouse gas emissions

Improving the condition of a farm dam can play a significant role in reducing greenhouse gas emissions (especially methane) from the water body. This also has the potential to be a source of carbon credits in the future.



Increase your peace of mind

A secure supply of water is reassuring, and an enhanced dam can be an oasis during drought. It can provide a pleasant green space on a farm, support native wildlife and increase your peace of mind.

“It’s a big change of mindset for a farmer to say, ‘I’m going to restrict stock access to a water point.’ But this has a production benefit, an environmental benefit and an aesthetic benefit. I think it wins three ways. Triple bottom line.”

— Marcus Richardson, “Larakoona”, Table Top NSW



Benefits:

Water quality & water security

Research demonstrates that enhancing farm dams leads to improvements in water quality and water persistence, which in turn, can have benefits for stock health and overall farm productivity.

Water quality

- Fenced, well-vegetated dams have a greater capacity to filter contaminants from run-off flowing from the surrounding paddocks. These contaminants, including sediment, nutrients and faeces, can reduce water quality. This makes the water less palatable to stock – reducing optimal water intake especially in hot conditions.
- Excluding stock from the vicinity of the dam prevents direct deposition of urine and faeces into the dam and its immediate catchment.
- During a 5-year research study, *Sustainable Farms* monitored the water quality of 132 dams in south-eastern Australia. Fenced dams were found to have 55% less phosphorus, 40% less nitrogen, 70% less *E. coli* bacteria, and 65% less turbidity.¹



Water security

- Evaporation is the principal source of water loss from farm dams. As climate change reduces water inflows and leads to increased evaporation, on-farm water security will become an increasingly important management issue.²
- Strategic planting of trees and shrubs beside a farm dam provides a windbreak that can reduce evaporation by up to 30%.³
- Increased ground cover around dams, particularly in the inflow area, reduces siltation and helps to maintain dam capacity. A higher depth-to-surface area ratio also reduces evaporative losses.



Productivity dividends

- Improving water quality has the potential to increase stock productivity. This is because less palatable water leads to reduced water intake and an associated reduction in feed intake by livestock.⁴
- Clean, enhanced dams and reticulated water contain fewer pathogens that may affect stock health and performance, and provide the opportunity for flexible pasture and grazing management.
- A cost-benefit analysis undertaken by *Sustainable Farms* compared the cost of enhancing all the dams on a farm with the potential benefits from modest weight gains in cattle and reduced dam siltation. The analysis found a 3:1 ratio of benefits to costs over the 50-year life of a dam in Victoria, and a 3:2 ratio of benefits to costs in NSW.⁵



Benefits:

Biodiversity conservation

Across Australian agricultural landscapes around 50% of natural wetlands have been lost, with remaining wetlands generally degraded. This has led to declines in many species of plants and animals. Enhanced dams can help restore biodiversity by providing habitat and resources that were once present in these natural wetlands.

By enhancing dams, farmers can create biodiversity hotspots that support a rich diversity of life including native aquatic plants, insects, crustaceans, fish, frogs, turtles, birds and bats.

- Water quality is a principal determinant of the biodiversity potential of a farm dam, enabling aquatic life forms to flourish.
- Enhanced dams typically have around three times more rushes, sedges, reeds and other semi-aquatic vegetation around the water's edge, which provide important habitat for frogs. Consequently, enhanced dams have been found to support a significantly greater abundance and diversity of frogs.⁶
- Enhanced dams also support a significantly greater diversity and abundance of water bugs such as insects, crustaceans and snails. These tiny animals play an important role in maintaining the health of aquatic systems and are also a food source for other animals.⁷

Welcome Swallow and
Broad-palmed Frog.
Photos: David Smith.

- Enhanced dams have been found to host 46% more bird species than unfenced dams without vegetation plantings. In particular, terrestrial woodland birds benefit from farm dam enhancement, utilising the abundant resources at these sites for breeding and foraging.⁸
- Across southern Australia, enhanced dams are being utilised as surrogate wetlands to support the conservation of a number of threatened native fish, such as the Southern Pygmy Perch and Southern Purple-spotted Gudgeon.

Ecosystem services

The community of organisms that flourish in and around an enhanced dam play a significant role in ecological function. This leads to an increase in ecosystem services including nutrient cycling, water filtration, pest control and pollination, all of which can benefit agricultural production.



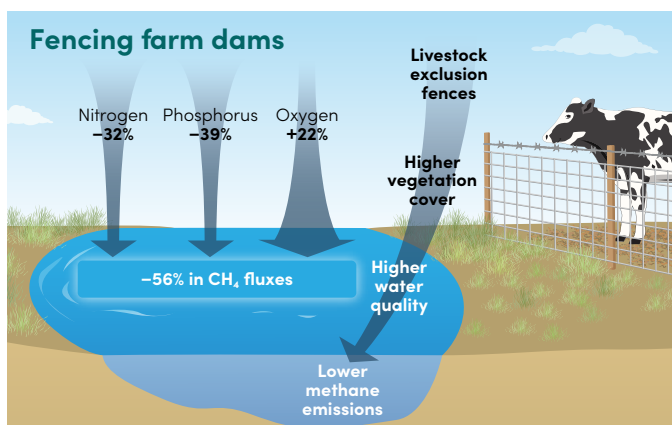
Benefits:

Reduced greenhouse gas emissions

Freshwater systems, particularly farm dams, emit potent greenhouse gases, such as methane. These emissions are triggered by fertiliser and manure run-off increasing nutrients and creating the ideal conditions for the production of methane, a gas with 30-100 times greater warming potential than carbon dioxide. However, a recent large-scale study shows that enhanced dams can reverse this trend.

In the study, fenced farm dams recorded lower levels of nitrogen and phosphorus and higher levels of dissolved oxygen. Subsequently, enhanced dams had on average a 56% reduction in methane emissions compared to typical unfenced dams.⁹

The increase in dissolved oxygen levels is significant because farm dams with high levels of dissolved oxygen can stop emitting methane and instead start absorbing greenhouse gases from the atmosphere. This means that enhancing



Enhancing farm dams halves methane emissions and improves water quality. Figure credit: Malerba et al. (2022)⁹

farm dams can turn these systems from being a climate change problem into a solution to lower the carbon footprint of Australian agriculture.

In the future, carbon credits for farm dam management could also deliver a financial dividend to farmers.

How to enhance a farm dam

1. Fence to manage livestock access

Reducing grazing intensity in the dam catchment, particularly in the immediate vicinity of the dam, can reduce the inflow of nutrients and sediment. This occurs in two ways:

1. Reducing grazing pressure enables increased growth of vegetation around the dam, which provides a filtration buffer.
2. Removing stock from the immediate vicinity reduces the amount of faeces and urine that enters directly into the dam.

Practical considerations:

- Aim to fence at least 10m back from the high-water mark of the dam. This provides sufficient room for the establishment of grassy groundcover and other vegetation around the dam to filter inflows.
- Extend the fence as far around the inflow area as possible, especially areas that remain boggy during wetter months.
- Include a gate into the fenced area to allow access when needed.
- If possible, avoid using barbed wire on fences (particularly the top strand), as gliders and some birds are vulnerable to being caught on barbed wire.
- As well as protecting the immediate vicinity of a dam, managing the wider catchment can also help limit the flow of nutrients and sediment into the dam. Use of rotational grazing can assist in maintaining a minimum of 80% groundcover, which will reduce erosion. Also limit the use of fertilizers and pesticides in the vicinity of the dam, especially during wet periods.



Provide alternative access to water for stock

A reticulated water system with troughs is ideal for maintaining water quality for livestock while minimising damage to the area around the dam.

If a backup supply of water is required when troughs can't be checked, such as when on holidays, creating a gated access point to a dam can provide flexibility by allowing occasional stock access.

Stock access points should be located away from the inflow, spillway and dam wall, and should lead to a deep part of the dam. Adding a hardened surface of compacted crushed rock is a good way to prevent erosion. Avoid making the access point too wide as this can encourage stock to congregate. A 4–6m wide laneway encourages stock to move away once they have finished drinking.

Which dam should I enhance?

Decisions about dam enhancements may be part of a broader process of farm water planning. When deciding which dam(s) to enhance, consider dams with the following characteristics:

- A dam that supplies significant water for stock, garden or household purposes, so the benefits of cleaner water can have the greatest impact.
- A dam that is best located to service the greatest farm area or number of paddocks.
- A dam with an existing reticulation system for stock is a prime candidate for enhancement.
- When renovating or de-silting a dam, consider fencing it to protect this asset into the future.
- A dam that is most reliable in dry times, ensuring your investment is well-targeted and will increase water security. A deep dam with smaller relative surface area is ideal, although depth variation is also important for establishing aquatic vegetation.
- A dam close to other natural assets on a farm, such as a shelterbelt, paddock trees, or a roadside corridor. This provides an opportunity to connect the dam environment with other important habitat in the landscape, creating a larger and more diverse area for native wildlife to move across.
- Incorporating areas of remnant vegetation or paddock trees into a dam's fenced area will help protect those assets and increase the area's habitat value.

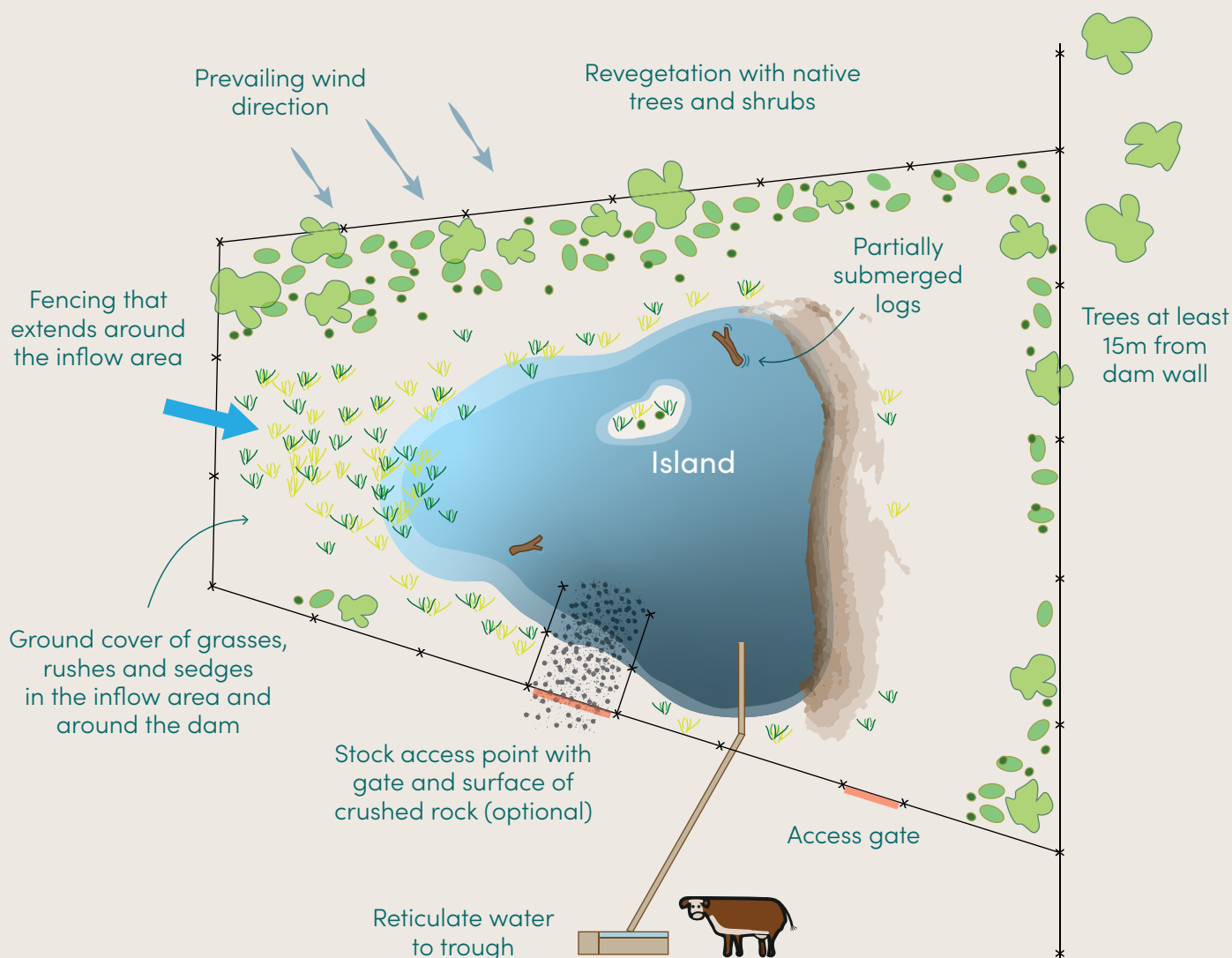
2. Revegetate

- Aquatic and semi-aquatic plants typically have long-lived seeds and will often re-establish on their own once grazing pressure is removed and water quality improves. Wait for a good wet season to see what naturally regrows, before investing in tubestock.
- Revegetation with native trees and shrubs on the windward side of a dam, can reduce evaporative water loss by up to 30%, while also providing important habitat for biodiversity. Consult with your local Landcare or NRM organisation for a list of plant species that are indigenous to your local area.
- Avoid planting trees and shrubs on the dam wall, or in the inflow or spillway areas where they may cause erosion issues.

3. Add additional habitat features

- Shallow areas in a dam enable fringing aquatic vegetation to establish and provide foraging areas for wading birds.
- Islands (solid or floating) provide a safe haven for turtles and waterbirds to bask and nest on.
- Partially submerged logs or snags provide perches for turtles, frogs and birds above the water, and refuges for aquatic fauna like fish, tadpoles and waterbugs below the water.

Key features of an enhanced dam



“We totally underestimate what an asset good water is to animals’ weight gain and general wellbeing. The dam didn’t go dry in the last drought. It was a great stop gap to have that good water. This dam is a little ecosystem all of its own – it’s still a pond teeming with life and it’s supporting visiting birds that might pop through. They’re the delights.”

— Jenny Bell, ‘Bohara’, Breadalbane NSW

Further information

For additional information on the management of farm dams and other natural assets on farms, visit

SustainableFarms.org.au/resources

The Farm Dam Handbook (NSW Government, 2011) available at **www.watarnsw.com.au/documents/publications/education/FarmDamFinalLR.pdf**

SustainableFarms.org.au

T (02) 6125 4669 E sustainablefarms@anu.edu.au



sustainablefarms



sustainable_farms_ANU

Sustainable Farms is an Australian National University initiative supported by philanthropic organisations, industry groups and government.

Sustainable Farms acknowledges the Traditional Custodians of the land we work on and we pay our respects to their Elders, past and present.

References

- Evans, M.J. *et al.* (2024) Farm dam enhancement significantly improves water quality. *Agriculture, Ecosystems & Environment*, 373: 109134.
- Malerba, M.E. *et al.* (2022) Australian farm dams are becoming less reliable water sources under climate change, *Science of The Total Environment* p. 829.
- Hipsey, M.R. *et al.* (2004) A Numerical and Field Investigation of Surface Heat Fluxes from Small Wind-Sheltered Waterbodies in Semi-Arid Western Australia, *Environmental Fluid Mechanics* 4: p. 79-106.
- Williams, W.D. *et al.* (2002) Effects of water quality on cattle performance. *Journal of Range Management* 55(5): p. 452-460.
- Dobes, L. *et al.* (2021) Increased livestock weight gain from improved water quality in farm dams: A cost-benefit analysis, *PLoS ONE* 16(8): e0256089.
- Littlefair M. *et al.* (2024) Management to enhance farm dam condition improves outcomes for amphibians. *Agriculture, Ecosystems & Environment*, 374, 109156.
- Westgate, M.J. *et al.* (2022) Improved management of farm dams increases vegetation cover, water quality, and macroinvertebrate biodiversity. *Ecology and Evolution*, 12(3), e8636.
- Smith, D.G. *et al.* (2025) Grazing control and revegetation increases bird biodiversity at farm dams. *Biological Conservation*, 309, 111310.
- Malerba, M.E. *et al.* (2022) Fencing farm dams to exclude livestock halves methane emissions and improves water quality, *Global Change Biology* 28(15): p. 4701-4712.



Australian
National
University



SUSTAINABLE
FARMS