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# 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.



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## Focus on dams: A key part of farm planning

Ensuring that farm dams are working well is increasingly important in light of changing weather patterns, increased economic pressures and changes to stock management practices. The best time to plan for drought is during periods of average or above average rainfall, when there is capacity to properly invest in farm water planning. Investing in dam enhancements can improve the quality and retention of water in these dams.

The need for increased water security, improved technology for monitoring reticulated water supply, the benefits for biodiversity, and, for some landholders, use of rotational grazing practices requiring additional water points, all provide a strong impetus to consider enhancing one or more dams on a farm.

## What is an enhanced dam?

An enhanced dam is one where livestock access is managed to limit the impact of stock on the water body and on the surrounding vegetation.

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

An ideal enhanced dam has healthy native vegetation in and around the water body, which creates a buffer to filter nutrients and sediment from run-off. As a result of stock exclusion and better vegetation cover, the water is cleaner. Native vegetation also provides habitat for wildlife.

An enhanced dam may also have other features designed to provide habitat for different native plants and animals, such as variable depths, islands or snags.



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 siltation, pollutants and nutrients. 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. Reduced sedimentation helps to retain the capacity of the dam and reduces evaporative losses. Strategically placed revegetation around a dam can also reduce evaporation by 20–30%.<sup>i</sup>



## Support biodiversity

Enhanced farm dams can be a proxy for natural wetlands, and provide important habitat 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





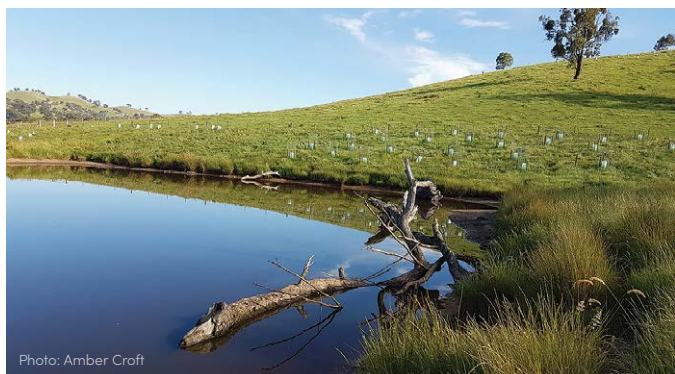
## Benefits:

# Stock health and farm productivity

Enhancing farm dams can lead to improvements in water quality and water persistence, which in turn 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 paddock. These contaminants, including sediment, nutrients and faeces, can reduce water quality. This makes the water less hospitable to plants and animals, and 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.
- Our farm dams research study, conducted over four years from 2019-2022, monitored the water quality of 120 dams in the south-eastern wheat-sheep belt. Results to date demonstrate that enhanced dams have lower levels of turbidity, faecal bacteria and nutrients, and higher levels of vegetation cover.



### 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 a key management issue.<sup>ii</sup>
- Designing dams to ensure a significant depth-to-surface area ratio can greatly reduce evaporative losses and secure water supply for longer. Dams with this characteristic should be prioritised for enhancement.
- Including shrubs and trees as part of a dam enhancement project increases shading and reduces windspeed, both of which reduce evaporation from farm dams. Increased ground cover around dams, particularly in the inflow area, reduces sedimentation and helps to maintain dam capacity.
- Floating and emergent plants in and around the water body can also shade water and keep it cooler, reducing evaporation and making water more palatable to livestock.



### 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.<sup>iii</sup>
- 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. There was a 70% probability that benefits would exceed costs.<sup>iv</sup>



## Benefits: Biodiversity and conservation

Natural wetlands have been highly modified or removed from many agricultural regions in south-eastern Australia, leaving many plants and animals that rely on them under threat. Enhanced dams can help restore biodiversity by providing habitat and resources that were once present in these natural wetlands.

By enhancing dams, farmers can play a role in supporting a range of native plants and animals.

- Water quality is a principal determinant of the biodiversity potential of a farm dam, enabling aquatic life forms to flourish.
- Enhanced dams support a rich diversity of life, including native water plants, insects, crustaceans, rakali, turtles, frogs and birds.
- Birds like the spotless crane, little grassbird, golden-headed cisticola and diamond firetail are rarely seen on traditional dams, but all use enhanced, well-vegetated farm dams.
- Platypus, a threatened species, are generally found in streams and rarely in dams, but have been observed by Sustainable Farms researchers using enhanced dams.
- Initial results from a study undertaken by Sustainable Farms found that enhanced dams with surrounding shrub and tree plantings can be hotspots for breeding birds – not just for waterbirds, but for woodland birds as well.

## 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, waste decomposition, natural pest control and pollination, all of which can benefit agricultural production.



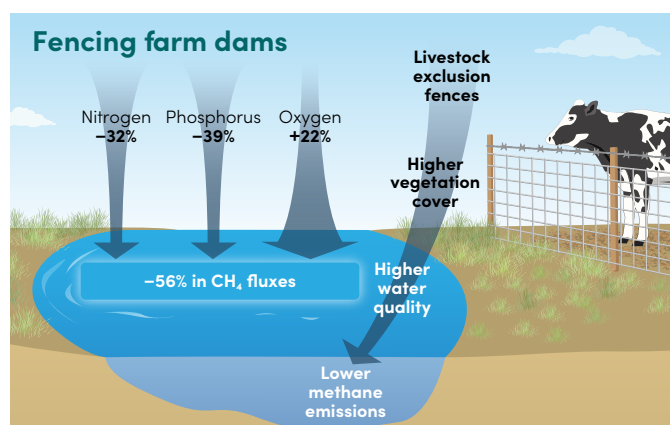
Broad-palmed frog and welcome swallow. Photos: David Smith.

## 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.<sup>9</sup> Subsequently, enhanced dams had on average a 56% reduction in methane emissions compared to typical dams.

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)<sup>9</sup>

farm dams can turn these systems from being a problem for climate change, to be 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

An enhanced farm dam is well-vegetated both within and around the dam. Usually, this requires fencing to exclude livestock. While in some cases dams can retain good surrounding vegetation with sensitive grazing management, biodiversity benefits are greater when a dam is fenced.

## Manage grazing

Reducing grazing intensity in the dam catchment, particularly in the immediate vicinity of the dam, can reduce the inflow of faeces, 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 dung and urine that enters directly into the dam.

Fencing the area around the dam is the simplest way to exclude stock from the dam.

- 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.
- Be aware of potential stock movement around a new fence – stock tracks can be created along fence lines which can then deflect water flow, particularly in flat country.
- Include a gate into the fenced area to allow access when needed.
- Be prepared to manage weeds and competing grasses such as *Phalaris* inside the fenced area for the first year to allow other vegetation to establish. Sensitive management is required to ensure ground cover is retained throughout this transition.
- 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.

## Consider the dam catchment

As well as protecting the immediate vicinity of a dam, managing the wider catchment can also help limit the flow of sediment, nutrients and faeces into the dam. The key ways to improve wider catchment health are:

- Maintain ground cover to avoid soil erosion and flow of sediment into the dam. At least 80% vegetation cover is recommended and use of deep-rooted perennial grasses can help stabilise soils.<sup>vi</sup>
- Minimise land use intensity in the dam catchment as much as possible.<sup>vii</sup> For example, by reducing tillage and the use of fertilisers and pesticides, especially during wet periods.

## Provide alternative access to water for stock

The best way to maximise water quality and minimise stock impacts on a dam is to fully fence the dam and reticulate water to tanks and troughs for stock use.

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

Hardened 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 surface of crushed rock or gravel over geofabric is a good way to prevent pugging of the access surface and subsequent sedimentation, as well as encouraging stock to move away once they have finished drinking. Ideally this should be constructed when the dam is built or renovated in a dry period.

## 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, for example shelterbelts or riparian vegetation. This provides an opportunity to connect the dam environment with other important habitat in the farm landscape, creating a larger and more diverse area of natural habitat for native wildlife.
- Incorporating areas of remnant vegetation or large paddock trees into a dam's fenced area will help protect those assets too.

## Revegetate in and around a dam

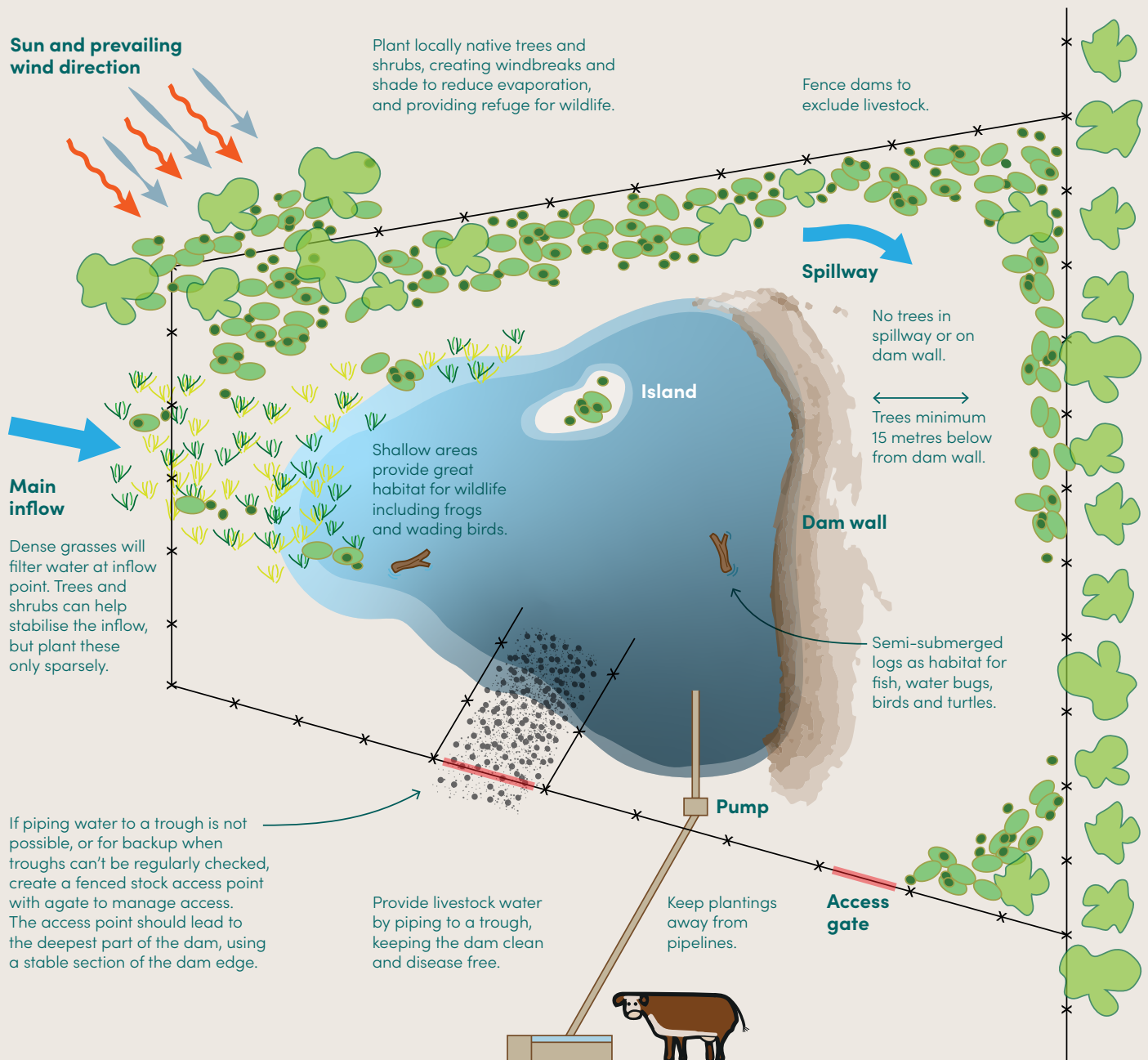
Revegetating the area around a dam with appropriate species can help filter run-off containing sediment and nutrients and therefore improve water quality. Active replanting is usually required to establish native vegetation and habitat useful to native animals, birds and invertebrates.

Different zones of a dam are suited to different types of vegetation. See the Sustainable Farms guide *Enhancing farm dams: What to plant in and around your dam* for more detailed information.

## Additional features to support biodiversity

- 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.

## Plan of an enhanced farm dam showing key features





“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](https://SustainableFarms.org.au/resources)**

*The Farm Dam Handbook* (NSW Government, 2011) available at **[www.waternsw.com.au/water-quality/catchment/living/managing-land/farm-dams](https://www.waternsw.com.au/water-quality/catchment/living/managing-land/farm-dams)**

## SustainableFarms.org.au

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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

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- <sup>ii</sup> 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.
- <sup>iii</sup> Williams, W.D. *et al.* (2002) Effects of water quality on cattle performance. *Journal of Range Management* 55(5): p. 452-460.
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- <sup>v</sup> Malerba *et al.* (2022) Fencing farm dams to exclude livestock halves methane emissions and improves water quality, *Global Change Biology* 28(15): p. 4701-4712.
- <sup>vi</sup> NSW Government (2011) *The Farm Dam Handbook*. DPI: Wollstonecroft.
- <sup>vii</sup> Davies, B.R. *et al.* (2008) A comparison of the catchment sizes of rivers, streams, ponds, ditches and lakes: implications for protecting aquatic biodiversity in an agricultural landscape. *Hydrobiologia* 597(1): p. 7-17.



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