



## Dairy Effluent: Choosing a Pond System

Scott McDonald, Kyabram

One of the primary purposes of pond systems in dealing with dairy effluent is to store it over the wetter months, which helps to avoid waterlogging and pugging of pastures. However whilst it is debatable whether they are the most effective way to manage dairy effluent on farms, they have significant advantages compared to direct-application systems and other management options that don't incorporate ponds because they:

- completely contain effluent over the wetter months thereby significantly reducing the potential for nutrient runoff to waterways
- manage and control value nutrients, enabling strategic and timely application that meets plant nutrient and water requirements.

Choosing the most appropriate pond system, will depend on:

- practicality
- ease of maintenance
- potential benefit—whether recycling effluent for yard washing or distributing valuable nutrients back to pastures and crops.

However, many pond systems fail not necessarily due to poor design, but more so from a lack of management.

Traditionally in Victoria a treatment system was recommended--sometimes referred to as an anaerobic/aerobic system--where the first pond is deep and the effluent overflows into a shallow second pond.

Although this system works well, the effluent in the second pond is *not* treated to an acceptable standard for discharge to water bodies.

Today--since it is unacceptable for effluent to leave the farm--the main focus is on storage ponds and being able to

distribute nutrients from the dairy and/or feedpad through a pond system back to pastures. These ponds should be capable of storing all effluent produced over the required storage period--usually during winter and spring when it is too wet to irrigate pastures, which will vary between regions.

The key principles in choosing the most appropriate pond system are not selecting the cheapest option or what is common in the area, but rather the farm's physical variables and management. Long-term planning is vital to develop a system that can cater for any proposed changes such as a feedpad development or dairy shed expansion.

Let's consider the options in detail.

### Single-pond system

Single-pond systems—whether being an in-ground storage or turkey nest (see Figure 1)—are basically an anaerobic storage designed to retain all effluent over the wetter months. The anaerobic processes enhance microbial digestion and breakdown of manure solids.

#### Advantages

- easy integration into farm topography
- minimal earthworks
- minimal maintenance and management

#### Disadvantages

- management needed to monitor solids and avoid conveyance problems and pond silting
- larger sized ponds may require specialist pumping and irrigation equipment to handle solids and overall volume
- no storage backup if pond becomes heavily silted

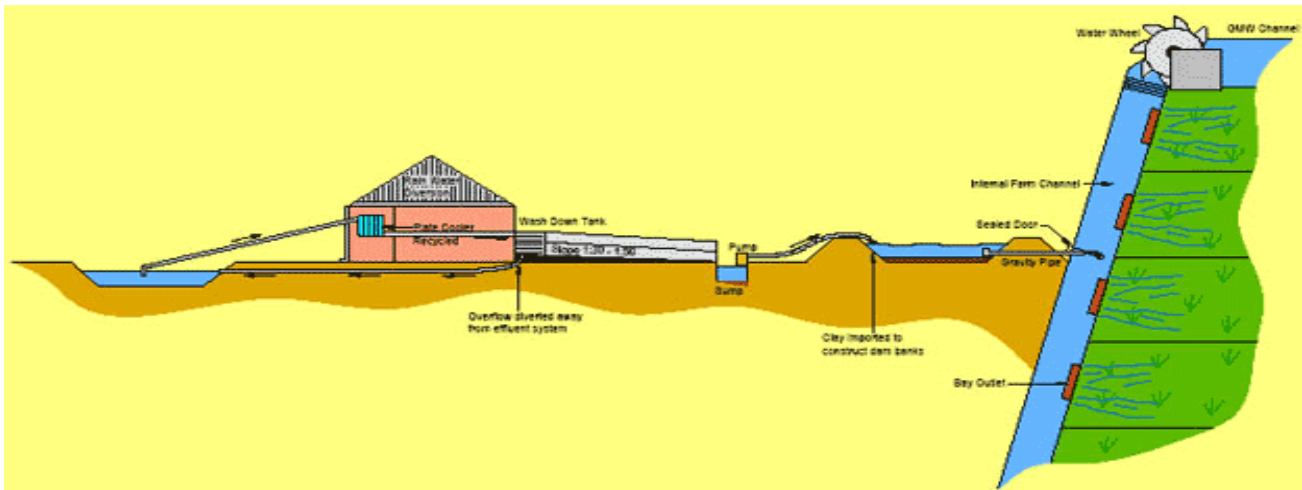


Figure 1. Single turkey nest pond with gravity conveyance into a farm channel

**Dual- and multiple-pond systems**

Dual-ponds (see Figure 2) are certainly still a good option, especially for larger farms. These systems are especially attractive for farms with floodwash or hydrant systems-- which use a large amount of water to clean the yard-- or farms reliant on sprinkler conveyance back to pastures and crops.

However the focus is usually on a system where the first pond collects and settles out the solids, and the effluent overflows into a second storage pond.

In a dual-pond system the second pond is considered the storage pond and is constructed on water use generated from the dairy and/or feedpad as well as any rainfall contribution. The first pond functions more as an anaerobic digester based on a retention time and manure loading. It is the first pond that contains most of the nutrients and accumulating salts.

A multiple-pond system may be desirable on some farms, which will generally reduce the amount of solids, bacteria and nutrients even further than dual-ponds.

**Advantages**

- improved water quality from second pond which is easier to pump and recycle
- fewer blockages when conveyed through sprinklers
- collection point to retain valuable nutrients

**Disadvantages**

- larger area required for pond construction
- need to continually remove accumulating salts in the first pond, which if allowed to build up may reduce anaerobic processing
- high maintenance requirement; poor first pond management will simply transfer the problem to the second pond

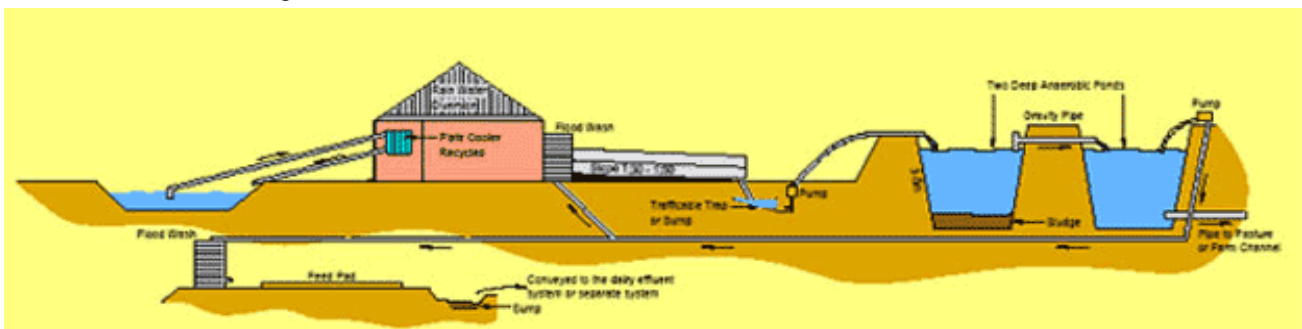


Figure 2. Dual-pond system with effluent recycled for floodwashing

**Ditch systems**

An alternative system to solid separation prior to pondage is the ditch system, which installs one or more long, narrow and shallow earthen ditches at the end of the cattle holding yard. The effluent stream is then directed to the ditch to enhance solid settling, allowing the liquid fraction to be pumped or gravity conveyed to the ponds.

Multiple ditches are rotated so that while one is being used the other is drying out and being cleaned.

Ditches are usually designed to allow easy machinery access either by a frontend loader or excavator.

**Advantages**

- significantly reduces solids entering the ditches, thus reducing the need to desludge regularly
- reduces the likelihood of conveyance problem from the ditch to paddocks

**Disadvantages**

- labour-intensive requiring regular cleaning
- difficulties storing and handling manure stockpiles

## Sizing ponds

Anaerobic and storage ponds require specific calculations to determine volume and dimensions including manure loading, herd size, water use, rainfall, sludge accumulation, retention periods, animal yarding times and freeboards.

Sizing ponds based on guesswork or similar sized dairies are not recommended because inadequately designed pond systems are usually expensive to fix and complicate the management of dairy effluent.

## Alternative pond systems

Alternative effluent storage systems include farm channels and drains, concrete bunkers or pits and gully depressions. However these options are generally considered high risk and labour-intensive, especially due to excessive weed growth and silting.

Irrigation re-use sumps cannot under any circumstances be used for effluent storage from point sources.

To be effective, pond systems need to be integrated into the farm layout, so there will be variations in pond designs taking into account specific farm characteristics and the desired management of the farm.

**Additional information may be obtained from other Information Notes in the effluent series or contact the following Department of Primary Industries' offices:**

Kyabram – (03) 5852 0500

Ellinbank – (03) 5624 2222

Colac – (03) 5233 5533

Maffra – (03) 5147 0800

Warrnambool – (03) 5561 9946

## Acknowledgement

The original author of this note was Jo Wheeler and the previous version was published in August 1995.

**The advice provided in this publication is intended as a source of information only. Always read the label before using any of the products mentioned. The State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.**