AGRICULTURE

DAIRY EFFLUENT: Choosing an Effluent Management System.

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Developing an effective dairy effluent system requires detailed planning taking into consideration the farm's individual characteristics, such as soil type, distance to waterways as well as how the system can be integrated into existing infrastructure and management strategies such as fertiliser applications and irrigation management.

Choosing the most appropriate effluent system whether it be pondage systems or direct application, will depend on what is more practical, easier to maintain and has the potential to return the most benefit.

This note will explore the relevant factors that need to be taken into consideration before implementing an effluent system. Understanding these factors quite often assist in determining the most appropriate effluent system.

Key components of an effluent system

Effluent systems often revolve around key components or stages, which are integrated to form the total system, designed to manage the effluent stream from its generation to its application and reuse. Components to consider in a dairy situation may include:

1. Minimisation of effluent - The more generated at the dairy or feedpad the more that requires storage and application to pastures. (refer to agnote AGO 433)

2. Solid separation & fibre removal - Removing the coarse material from the liquid stream such as manure solids, fibre, debris, sand, gravel and stones reduces the likelihood of problems with other components within the effluent system. These may include pumping, storage, conveyance and application stages.

3. Conveyance - How will effluent be conveyed from the point source? Where will it be conveyed too? Can gravity be utilised? What distances are involved? These questions will assist in determining the most appropriate conveyance method.

4. Storage or containment - What is the most practical and effective method to contain effluent within the property boundaries over the wetter months of the year? (Refer Agnote AGO422)

5. Application - Determining the end location for where effluent will be applied is often a good starting point when designing an effluent system. A key principle in the application stage is ensuring effluent can be applied over a significant percentage of the farm paddocks. Application of effluent should be strategically linked to the farm soil fertility targets and fertiliser applications.

6. Management - The overall management and ongoing maintenance of an effluent system is often overlooked.

Most effluent systems fail due to inadequate management more so than system design. This component of the effluent system should take into consideration: costs of servicing, ease and frequency of maintenance, desludging strategies and staff responsibilities. On the average size dairy farm simple solutions are often practical and more reliable.

Types of effluent systems

All effluent systems have their advantages and disadvantages; it is simply a matter of choosing the system that best suits the farm physical variables, location and labour capacity. Effluent systems are unique and should be tailored to individual farms and not based around what the neighbouring farm is doing.

Common type of effluent systems may include:

1. Direct application to pastures, crops

These systems may bypass effluent ponds and return effluent direct from the point source (dairy) back to pastures or crops via various application methods. Usual approach is pumping from a sump at the dairy back to pastures via a fixed or travelling effluent irrigator.

Advantage

- Low cost and no pond maintenance.
- More effective utilisation of nutrients.
- Suitable to lighter free draining soils.

Disadvantage

- Higher likelihood of conveyance problems.
- Difficult to contain effluent on farm during high rainfall.
- Fairly labour intensive. Moving or repairing sprinklers.

2. Single Storage pond

A single pond system assumes a storage pond capable of containing all the effluent generated at the dairy and or feedpad over the wetter months of the year. A period when rainfall exceeds evaporation and the potential for runoff is likely. Generally used to return effluent back to pastures or crops more quickly without nutrients settling out.

Advantage

- Effluent stored and applied to pastures when safe.
  A more controlled and strategic application.
- Reduced workload in shifting conveyance pipes and sprinklers.

Disadvantage

- Dependant on soil type and water table depth.
- Pond needs desludging every few years and ongoing maintenance.
- Requires agitation to access the valuable nutrients. With phosphorus and nitrogen settling in the lower layers of the pond.

3. Multi-pond system (one settling pond and one or more storage ponds)

Dual or multiple ponds are designed for a variety of reasons such as anaerobic digestion, solid settling, pathogenic or odour treatment or simply as winter storage.

Advantage

- Opportunity to recycle hence reducing the large volumes of water required to service floodwash and hydrant systems.

- Less conveyance and sprinkler problems.
- Large water supply rich with nutrients to service nearby pastures or crops.

Disadvantage

- Requires a significantly large site, which may take away valuable pasture area.
- Requires regular management and maintenance, in particular the first pond.
- Tendency to trap and retain the value nutrients within the lower sludge layers, which may be difficult to access.

4. Slurry tankers and wagons

Although not common, these practices are still viable options for the small dairy farm that may have conveyance problems or limited accessibility to paddocks. Usually a preferred option on free draining soils for dairies maintaining a herd dry period. Reduced dairy operation over the winter months.

Advantage

- Opportunity to strategically place effluent on specific paddocks.
- Cleaner collection at the dairy.
- Emphases a need to minimise water consumption at the dairy hence water savings.

Disadvantage

- May have difficulty accessing laneways and paddocks over the wetter months.
- Labour intensive requiring constant management.
- Initial purchase costly with regular repairs and maintenance required.

5. Sacrifice areas.

Traditionally used as a disposal of a waste mentality with very little control. These systems involved gravity conveyance or pumping via an open-end pipe direct from the dairy to a section of the farm considered having little value. Hence the term sacrifice.

Generally, not a recommended method for effluent management and would not meet industries standards.

Advantage

- Low cost due to lack of infrastructure.
- Little labour required.

Disadvantage

- Long-term damage to farm and nearby waterways.
- No productive use of nutrients.
- Higher risk to herd health.

Factors to consider when choosing an effluent system

Legislative and industry requirements

There is a misguided belief that effluent systems revolve around construction of effluent ponds. However effluent ponds whether they are anaerobic, aerobic, facaulitive or storage ponds are simply a component within an effluent system and not necessarily a legislative or industry requirement. In some incidences the construction of effluent ponds are not a practical or viable option.

The expectation of the industry, which includes Government Departments, Water Authorities, Milk Processors, Farmer organisations and communities is that dairy effluent be contained within the farm boundaries and applied in a land application in a manner that precludes the pollution of both surface and ground waters.

A farming perspective should be to obtain the maximum economic benefits from the nutrients by implementing a practical and cost effective effluent system, whilst improving productivity.

Potential daily effluent volume

One of the first considerations in determining the most appropriate effluent system is understanding what volumes of effluent need to be managed. This should include all significant point sources such as dairies, feedpads, and loafing areas. This knowledge will then determine pond sizes, areas of application, labour and pumping requirements.

Labour and maintenance

A lot of effluent systems fail, not necessarily due to inadequate design, but more so from a lack of management and inadequate maintenance. Some systems such as direct application and shallow ditch systems are labour intensive and require constant management.

Due to the nature of the product (liquid effluent, manure solids, fibre, stones, sand and gravel) is it easy to see why a lack of management or maintenance could lead to system failure.

Keep in mind ponds are designed to contain effluent for specific periods of the year anywhere from 3 to 6 months. For ponds to be effective they need to be emptied regularly and desludged periodically.

Future planning

It is pointless designing an effluent system without taking into consideration future development on the farm. It is common for a lot of effluent systems to fail simply because of changes which werent taken into account when the system was originally designed.

For example, increased herd, installation of a floodwash tank, expansion of the holding yard or incorporation of a feedpad.

Key management should include:

1. Developing a Whole Farm Plan.

2. Developing an Effluent Management Plan that allows for expansion and modifications to the existing system.

Farm physical variables

On occasions when selecting the most appropriate effluent system the decision may be predetermined or pigeon holed into a particular method due to key farm variables.

Examples.

- Farms with high water tables (1-2m) would tend to steer away from inground anaerobic ponds.
- Farms with fine sandy and free draining soil types would have to weigh up the additional cost for pond liners and clay importing options.
- Farms with large storage ponds may not choose tractor-mounting pumps, as it will tie the tractor up for days as it sits on the pond.

Effluent systems are tailored to suit the unique circumstances and characteristics of individual farms. The system design must be cost effective and practical enabling farmers to overcome property limitations by implementing reasonable solutions.

Recycling effluent option

One of the more common practices with the introduction of floodwash and hydrant washdown systems was the option to recycle secondary effluent water to clean holding yards or feedpad facilities.

The option to reuse effluent water is advantageous in that it not only guarantees a reliable water source all year, but it reduces the storage pond overall capacity. Choosing this option also tends to sway the effluent system to a dual or multiple pond system unless it is a relatively large single pond with an effective solid separation component.

Land area for reuse of effluent

Unfortunately this component within the overall effluent system is under estimated or left as the last consideration.

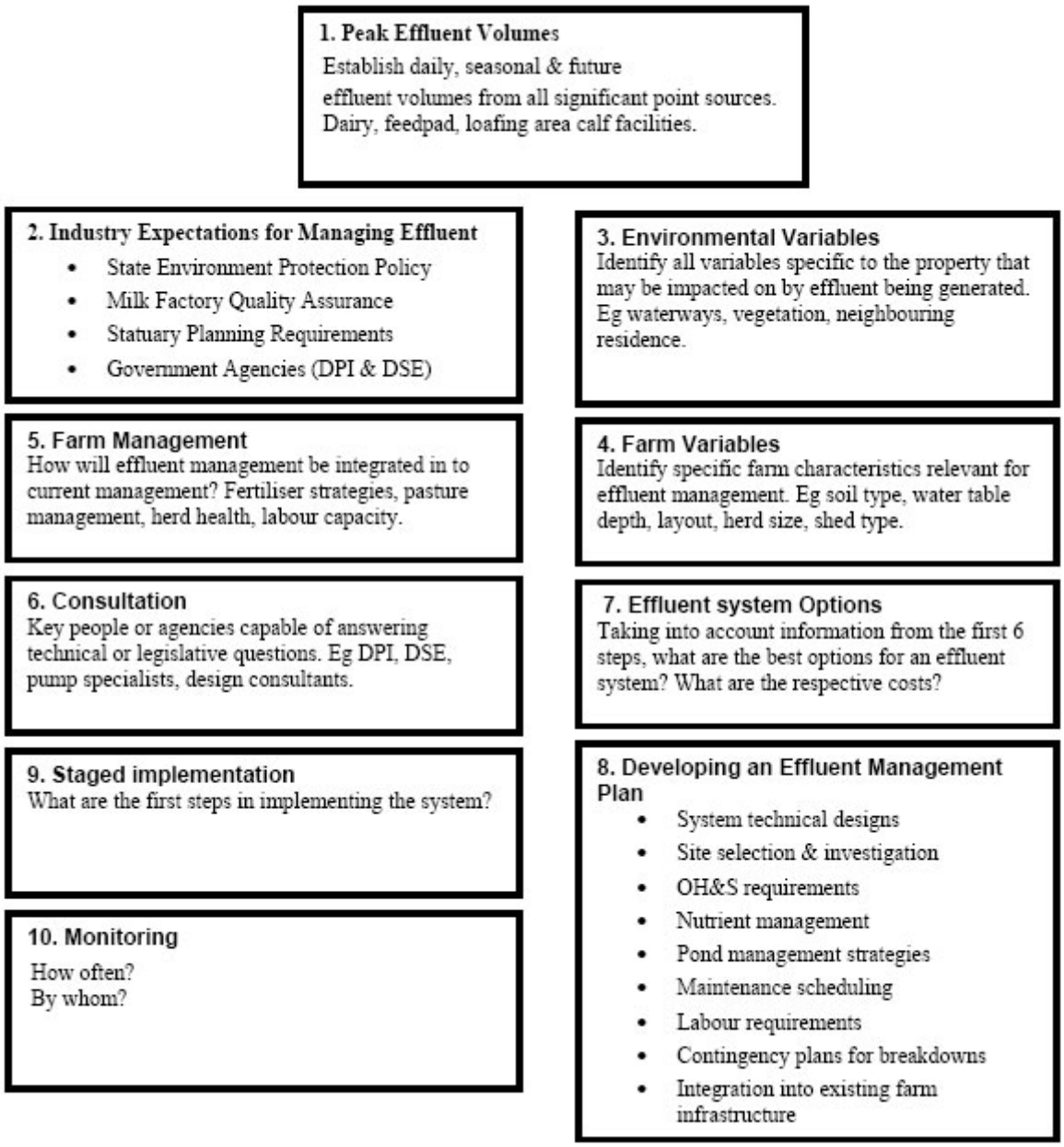
With a lack of sufficient knowledge in the past as to nutrient values and where the various nutrients were accumulating within the ponds and overall effluent systems, management practices revolved around applying effluent to a minimum of 10% of the farm pastures.
This rough and ready approached provided no guarantee effluent was actually being applied economically or on pastures that actually needed applications.

Today with far greater knowledge, better testing and scientific studies farmers have the opportunity to fully utilise the nutrient potential of effluent by strategically applying it to suit soil fertility targets and optimise pasture and crop yields.

The more advanced level of nutrient management on farm complimenting Effluent Management Plans is the development of Nutrient Management Plans. These plans take into account not only effluent application within the farming system but moreso detailed nutrient mapping and budgeting programs to develop a more actual representation of the farms nutrients.

Having this knowledge and greater understanding of the farms nutrient balance enables more economic and strategic applications of effluent.

Decision process for developing an effluent system



Further information

For assistance in choosing the most appropriate effluent system for your farm contact the following DPI offices who have specialist staff available.

Ellinbank (03) 5624 2222

Alternatively other agricultural notes in the Dairy effluent series will provide additional information to assist in understanding effluent management.

Acknowledgment

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