

Treatment, Storage and Use of Swine Wastewater

The collection, storage, transfer and use of wastewater requires planning. Start by keeping the amount of wash water, spilled drinking water, and contaminated rainwater to a minimum, thereby reducing the amount of water to be managed. Minimal use of water will save time, labor, and money. See ADAP fact sheet 2003-1 on *Reducing Wastewater from a Swine Operation*.

Following are some ideas for handling the wastewater collected. See ADAP fact sheet 2003-2 on *Collection and Separation of Solid and Liquid Swine Wastes* for ideas on liquid waste collection methods. Care must be used because over-applying nutrients from swine wastes and other fertilizers to croplands can lead to pollution and groundwater contamination. Use swine wastewater with caution because wastes can carry disease.

Wastewater storage

Ponds and lagoons provide storage of wastewater until it can be used safely. As a safety factor, these storage structures must have enough capacity to contain wastewater through periods when it is too wet for land application. Similarly, they need to be able to hold additional water collected during periods of heavy rainfall.

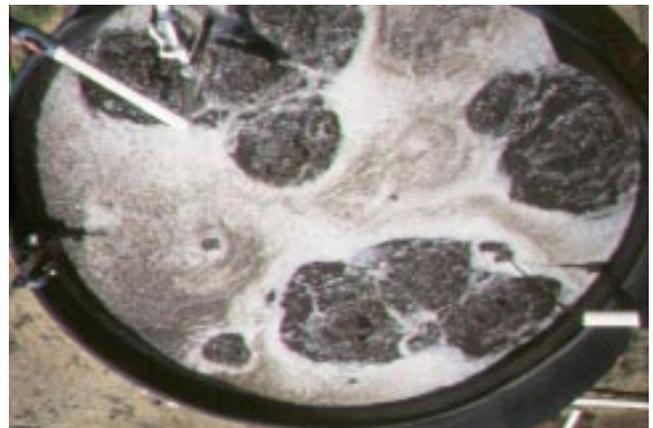
Bacteria in the wastewater break down the wastes and reduce the nutrient content. Evaporation can reduce the amount of liquid. Small farms in very dry areas have been able to use shallow ponds to evaporate all of their wastewater. Using ponds and lagoons for storage requires the following:

- Ponds may be constructed from earth, concrete, steel, or other materials that prevent the seepage of water.

- Liquids should not leak through the bottom and sides. If a farm is located on a porous base, such as coral, a plastic liner can be used to prevent leakage into the ground.
- The liquid level in the pond must be kept low enough so that the pond does not overflow in a heavy rain. A pole with depth markings set in the pond makes monitoring levels easy.
- Low-growing vegetation must be maintained around the pond to protect its banks from erosion while preventing large root growth into the pond banks.
- As a safety measure, maintain a fence and post warning signs around the waste storage facility to keep people and animals out of it.
- The bottom of the pond should be constructed at least 61 cm (2 ft) above the water table.

Wastewater aeration

Aeration of stored wastewater reduces organic material and odors so that the wastewater will be easy to use. In an aeration operation, increased amounts of air are made available for bacteria that



5,000 gallon aeration operation

break down wastes. Aeration is not as common as other methods used in swine waste management systems due to the costs associated with its operation. The simplest way to use aeration is to build a shallow pond less than 1 m (3 ft) deep. Such a pond will be naturally aerated by air passing over it. For deeper ponds, aeration requires:

- Having wastes that are less than 1 percent solids.
- Running aerating equipment with an energy source, or using a wind-driven aerator.

Aeration results in:

- Saving all potassium and phosphorous in the sludge.
- Reducing nitrogen content up to 90%.
- Reducing odor.

Wastewater application

Wastewater applied to a crop supplies nutrients, provides a virtually free water source, and improves plant yield. Untreated solid wastes can be applied safely around the base of trees (e.g. bananas, breadfruit, etc.) or around other crops (e.g. sweet potatoes which will be cooked), but avoid direct contact with food plants (e.g. lettuce, cucumbers) that could be consumed raw. The equipment needed to spread wastewater on the crop may include a portable pump, pipeline, sprinklers, or a hose. When spreading wastewater, do not allow the liquid to form pools or to run off the edge of the field.

Never apply fresh swine wastewater to crops, such as leafy vegetables, that are eaten raw.

There are various types of irrigation systems to help spread wastewater over crop fields. Plastic hose, surface systems and drip irrigation are preferred because they produce much less odor than sprinkler systems. Sprinkler systems should only be used in very isolated locations.

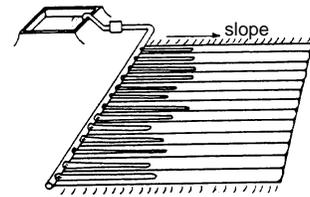
Types of irrigation systems include:

- ① flexible plastic hose: a very economical and low-tech method of hooking a pump to a PVC pipe or plastic hose and manually spreading the effluent where needed. It can be used anywhere except where the slope is too steep, causing the effluent to run off.



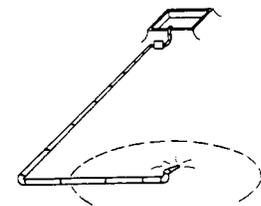
① a pump used to apply wastewater

- ② surface systems: a very low-labor and low-cost system of irrigation where furrows are installed on a gradual downhill slope utilizing gravity to distribute effluent to crops.



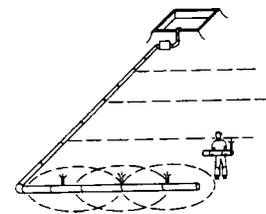
② surface system *

- ③ stationary sprinklers: a system that evenly distributes the effluent by shooting the effluent over the field using a sprinkler. Be aware of wind direction because spray and odors are released that may blow toward neighboring properties. Clean the system thoroughly to avoid plugging up the sprinkler head. Odors can be a problem.



③ stationary sprinkler*

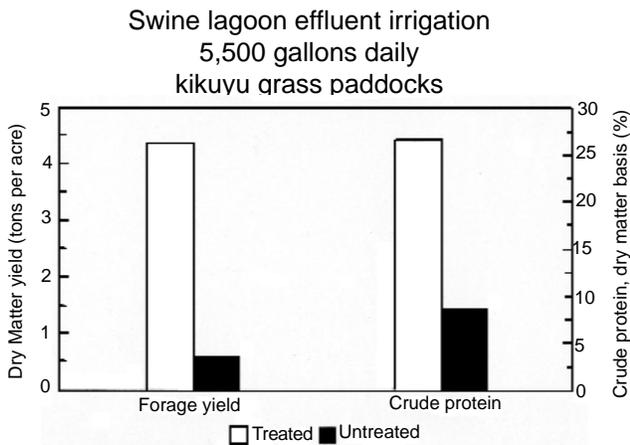
- ④ handmove systems: a portable system with movable sprinklers and pipes that can be dismantled and reconnected to irrigate many fields. Odors can be a problem.



④ handmove system*

* Source: Hawaii State Department of Health, Wastewater Branch. *Guidelines for Livestock Waste Management*. 1996.

The figure below shows the effects of applying treated swine wastewater at a farm in Waimea, Hawaii. The lagoon provides 20.8 m³ (5,500 gallons) of water for irrigating kikuyu grass paddocks on a daily basis. Treated pasture produced eight more tons of forage per acre containing 16 percent more crude protein than untreated pasture.



DuPonte, M.W., and N. Keala. Pollution Prevention Planning Through Best Management Practices. Use of Swine Effluent in Pasture Management Schemes. In M.W. DuPonte and A. F. Kawabata (Eds.). *The Hawaii Nutrient Management Education Program Cooperative Extension Service*, University of Hawaii. 2000.

For additional resources and publications, refer to ADAP fact sheet 2003-11 on *Additional Information for Swine Waste Management*.

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