

Farm Structures FACTSHEET



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EARTH BANK STORAGES FOR DAIRY MANURE

In areas of low annual precipitation and low ground water tables, earthen basins can provide long-term storage of manure at costs that are much lower than either steel or concrete pits. If properly planned and managed, earthen storages will not create pollution or nuisance problems. Earthen basins generally should not be considered in high precipitation areas, in areas with high ground water tables, or over sand, gravel, or fractured bedrock.

SIZE OF STORAGE

Dairymen should plan on storage for at least 200 days to make efficient use of the fertilizer value of manure and to facilitate labour management. To avoid water pollution problems, manure should not be spread on snow-covered or frozen ground. For 200-day storage, design the basin to provide 350 cubic feet of capacity for every mature dairy cow and 160 cubic feet for younger stock. If storage for parlour wastewater is required, provide an additional 100 cubic feet of storage capacity for every milking cow. To account for precipitation, increase the size of storage by an amount equal to the anticipated 6-month precipitation (in feet) multiplied by the surface area of the basin (in square feet). As a rule of thumb for most areas of North Central BC and the Kootenay Region, increase the storage capacity by 20% to account for precipitation. Where storage for longer than 200 days is planned, evaporative losses will partially offset dilution by precipitation. In all cases, provide at least 1 foot freeboard space when calculating the capacity of an earthen basin.

More detailed information on sizing dairy manure storage structures is given in [Factsheet #383.100-2 Sizing Dairy Manure Storage Facilities](#).

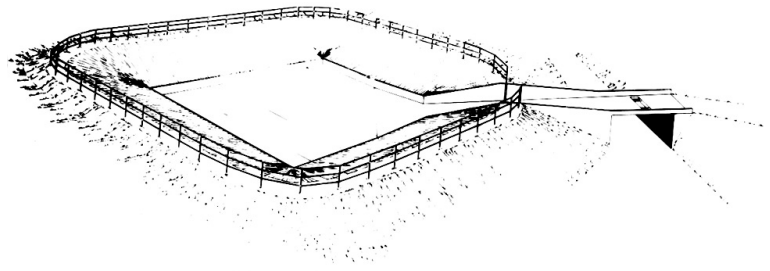


Figure 1 Semi-solid earth bank storage; note the curbed concrete floor and the unloading ramp. Manure is dragged up the ramp with a tractor scraper and falls through the grate into an open-top spreader.

SEMI-SOLID MANURE STORAGES

Where dairy wastewater is not added to manure in the storage and where some bedding or long hay is being used, the most appropriate method of handling the manure may be as a semi-solid. Manure may be transferred to storage directly by a tractor scraper, via barn cleaners and elevators, or by positive placement pumps. Piston pumps are rapidly gaining acceptance as the preferred method for moving manure into an earthen storage. Although more expensive, the pump system permits manure to be moved longer distances to storage, eliminates problems of frozen manure in barn cleaners and facilitates the addition of manure into the storage from the bottom. Manure and snow do

not become mixed making is possible to empty the storage much earlier in the spring than where barn cleaners are used. For best results, pumps of the solid-piston type are preferred over the hollow-piston type.

Semi-solid manure can be removed from storage by tractor front-end loaders, sludge pumps or ramps. Because tractor access into the basin is essential in case, the basin should have a concrete floor surrounded by a 2-foot high curb. Where front-end loaders are to be used, it may be desirable to drain as much of the liquid portion of the manure out of the storage as possible but the effluent drained off must be contained properly so as not to create a pollution problem. Porous fences are one method for removing liquids into an adjacent storage basin but their use likely is not practical where annual precipitation is less than 30 inches.

Specialized ramps have been used for some time in the Fraser Valley for loading spreaders from semi-solid manure storages. With this system, a tractor with a rear mounted scraper blade pulls manure up a ramp and over a grate through which the manure falls into a top-loading spreader. This system provides a low-cost efficient method for removing manure from storages.

Some progress is being made by pump manufacturers to develop a pump to successfully handle undiluted dairy cattle manure. Consult with your local agricultural engineering office for more specific information.

LIQUID MANURE STORAGE

Where dairy wastewater is added to the manure and where the use of long hay and bedding is minimized, liquid handling of manure is possible. Liquid manure may be transferred directly into the storage by tractor scraper or with pumps. Barn cleaners are not recommended for handling liquid manure due to freezing problems and the slowness with which manure is moved, particularly in elevator sections. A number of good centrifugal low head pumps are available to transfer manure from a collection pit to the storage. As in the case of semi-solid manure, piston pumps probably are the best choice where the storage is located remote from the barn.

Manure stored as a liquid in a earthen basin must be agitated prior to its removal for land application. One or more pumping docks which extend out into the basin and upon which a tractor can be parked to operate the agitation and pumping equipment are essential. A concrete pad at least 10 feet square should be placed under the pump inlet to prevent scouring the bottom of the basin and to help prevent rocks and sand getting into the pump. A one-foot deep sump beneath the pump will allow more complete emptying of the storage. The use of open impeller centrifugal pumps to agitate the storage and to pump manure into a top-loading tanker wagon is most common. Where a vacuum tanker is used to haul and spread the manure, a tractor operated propeller agitator is probably the best choice for agitating manure in storage.

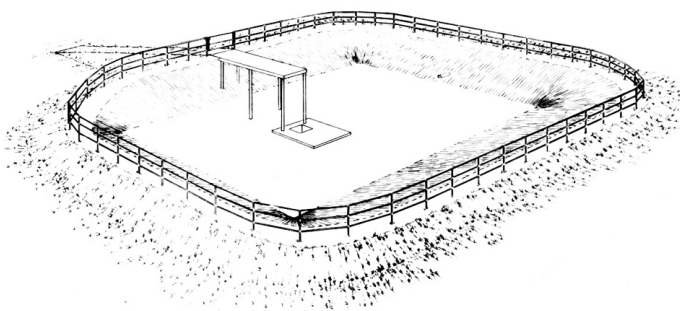


Figure 2 Earth bank storage for liquid manure. Note the pumping dock upon which agitation and loading equipment will operate.

CONSTRUCTING THE STORAGE

A manure storage basin is not just a hole in the ground. Soil characteristics must be evaluated prior to construction of the basin. In general, earthen storages should be constructed only where the sub-soil contains enough clay to make a manure tight seal. Common side wall slopes are 2:1 (2 feet run per 1 foot rise) on the inside wall and 3:1 on the outside wall. Steeper slopes may result in erosion and dyke instability whereas shallower inside slopes increase the area required for the storage and result in manure hanging up on the walls during emptying. A good grass cover should be established as soon after construction as possible on the top and outside banks.

Blueprints detailing earthen basins for liquid and semi-solid handling of manure are available from the Resource Management Branch of the BC Ministry of Agriculture and Food.

FOR FURTHER INFORMATION CONTACT

John Luymes, Farm Structures Engineer
Phone: (604) 556-3114
Email: John.Luymes@gems7.gov.bc.ca

RESOURCE MANAGEMENT BRANCH

Ministry of Agriculture and Food
1767 Angus Campbell Road
Abbotsford, BC CANADA V3G 2M3