

Covers for Long-Term Dairy Manure Storages Part 2: Estimating Your Farm's Annual Cost and Benefit

Updated November 2015¹

Annual Costs of Storage Covers

With the wide variety of storage cover options, a cost-benefit analysis is an important part of evaluating whether to install a cover, and if so, what type. Table 1 provides estimates of the average annual cost of covers for different storage structures. This analysis assumes a lost opportunity cost of capital at 8% (excluding gas handling equipment), and includes depreciation, maintenance, repairs, and disposal costs. Maintenance and repair costs vary depending upon the cover material chosen and are typically covered by the installer or an associated service provider. For remote locations, a one-time repair cost can be as high as \$5,000.

Annual Benefits of Storage Covers

While permeable and impermeable covers both reduce odor emissions and may reduce nitrogen loss to the atmosphere, an impermeable cover can provide further operational benefits that can help offset higher capital costs. Benefits include the avoidance of handling rainwater mixed with stored manure and the potential to sell carbon credits (CO₂ eq) if methane is captured and destroyed. (For information on Carbon Credits, see Fact Sheet GHG-1: Overview of Carbon Trading in Agriculture.)

Rainwater can be isolated from the manure storage with an impermeable cover. The benefit to excluding rainwater is realized in the reduced cost of land application, increased storage capacity of the manure storage system or reduction of the required storage size. The total impact of rainwater avoidance depends upon the surface area of the storage system, whether adjacent areas contribute runoff to the storage, and the net annual precipitation (rainfall-evaporation) of the specific site. Annual avoidance can range from 300,000-700,000 gallons per acre of surface area in NY. The accompanying Cover Cost Calculator allows for the estimation of on-farm savings based on rainwater avoidance and specific manure handling costs.



Impermeable cover installed on an existing earthen dairy manure storage in New York State

Table 1. Average annual cost of manure storage covers based on storage size. Annual cost is the summation of lost opportunity cost of capital at 8% (based on installed price per square foot over the expected operational life of the cover, excluding gas handling equipment), depreciation, maintenance and repair, and disposal at the end of useful life.

Storage Size	Permeable Geotextile Cover Installed Cost and Expected Life			Impermeable Cover Installed Cost and Expected Life	
	\$0.35/square foot 5 years	\$1/square foot 5 years	\$1/square foot 10 years	\$3/square foot 20 years	\$5/square foot 20 years
100' Diameter (0.18 Acre)	\$ 1,500	\$ 2,800	\$ 1,500	\$ 2,400	\$ 3,900
120' Diameter (0.26 Acre)	\$ 2,200	\$ 4,000	\$ 2,200	\$ 3,500	\$ 5,600
200' Diameter (0.72 Acre)	\$ 5,900	\$ 11,100	\$ 6,200	\$ 9,700	\$ 15,700
1 Acre	\$ 8,200	\$ 15,400	\$ 8,600	\$ 13,500	\$ 21,800
2 Acres	\$ 16,400	\$ 30,700	\$ 17,200	\$ 27,000	\$ 43,600

¹**Acknowledgement:** Initial development of this fact sheet was supported in part by funds from the New York Farm Viability Institute: Center for Dairy Excellence

Biogas collection and combustion from an impermeable storage cover can qualify as a greenhouse gas (GHG) mitigation technology because methane (a potent GHG) is destroyed in the combustion process. Public and private exchanges have been developed for the allocation and trading of carbon credits (CO₂ eq.) generated from greenhouse gas mitigation projects. The Climate Action Reserve (CAR) and the Regional Greenhouse Gas Initiative (RGGI) are potential carbon credit markets for northeast dairy farmers.

The CAR protocol states, “GHG emission reductions from a livestock project are quantified by comparing actual project emissions to baseline emissions at the project site. Baseline emissions are an estimate of the GHG emissions from sources within the GHG Assessment Boundary that would have occurred in the absence of the livestock project. Project emissions are actual GHG emissions that occur at sources within the GHG Assessment Boundary during the reporting period. Project emissions must be subtracted from the baseline emissions to quantify the project’s total net GHG emission reductions.”

For more information on Carbon Credits, see Fact Sheet GHG-1: Overview of Carbon Trading in Agriculture.

Estimate Your Annual Cost and Benefit with the Cover Cost Calculator

The MS Excel® Spread Sheet: Cover Cost Calculator has been developed to estimate the annual cost and benefit of implementing an impermeable manure storage cover based on your specific inputs, shown in Figure 1. To use the Cover Cost Calculator open the Excel file and select “Enable Macros”, then follow directions provided in the program. The Cover Cost Calculator does not account for benefits associated with odor control or nitrogen retention.

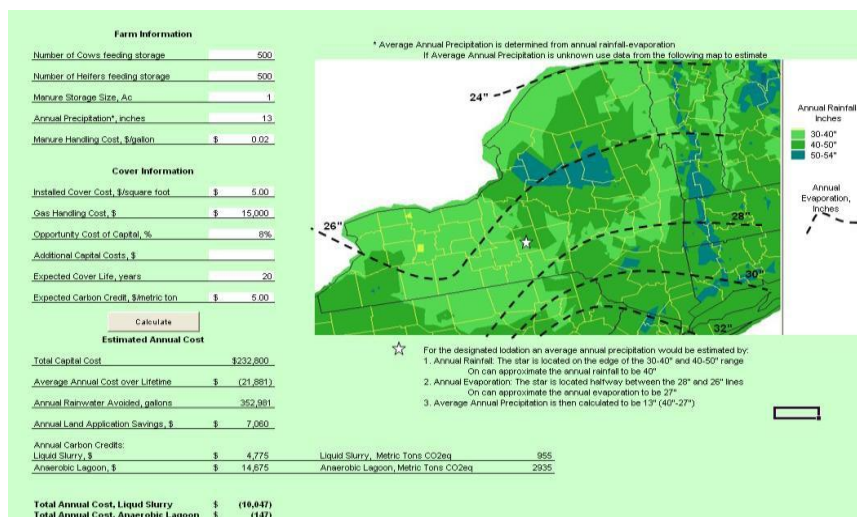


Figure 1: Screenshot of Cover Cost Calculator

Fact Sheet Series

Covers for Long-Term Dairy Manure Storages

SC1: Odor Control and More

SC2: Estimating Annual Cost and Benefit

SC3: Flares and Gas Handling (pending)

SC4: Design Considerations for Impermeable Covers (pending)

SC5: Design Considerations for Permeable Covers (pending)

SC6: Design Considerations for Pump-out of Covered Storages (pending)

Authors Tim Shepherd

Curt Gooch, P.E.

Karl Czymbek

Jason Karszes

cag26@cornell.edu

kjc12@cornell.edu

jk57@cornell.edu

607-255-2088

607-255-4890

607-225-3809

References: General information within this document was gathered from the 2008 Conference Proceedings of Liners and Covers for Agricultural Waste Storage, Robert Burns, Iowa State University. Cover cost information reflects personal correspondence with Andrew Mills of Layfield Group, Richmond BC, Canada, November 2008. The complete CAR protocol can be found at: <http://www.climateactionreserve.org/how/protocols/us-livestock/>

¹**Acknowledgement:** Initial development of this fact sheet was supported by funds from New York Farm Viability Institute: Center for Dairy Excellence