MARYLAND COOPERATIVE EXTENSION
UNIVERSITY OF MARYLAND
COLLEGE PARK•EASTERN SHORE

Fact Sheet

Fact Sheet 416

Structures for Broiler Litter Manure Storage

Common procedures for managing broiler litter manure after removal from the broiler house result in losses of valuable fertilizer nutrients that have the potential of contaminating ground and surface waters. The method of stockpiling manure uncovered on the soil for the winter season before application on cropland can result in a fivefold reduction of nitrogen in the manure. The nitrogen lost from the manure can be carried by water to surface streams or ditches and into the ground water. The nitrogen lost represents a loss of farm income because the manure nitrogen can be used to replace purchased fertilizer nitrogen.

Why Is Storage Necessary?

The cleaning period of a broiler house depends on the schedule of the broiler flocks. This does not always coincide with the availability of open cropland or the proper soil moisture conditions that allow distribution of the manure. Storage must be provided to hold the manure until the proper application time. This will allow the most beneficial use of the manure nutrients on cropland.

How Much Manure Is Produced?

Poultry litter manure is a combination of litter material plus manure. Litter manure production varies with management and other factors. An average litter manure production rate can be estimated as 1 ton (or about 81 cubic feet) per 1,000 birds produced. With an average production frequency of 51/2 flocks per year, the annual litter manure production is estimated at 51/2 tons (446 cubic feet) per 1,000 birds of house capacity.

Manure litter that becomes saturated with water because of spillage around bird watering systems is called "cake" and must be removed from the broiler house between each flock. The remainder of the manure litter that is dry can be used for many flocks. Total broiler house cleanout has been delayed for up to 3 years.

Can Management Reduce the Storage of Manure?

Proper management of the litter in the broiler house will reduce the need to remove manure between flocks. It also will provide for a cleanout schedule that allows direct application of manure to cropland without intermediate storage. Direct field application will allow the most efficient utilization of the manure nitrogen by avoiding potential losses and reducing handling costs.

The primary management objective should be to select and operate bird watering systems to minimize water spillage on the litter. A trough-type watering system can allow production of 20 to 30 cubic feet of cake per 1,000 bird flock. Round-type waterers reduce the cake production by about 25 percent. Closed-system drinkers allow less than 1 cubic foot of cake production per 1,000 bird flock.

Reduced spillage will:

1. save water,
2. improve bird quality,
3. improve production environment,
4. reduce ammonia release from the litter,
5. reduce the volume of wet manure cake, and
6. extend the time between litter cleanout.

Dollars spent on water system management provide economic and environmental returns to all phases of bird and manure management.

What Kinds of Manure Storage Can Be Used?

The storage method must protect the manure from prolonged contact with rainwater. This requires a surface on the stockpile that sheds water . A protective surface can be provided by covering the pile with plastic sheeting or by providing a permanent roofed structure. A deep, well-rounded stockpile of compacted manure also will shed water.

The stockpile must be separated from seasonal high ground water by 4 feet of well-drained soil or a watertight liner of plastic sheeting or concrete. Locate the stockpile to avoid normally wet areas, runoff or drainage pathways, and other areas of running or standing water.

Broiler litter manure contains both wet and dry organic materials that produce heat when stored in confined piles. Storage structures with confining walls may be subject to spontaneous combustion within the manure. Limit manure contact with wood or provide for concrete wall construction.

Open Stockpile

Uncovered stockpiles can be improved with proper construction. Choose a high, well-drained location away from drainage ditches. Construct by dumping manure to form a narrow pile. Drive over this manure with a tractor, truck or other heavy wheeled vehicle to provide compaction. Drive over and dump additional manure on top of the compacted pile and compact again. Widen the pile on each side as it is made deeper. Continue this procedure until the stockpile has a deep, well-rounded top surface with sloping sides of compact manure. Because slightly wet litter will compact better than dry litter, the wetter material should be applied to the pile last to provide a compact surface crust.

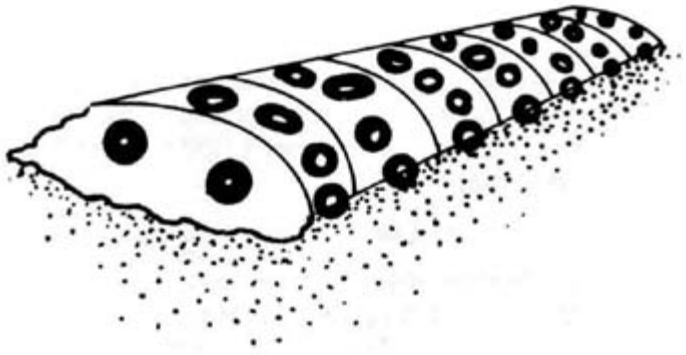

Figure 1. Open Stockpile

Covered Stockpile

Stockpiles of manure can be protected by covering with plastic sheeting, which is anchored with earth and used auto tires. Select the site as indicated for improved stockpiles. Locate near natural windbreaks. The manure need not be compacted. However, compacting will allow more manure to be stored in a small area and reduce the amount of plastic sheeting necessary .Take care while applying the plastic to prevent tearing. Anchor the edges by laying the sheeting edge across a small trench approximately 12 inches deep and backfilling with soil. Lay used tires over the top of the plastic on the pile. Improperly anchored plastic will become loosened in the wind and tear or blow off the pile. Heavy gauge (6 mil) can last one or two seasons. Lighter gauge material is not recommended.

Stockpiles With Temporary Ground Liners

Where stockpiles must be located on high water-table soils, a ground liner is recommended to prevent nitrogen leaching to the ground water. A liner must be accompanied with a cover. The liner is a sheet of 6 mil plastic laid on the soil surface on top of which the stockpile is formed. Prepare the soil surface by removing any debris that might puncture the plastic. If the soil is loose, provide some compaction with a wheeled vehicle before laying out the plastic.

Apply a 12-inch layer of manure over the majority of the plastic before forming the pile to minimize the possibility of tearing by the equipment tires. A compact pile can be formed. Fold the edges of the liner 1 to 2 feet up the sides of the pile and anchor in the manure. Apply the surface cover as described for a covered stockpile. The ground liner will be torn during unloading of the pile and new plastic will be required each year. The torn plastic liner can cause difficulties with manure spreading equipment.

Stockpiles With Permanent Ground Liners

If you desire a permanent location for manure storage, a concrete slab can be constructed on which you can place a covered stockpile. Using concrete removes the problems associated with using a plastic liner. The concrete should be 6 inches thick, reinforced with wire mesh and placed on 6 inches of compact gravel. To prevent concrete failure, thicken the perimeter of the concrete to form a footer where traffic enters and exits. Grade the site to achieve maximum underdrainage. An improved gravel roadway will allow stockpile construction during poor soil conditions. Construct the stockpile as described for the improved stockpile. Anchor the cover sheet edges with wood poles, concrete blocks or other heavy objects on the concrete slab.

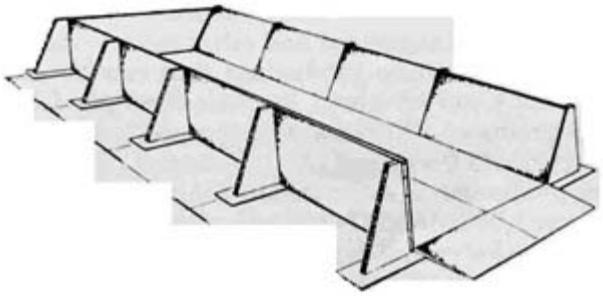

Figure 2. Stockplies With Permanent Ground Liners

Bunker- Type Storage Structures

Bunkers are permanent aboveground concrete slabs with two parallel walls of concrete identical to those used for storing silage on livestock farms. A bunker allows deeper piling and compaction of manure to reduce the total area required of the manure storage. An end wall can be constructed to slightly increase the storage capacity. However, loading the structure is more easily accomplished without an end wall. A cover of plastic sheeting can be attached to the walls with batten strips and anchored with tires. You can use a more permanent cover of fiberglass reinforced fabric with edge anchorage eyelets similar to that used for truck covers. With careful use, storage and repair the reinforced fabric cover will last many years.

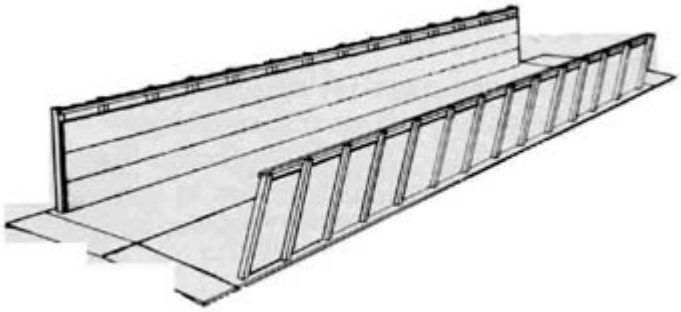

Figure 3. Bunker-Type Storage Structures 1

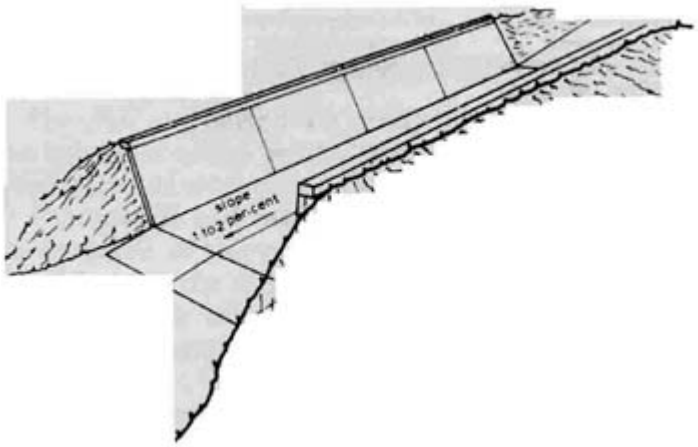

Figure 4. Bunker-Type Storage Structures 2

Storage Structures With Permanent Roofs

You can construct concrete slabs, bunkers or other structures with permanent roofs to eliminate the need for plastic covers. The roof structure must be a clear span supported by the outside walls or perimeter posts. Interior posts will obstruct loading and unloading of the structure. Wood posts within a manure pile might be ignited if spontaneous combustion conditions are present. Roof structures must be of sufficient height to allow manure piling. Compaction loading will be difficult under a roof. Roofs 12 feet or higher may require wall panels to protect the stored manure from excessive blowing rain.

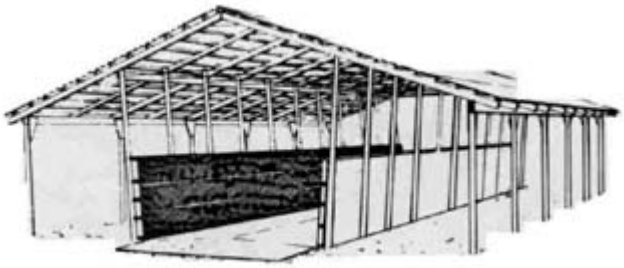

Figure 5. Storage Structures With Permanent Roofs 1

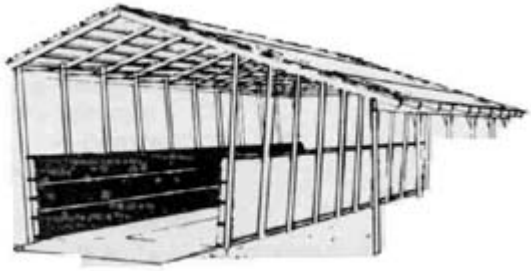

Figure 6. Storage Structures With Permanent Roofs 2

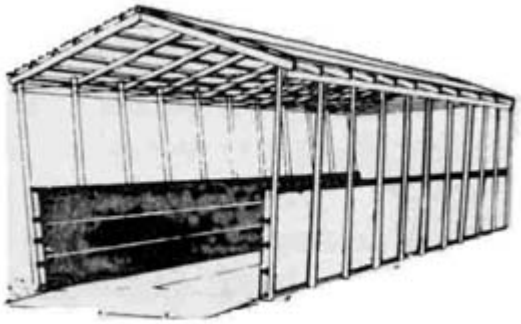

Figure 7. Storage Structures With Permanent Roofs 3

Summary

Improved storage techniques for broiler manure litter are required to allow the most effective use of the nutrients contained in the manure. The primary goal of manure management is to retain the nutrients in the manure during storage. Broiler litter manure storage can take many forms with a great range of investment costs. All available storage techniques and structures must be managed carefully to fully realize their potential for nutrient retention and environmental protection.

The use of manure storage structures is considered a Best Management Practice for the protection of environmental quality. Any improvement in manure management will help improve environmental quality. Your local Cooperative Extension Service representative can provide assistance in plan- ning for proper manure management.

Both state and Federal programs exist which will assist with the construction of manure storage structures through cost share activities. However , structures must meet specific requirements to qualify for cost share money. Some storage methods mentioned in this fact sheet may not meet the current requirements for cost sharing. Before constructing a manure storage structure, contact your local Soil Conservation District office to determine the design and construction procedures required of the cost share program.

Summary of Storage Type

Type	Advantages	Disadvantages	Remarks
1) Improved Stockpile	a) no investment cost b) water pollution potential reduced c) manure can be stored at or near the point of use d) new locations can be used each year or for many stockpiles	a) more time required for stockpile construction than for current practice b) moderate nutrient loss might occur c) potential exists for surface and ground water pollution	a) well-formed piles remain dry when a crust is formed
2) Covered Stockpiles	a) new locations can be used each year or for many stockpiles b) no special construction or equipment required c) manure can be stored at or near the point of use d) water pollution potential reduced	a) cover may last only one season b) possible nutrient movement c) potential to remove topsoil from storage site during unloading d) plastic subject to damage from wind and debris	a) low investment b) 6-mil plastic must be used c) cover must be well anchored to stay on the pile
3) Stockpiles With Temporary Ground Liners	a) nutrient loss minimized b) manure can be stored at or near the point of use c) new locations can be used each year or for many stockpiles d) water pollution potential reduced	a) ground plastic might b) ground plastic will last only one season c) careful site preparation required to prevent ground liner puncture d) cover may last only one season e) plastic subject to damage from wind and debris	a) low investment cause some difficulty b) 6-mil plastic must during piling, unloading be used and spreading operations c) cover must be well
4) Stockpiles With Permanent Ground Liners	a) can be located near fields b) potential water pollution significantly reduced c) fertilizer value conserved d) piling can occur during periods when soil moisture might prevent access to field storage sites	a) a permanent site is required that might not be convenient to all of the use sites b) runoff from the storage site will require control to prevent soil erosion c) cover subject to damage from wind and debris	a) moderate investment b) acompact pile or plastic cover is needed
5) Bunker-Type Storage Structures	a) potential water pollution significantly reduced b) fertilizer value conserved c) more manure can be stored in a smaller area d) covers can be easily secured-possible damage can be minimized allowing longer life e) can be used for grain or fertilizer storage when not storing manure	a) requires a plastic or fabric cover b) requires a permanent site that might not be convenient to use sites c) requires runoff control around the site to prevent soil erosion	a) high investment

Type	Advantages	Disadvantages	Remarks
6) Storage Structures With Permanent Roofs	a) potential water pollution significantly reduced b) fertilizer value conserved c) can be used for storage ofmachinery, grain or fertilizer when not storing manure	a) requires runoff protection around the site to prevent soil erosion b) haven for birds providing possible disease from farm to farm c) requires a permanent site that might not be convenient to use sites d) reduced drive through capability for manure compaction which reduces structural capacity e) dry material may become airborne in winds unless sides are closed f) structural maintenance required	a) high investment b) if wood construction, fire potential from spontaneous combustion c) metal construction transmission from subject to rapid corrosion

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