



A Portable Dry-Litter Pig Pen

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Water, too often taken for granted, is of critical importance in island ecosystems. Water bodies, such as streams and coastal ocean areas, as well as underground drinking water sources, need to be protected from the many pressures and contaminations created by increasing human and livestock populations. The goal of the small-scale swine waste management system described here is to help island communities by developing beneficial uses of pig manure while protecting water resources from being polluted by the nutrients in pig wastes that may run off or leach from pig pens. The system is applicable for backyard or small-farm pig husbandry, where allowable under local zoning regulations, in Hawaii and other regions of the Pacific.

This portable dry-litter (PDL) pen system was introduced by the authors in American Samoa in 2002. It is easy to install, and it helps recycle plant residues by transforming them into nutrient-rich compost. The pigs are provided a bedding of compostable material such as yard trimmings, crop residues, or shredded municipal green-waste from tree trimming. The bedding helps to absorb pig waste liquids, while the action of the pigs' hooves and rooting helps to break down the solid pig waste and mix it with the bedding. No wash water is used. Bedding material is added on a regular basis to keep the animals in a relatively clean environment. For each pen cycle of 4–6 months, up to four animals may be raised until the desired market or slaughter weight is achieved. After each cycle, the pen is moved to a new site, and the process can start again.

This pen system was developed using materials that were available from hardware suppliers in American Samoa. The rigid, galvanized fence panels used are products of the Behlen Manufacturing Co., Columbus, Nebraska, USA; they may not be available everywhere. Such panels are suggested because of their rigidity and durability, but other fencing materials may be substituted.

Materials and tools needed

- four 8-ft pen side fence panels*
- fencing for floor (8 ft x 8 ft)**
- four 6-ft T-posts
- one corrugated galvanized roof panel (10 ft long)
- one 2 x 4-inch piece of lumber (10 ft long)
- coil of tie wire
- post pounder
- drill and ¼-inch bit
- hacksaw or heavy-duty wire cutter
- pliers

*Behlen Mfg. Co. makes various sizes of fencing panels in 16-ft lengths. Panels for pig enclosures usually have the horizontal wires closer together at the bottom; Behlen markets a 42-inch "Combo" panel and a 34-inch "Hog" panel in this style. The panels shown in the photographs are 60-inch "Security" panels with a uniform mesh grid.

**The floor fencing does not need to be rigid or heavy gauge. Pigs usually stop rooting once they encounter a barrier, and the floor is designed to keep them from digging under the side panels and to prevent them from making depressions in the soil that might collect water. Light fencing materials (such as chicken-wire) used for the pen floor may need to be replaced with each pen cycle. Behlen markets a "Handy Panel" with a grid of about 6 x 8 inch mesh, which at 4 x 8 ft would be a convenient dimension; regular construction reinforcing wire used in poured concrete slabs will work as well.

Ideal location for a PDL pen

The location of a PDL pen is important from both an operations and management standpoint. Choose a site that is level and shaded so that the pigs are protected

from the sun. If possible, the site should be close to or within the area from which the bedding materials are obtained and also where the compost will be applied. This makes it easier to collect the bedding materials and distribute the compost. Make sure the PDL pen site is set back far enough from any streams and well heads—normally 50 feet from streams and up to 1000 feet from wells (allowable set-back distances will vary according to local environmental protection regulations).

Building the pen

1. Use the hacksaw or wire cutter to cut the side-panel fencing to 8-ft lengths.
2. Lay the floor wire on the ground chosen for the pen site.
3. Drive the first T-post into the ground at one corner of the floor wire.
4. Attach one fence panel to the T-post with tie wire.
5. Determine the location of the next T-post, drive it, and attach the fence panel to it.
6. Repeat steps 4 and 5 for the remaining T-posts and fence panels.
7. Square up all four sides as you work with each panel; tying the floor wire to the side panels will add greater security from escape.
8. Drill holes near the ends of the 2x4 and wire it to the T-posts on one side of the pen.
9. Drill or punch holes in the corners of the roofing material; attach one edge to the 2x4 and tie the corners of the opposite side directly to the side panels.

The roof provides shade and protection from rain.

9. Cover the entire pen floor with 6–8 inches of dry bedding material.
10. Access the pen through a corner opposite the roof.

How the PDL pen works

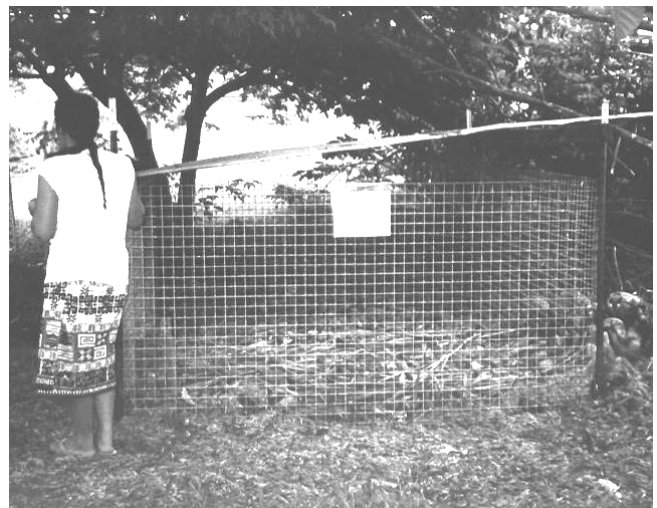
Once the pen is built and the bedding has been added, it is ready to house pigs. The 8-ft square pen area (64 square feet) will accommodate up to four weaned pigs, figuring on at least 15 square feet per pig. The pigs will root through the dry litter material looking for bugs and worms, but the wire floor will prevent them from digging themselves out of the pen and escaping. The wire base also helps to prevent the pigs from creating depressions in the soil that can collect water and breed mosquitoes.

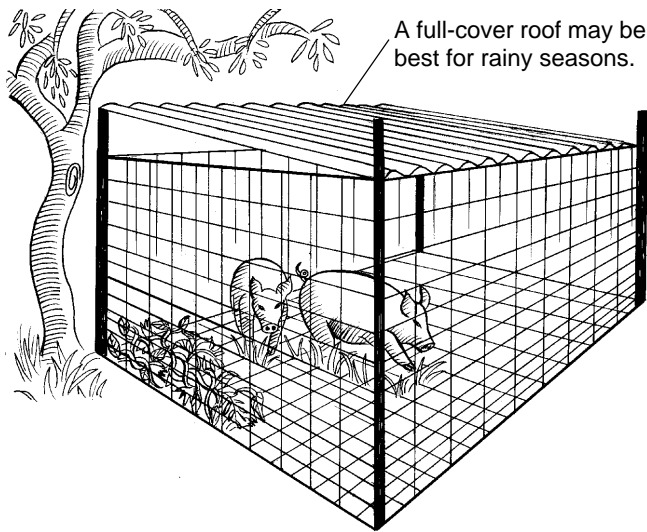
At least twice a week, add new, dry litter to the pen to cover any exposed pig manure. The pigs will use one corner or end of the pen as a dunging area rather than excreting wastes everywhere in the pen. Over time, as more dry litter is added, the material in the pen will build up, and the floor of the pen will rise. With the active stomping and rooting of normal pig behavior, the material becomes a mixture of pig waste and green-waste that will begin to compost.

The PDL pen cycle

Pigs can be kept in the PDL pen for from 4 to 6 months. Once the pigs are slaughtered, the pen cycle is complete. The cycle should not be longer than six months. The pen should be moved, and the mixture of manure

Portable dry-litter pig pens in American Samoa.





and bedding material should be piled and composted.

The pen should be moved after each cycle to prevent concentration and build-up of nutrients from the waste in the soil beneath the pen. Moving the pen allows the site to recover.

To move the pen, remove the 2x4 and roofing material. Scoop out the manure and green-waste mixture to a nearby site prepared for composting. Move the wire base and place it in the new pen location.

If setting up the new pen just next to where it was previously, leave two posts and one side of the pen standing. Remove the other two T-posts and three fence panels. Set up the posts and panels on the opposite side of the standing fence panel. Reattach the 2x4 piece of lumber and roofing material. The pen has thus been moved to a new site and is ready to begin the next pen cycle. This system can be used in four-cycle rotations as shown in the diagram on page 4.

The manure and green-waste mixture

After completion of each pen cycle, the mixture of pig manure and green-waste is ready for composting. For details on the composting process, read CTAHR's publication HG-41, *Backyard Composting: Recycling a Natural Product* (see *References*). Following are some basic instructions.

The compost pile should be about as high as its diameter, but usually not more than 3–4 ft high. The pile should be protected from heavy rain and kept moist but not wet.

The interior of the pile should heat up to the point where it is uncomfortable to put your hand into it; this means the decomposition process is proceeding. As the interior of the pile cools, turn it with a spading fork, pitchfork, or shovel so that the parts on the outside are moved to the center of the pile; it should heat up again. Once the pile no longer heats up, the compost process has run out of "fuel."

"Finished" compost is brown and crumbly, and the plant materials that went into it should no longer be recognizable. If this is not the case, screen out the fine material to use as fertilizer and save the coarse material for the next compost cycle, or use it as mulch.

The finished compost is relatively free of disease pathogens if the pile got hot enough. Avoid adding fresh manure to the pile while it is composting, because this may add pathogens that will not be killed in the heating process. Finished compost can be used in the garden or crop field or sold to neighbors and other farmers.

See ADAP publication 2003-3, *Treatment, Storage and Use of Swine Waste Solids*, for ideas on composting swine waste solids. See CTAHR publication AWM-1, *Composted Animal Manures: Precautions and Processing*, for more information about animal waste management.

Benefits of the PDL pen system

Advantages of the PDL pen system include:

- uses no water for pen cleaning
- discharges no effluent from the pen when properly managed
- low construction cost compared to concrete, cinder-block, or wooden structures
- requires minimal effort or cost to operate and maintain
- produces a beneficial organic fertilizer byproduct to improve the soil and aid crop growth
- requires only a small land area
- reduces fly and mosquito breeding.

Considerations about the PDL pen system

Here are some things to keep in mind when using a PDL pen system to manage the solid and liquid swine wastes:

- You need a consistent supply of bedding material. A mixture of different materials is preferable. Do not use poisonous plants. Avoid adding weed seeds unless you know how to manage the composting process effectively so that seeds are killed.

- This system is best for small-scale operations.
- It requires relocation after each 4–6-month cycle.
- Flat land is best; it cannot be used on steep or rough terrain.
- It should not be placed over or near groundwater recharge areas (wells, streams, springs) or within a natural drainage area (ditch, stream channel).
- Composting is required to produce a fertilizer that can be used without “burning” sensitive crops.
- The composting process should reach temperatures between 130 and 155°F for a couple of weeks to destroy disease organisms in the manure, and weed seeds.
- Local regulations on sites, set-backs, and other guidelines for piggery operations should be followed.

Benefits of using compost include:

- increased soil fertility, aeration, and water-holding capacity
- increased soil organic matter content and microbial activity
- increased soil resistance to erosion
- suppressed levels of plant pathogens and soil nematodes.

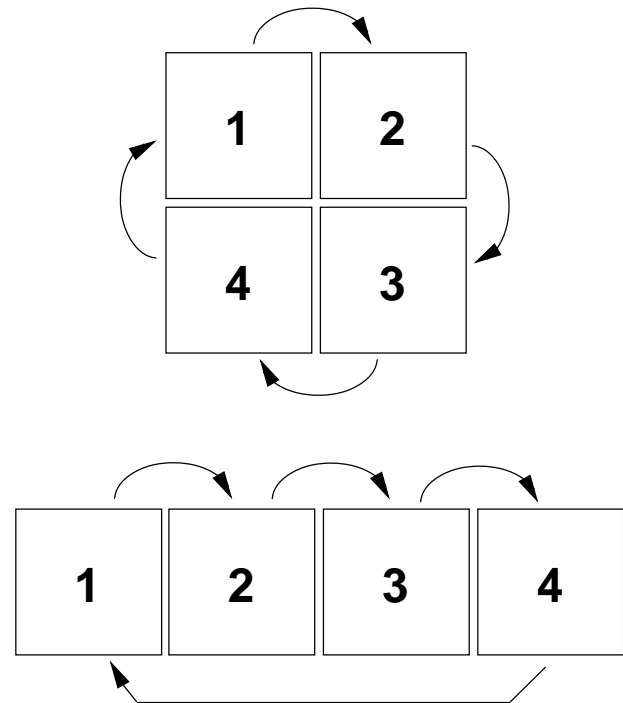
Summary

The portable dry-litter pen system is a practical option for small-scale piggery operations. It adapts the concept of the dry-litter waste management system developed for commercial swine operations in Hawaii, combining it with rotational grazing and cropping strategies and the goal of recycling through composting. The system is relatively inexpensive and adaptable to locations with limited land area. No water is used for pen cleaning, thus reducing the threat of pollution of groundwater supplies and surface water bodies.

Acknowledgment

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Two examples of a four-cycle PDL pen rotation.



For additional information

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