Alabama Poultry producers are facing increasingly difficult problems disposing of dead poultry on their farms. Current practices include incineration, burying the carcasses in approved pits, and rendering. Current disposal methods may not be environmentally sound or cost effective.

**Composting**

Recent work at the University of Maryland’s Poultry Research and Education Facility at Princess Anne, MD has sparked new interest in the old organic gardening practice of composting. In this case, composting dead poultry. Composting is a controlled, natural process in which beneficial microorganisms—bacteria and fungi—reduce and transform or change organic wastes into a useful end product—compost. In dead bird composting operations, a prescribed mixture of dead poultry, manure, straw, peanut hulls, or coastal hay, and water provide the necessary ingredients for changing the mixture to compost. This mixture will have a carbon:nitrogen ratio (C:N) of about 23:1 and a moisture content of about 55 percent. Acceptable C:N ratios are between 15:1 and 35:1. Acceptable moisture content ranges are between 40 and 60 percent.

**Composter Size**

Composter size is based on broiler farm capacity, overall bird size at the end of the production cycle, and mortality. Studies show that the composter should be designed using the following formula:

\[
\text{Capacity of the first-stage composter bins in cubic feet} = 0.0025 \times \text{Final bird weight} \times \text{Farm capacity per cycle}. \]

**Example:** What capacity of first-stage composter bins in cubic feet is required for a poultry grower with a 100,000-head capacity farm with final bird weight of 4.2 pounds (Table 1)?

First-stage capacity in cubic feet \(= 0.0025 \times 100,000 \times 4.2 = 1,050 \) cubic feet.

Field studies have shown that at least 1 cubic foot of secondary composting bin is necessary for each cubic foot of first-stage or primary-bin capacity.

**Composter Operation**

A simple mixture of straw, hay, or peanut hulls with dead poultry, poultry litter, and water and oxygen will produce the readily available beneficial bacteria and fungi needed to convert these materials into an inoffensive and useful compost. In field studies, odors and insects have not been a problem. Tests on certain pathogens, such as *E. coli*, and on Gumboro and New Castle disease viruses show that they do not survive the pasteurizing effects of composting.

**Daily Operation**

Once the weight and volume relationships of one day’s dead poultry are determined, the other elements can be weighed out according to the formula in table 2.

### Table 1. Number of First-Stage Composter Bins Required Based on Number of Broilers on Hand (Based on 4.2 lb. Bird)

<table>
<thead>
<tr>
<th>Farm Capacity</th>
<th>Required Cubic Feet for First-Stage Bins</th>
<th>No. of First-Stage Bins (5’ x 5’ x 8’)</th>
<th>Required Cubic Feet for Second-Stage Bins</th>
</tr>
</thead>
<tbody>
<tr>
<td>20,000</td>
<td>210</td>
<td>1</td>
<td>210</td>
</tr>
<tr>
<td>40,000</td>
<td>420</td>
<td>2</td>
<td>420</td>
</tr>
<tr>
<td>60,000</td>
<td>630</td>
<td>3</td>
<td>630</td>
</tr>
<tr>
<td>80,000</td>
<td>840</td>
<td>4</td>
<td>840</td>
</tr>
<tr>
<td>100,000</td>
<td>1,050</td>
<td>5</td>
<td>1,050</td>
</tr>
<tr>
<td>120,000</td>
<td>1,260</td>
<td>6</td>
<td>1,260</td>
</tr>
</tbody>
</table>

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Weigh the elements in buckets on scales the first day. On subsequent days, a loader can be used once the weight of a full loader/bucket is determined for each element except water. One gallon of water weighs about 8 pounds.

Or, use a hose to deliver the correct amount of water based on a percolation test (the time necessary to deliver the required gallons through the hose).

Place at least 12 inches of poultry litter on the concrete floor of the first-stage composter bin. Place a layer of straw on top of the manure to allow oxygen under the poultry. Add a layer of dead poultry; apply water; cover poultry with another layer of manure, followed by another layer of straw. Then add water to satisfy the formula. The final cap is two layers of manure placed over the poultry. Do not add water to this final cap. See figure 1 for details. Note: 400 pounds of dead poultry will require the following:

- 800 pounds cake or manure
- 40 pounds straw (one bale)
- 50 gallons water

(Water should be applied to each solid element during the layering process. This will allow the solid elements to soak up the required amount of water. Use water sparingly.)

Ideally, the composter will be sized so that the average day’s mortality will equal one layer of dead poultry in the primary bin. Each subsequent day, layer the dead poultry and other elements in the bin (manure, poultry, straw).

**Monitoring the Composter**

Monitor the temperature in the compost pile with a 36-inch probe-type thermometer. After 7 to 10 days, the pile reaches its high reading of 130 to 150 degrees F., which pasteurizes the compost. Once the temperatures peak, move the material to the second-stage bin or secondary treatment alley for aeration and reheating. As compost from the primary bins is added to older compost in the secondary treatment alley, a skid loader mixes and aerates the compost.

If a front-end loader moves the material, the bucket can be raised high enough to allow the material to drop into the secondary unit and, thus, improve aeration and mixing. The temperature in the secondary bin will rise as beneficial bacterial activity begins and will peak in 5 to 10 days. Monitor the temperature in stage 2 just as in the primary stage.

The final step is to store the pasteurized compost in a manure storage shed, or pile it outside, covered with plastic. During the planting season, apply compost directly to the land and work it into the soil, using the same guidelines as applied to poultry manure.

Loading and managing a composter sized for a broiler farm having a 100,000- to 130,000-bird capacity takes about 20 minutes a day. This average does not include the time necessary to pick up the dead poultry.

**Sample Design**

Composters can vary considerably and still perform well. However, experience teaches that all good composters have certain common features.

**Roof:** While some materials may be composted in the open, this does not work well with dead bird composts. A roof ensures year-round operation and controls rain water and percolation, which can be major problems.

**Foundation:** An impervious, weight-bearing foundation (concrete) is critical to all-weather operation. A concrete foundation secures the composter against rodents, dogs, and other animals, and prevents contamination of the surrounding area.

**Building materials:** Specify pressure-treated lumber or other rot-resistant materials as they resist the biological activity of composting.

Figures 2 and 3 provide a general layout of a typical freestanding farm composter. It is recommended that raw litter storage space be built into the composter.

The cost of materials for construction of the composter, including the concrete pad, ranges from $3,000 to $5,000. Total cost depends on composter size, which is based on flock size and the cost of labor to construct the unit.

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Figure 1. Dead poultry composter bin layering

During the composting process, the volume of the mass will reduce 25 to 30 percent. This will enable the operator to add more material to the top of the bin.

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Figure 2. Composter floor plan (not to scale)

Min. slab 6” concrete
3500 PSI with 6” X 6” #10 WWM

Figure 3. Composter front and left side elevation (not to scale)
**Land Application of Compost**

Once the composting process is completed, protect the product from rainfall to prevent the leaching of soluble nutrients such as nitrate and potassium out of the pile.

The nutrient content of the compost will vary depending upon the amount and nutrient content of the manure and straw, the age of the compost, and the method of storage. Compost samples analyzed by the University of Delaware had the following average analysis on an “as sampled basis”:

- **Moisture** ……………..………….28%
- **Nitrogen (total)** ………………..1.85%
  - ammonium nitrogen…….0.15%
  - organic nitrogen…….1.70%
- **P₂O₅** ………………….....2.29%
- **K₂O** ……………….1.56%

A ton of compost provides 37 pounds of nitrogen (N), 46 pounds of phosphate (P₂O₅), and 31 pounds of potash (K₂O). Because of variation in nutrient composition of composts, regular analyses for nitrogen, phosphorus, potassium, sulfur, and micronutrients are desirable.

Land application of compost or any poultry waste, like application of fertilizer, must balance nutrient content with the crop nutrient needs based on regular soil tests and realistic yield goals. The greatest problem in land application of organic wastes is overapplication. This is not only wasteful of potential plant nutrients, but it can also result in excessive levels of nitrogen and phosphorus in soils. Nutrients not taken up by plants can be lost to groundwater by leaching, or to surface water through runoff.

To avoid excessive nutrient application, apply compost based on the nitrogen need of the crop. Nitrogen in compost is not as readily available as nitrogen in fresh poultry litter because more is in the organic form and less in the ammonium and urea form. Refer to Extension publications ANR-244 and ANR-244a, “The Value and Use of Poultry Manure as Fertilizer” and its “Worksheet,” for help in calculating application rates based on the analysis. In general, 50 to 65 percent of the total nitrogen will be available during the growing season in which it is applied. Assume 75 percent of the phosphate and potash will be available.

Apply compost as close to planting as possible for row crops and annual crops, and incorporate with normal soil tillage operations. For perennial summer grass pastures and hayfields (bermudagrass and bahiagrass), apply in early spring and again in early summer if additional growth is needed. For cool-season perennial grass pastures and hayfields (fescue and orchardgrass), make early fall and early spring applications. Based on the average analysis given earlier and assuming 65 percent of the nitrogen will be available during the season, the following application rates are suggested (Table 3).

<table>
<thead>
<tr>
<th>Crop</th>
<th>Time of Application</th>
<th>Tons of Compost per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn (unirrigated)</td>
<td>prior to planting</td>
<td>4.3</td>
</tr>
<tr>
<td>Cotton</td>
<td>prior to planting</td>
<td>3.2</td>
</tr>
<tr>
<td>Small grains (grain)</td>
<td>prior to fall planting</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>topdressing in late winter</td>
<td>2.2</td>
</tr>
<tr>
<td>Small grains (forage) and temporary winter grazing</td>
<td>prior to fall planting</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>topdressing in late winter</td>
<td>2.2</td>
</tr>
<tr>
<td>Summer pasture (bermuda, bahia)</td>
<td>early spring</td>
<td>2.2*</td>
</tr>
<tr>
<td></td>
<td>early summer</td>
<td>2.2*</td>
</tr>
<tr>
<td>Cool-season pasture (fescue, orchardgrass)</td>
<td>early fall</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>late winter</td>
<td>2.2</td>
</tr>
</tbody>
</table>

*Add one extra ton for hay production

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**Table 3. Suggested Application Rates of Dead Bird Compost**

**J.O. Donald,** *Extension Agricultural Engineer,* Professor, Agricultural Engineering, **Charles C. Mitchell,** *Extension Agronomist,* Professor, Agronomy and Soils, and **Vic Payne,** *Environmental Engineer,* Natural Resources Conservation Service.

For more information, call your county Extension office. Look in your telephone directory under your county’s name to find the number.