

## Composting animal mortalities in North Carolina

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### Abstract (Summary)

In August 1997, North Carolina State University broke ground to develop the Animal and Poultry Waste Management Center. Soon after, a composting facility was built next to the center. Since January 1998, the facility has primarily been used to compost chicken and turkey mortalities. The work there fits into the objectives of a public-private partnership formed by the center to explore conversion of animal waste and mortality to value-added products. Research breakthroughs at the NCSU Animal and Poultry Waste Management Center and at other centers throughout the nation will undoubtedly provide improved options to create value-added products - not environmental threats.

### Full Text (1774 words)

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### [Headnote]

Animal and Poultry Center at N.C. State University evaluates different approaches to achieving economical, environmental solutions.

IN AUGUST, 1997, North Carolina State University broke ground to develop the Animal and Poultry Waste Management Center (APWMC). Soon after, a composting facility was built next to the center. Since January, 1998, the facility has primarily been used to compost chicken and turkey mortalities. The work there fits into the objectives of a public-private partnership formed by the center to explore conversion of animal waste and mortality to value-- added products.

The state requires that animal mortality composting facilities have a roof and a concrete floor with drainage for leachate collection. The APWMC's 40-by-150-foot composting facility has a slight slope to the center where leachate collects and is pumped to a storage pond. The building contains 18 wooden bins measuring six feet wide by eight feet long by five feet deep. Poultry litter is laid in the bottom of the bin, and then layers of whole birds are alternated with litter, with a final capping of litter. Each bin holds four to five layers of birds. "It's hard to say how many birds are added per layer because it varies so much due to bird size," says Agricultural Research Unit manager Jason Wilson. "For example, we'll add ten 50- to 60-pound turkeys in one layer and about 100 one-pound birds in another." Sometimes clean shavings or sawdust are mixed with the litter to adjust the carbon content. A skid-steer loader is used to fill the bins and to move materials. Instead of turning the compost within the bin, it is moved to another bin when it's time for turning.

The state permit requires that the composting materials be sent through a minimum of three cycles of maintaining 150 deg F. Wilson says that the compost usually heats to 160-165 deg F, and when it drops 25 deg, it is moved to another bin where it heats up again. At the end of the second heat, usually four to six weeks into the process, most of the birds' body parts are disintegrated. The third heat can be a storage heat where compost is in a pile under shelter. When the compost is finished, after a total of six to eight weeks, the permit allows it to be land applied or sold to the public. Operators have never had to land apply the compost because they sell it all to the public. Although they don't advertise that compost is for sale, word of mouth has created regular customers who come to pick up the compost for \$3 per cubic yard or \$8 if screened. Some bones are usually left in the compost from the edge of the pile, so some customers prefer that the compost be run through a vibrating screen to half-- inch particles. The facility has two permits; the state veterinarian permits the composting facility and inspects it annually, and the Department of Environment and Natural Resources permits the marketing of the compost.



### [Photograph]

The composting building at the university's animal waste management center has 18 wooden bins, each measuring six feet wide by eight feet long by five feet deep (inset).

The APWMC applied for a permit for swine mortality composting, but it was denied by the recently retired state veterinarian because hogs have more mass and larger bones to break down, so it would require larger facilities and more management. Instead, the APWMC is exploring alternatives for converting swine mortalities to value-added products. One alternative is developing products for poultry feed, so research is being conducted to determine whether this option would provide comparable protein to what animals are receiving now and whether it would be economically feasible for swine mortalities to be transported to a central processing location.

#### COMPOSTING METHODS USED AFTER FLOOD DISASTER

Last year, eastern North Carolina experienced a disaster when hurricanes caused severe flooding. According to Dr. Jo Anna Quinn, director of diagnostic laboratories at N.C. Department of Agriculture and Consumer Services, flooding caused the deaths of 2,107,857 broiler chickens, 752,970 turkeys, and 21,474 hogs. Most of the dead animals were buried, although some went to rendering plants or were incinerated. The only composting that took place was on Perdue Farms because it has a ten-year history of commitment to composting.

Flooding from Hurricane Floyd destroyed all 806,140 chickens being raised on 26 of Perdue Farms' contract grower farms in nine counties. Perdue responded by offering technical assistance from Rick Harrell, environmental manager with its Corporate Environmental Engineering Team. The state veterinarian's office issued permits for in-ground disposal or incineration of animal mortality, but Harrell argued that the ground was too wet for inground disposal and incineration was too expensive. He insisted that composting would be more environmentally friendly, provide more pathogen control, and be a more economical alternative.

The majority of Perdue's poultry growers already compost their mortalities, but they use bin systems required by the state like the one operating at the APWMC. The bins are not designed to handle catastrophic losses of chickens, so an emergency alternative needed to be devised. Although NCDA normally requires that poultry composting operations have a constructed composting unit on a cement pad with a roof overhead, it approved of mass composting at several Perdue farms due to the emergency situation.

Each farm had two to four chicken houses holding 25,000 birds per house. Many of the chicken houses were flooded to the ceiling, so farmers had to wait three or four weeks for the water to recede. After the water drained out, it left a soupy mess that was too wet to handle, so Perdue trucked in dry peanut hulls and wood shavings that were either blown directly into the houses or dumped in by skid-steer or front-end loaders. Only then could the material be moved out of the houses into dump trucks that took it to a selected site on the highest piece of ground on each farm. "Perdue's greatest challenge was finding dry sites," says Harrell.

At each farm, a row of wood shavings was placed one-foot deep on the ground; the mixture of mortalities, litter, peanut hulls, and wood shavings was unloaded on top and covered with tarps. A border of wood shavings and peanut hulls was laid around the pile to control runoff. Farms with four chicken houses filled with market-age birds ended up with three rows with dimensions approximately 25 to 30 feet wide, 150 feet long, and five to six feet high. It took ten to 15 tractor trailer loads of wood shavings and peanut hulls per farm to fill the chicken houses and make the composting piles. The compost piles took three to four weeks to go through the initial heat process, then they were turned with front-end loaders and allowed to cook for 28 days. After that, the compost was ready to be applied on the growers' farms as a fertilizer product.

The State Soil and Water Conservation (SWC) Division's Ag Cost Share Group oversees a cost-share funding program for poultry growers that covers up to 75 percent of construction costs up to \$25,000 for composting units. The SWC pays out an average of \$8,000 to \$10,000 to each farmer, depending on the size of the units being constructed. SWC also provides construction designs for the composting systems based on NRCS standards. The formula for sizing composting units is farm capacity (number of birds) x percent mortality x average market weight x 1.5 divided by age of birds (in days) = volume in cubic feet. An example for broilers would be 100,000 capacity x 0.5 percent x 5 pounds x 1.5 divided by 49 days = 765 cubic feet.

#### BARRIERS FOR SWINE

Although a number of small-scale composting projects have been conducted with swine mortalities, this waste management method has failed to become widespread in North Carolina. This is primarily due to the state veterinarian refusing to issue permits because of the belief that large animals are too difficult to compost. In the opinion of the state veterinarian, hogs are too large, their hides are tough, there is more fat, and their bones are bigger, making them tough to manage under controlled conditions that will prohibit the spread of disease. Dr. Fred Kirkland, director of field forces for the State Veterinarian's Office, says: "Numerous studies have indicated that

composting doesn't work for any animal over 35 to 40 pounds." However, Dr. James Barker, NCSU Biological and Agricultural Engineering professor, refutes that statement, saying, "If composting is done right, then size doesn't matter."

One study that Barker conducted with Dr. Morgan Morrow, a veterinarian in NCSU's Animal Science Department, took place from January 1992 through July 1994. They added over 10,000 pounds of pig carcasses to seven compost piles. Concrete block pens measuring 8.25 feet by five feet held six of the piles in an idle hog growing barn, and the seventh pile was in an isolation room because Pseudorabies virus (PRV) was added. The mix ratio, on a weight basis, of ingredients added was 1.0 part pig carcass, 0.1 part wheat straw or 0.2 part peanut hulls, 1.5 part turkey cake, and 124 gallons of water per 45 pounds of carcass. In two of the piles, they added *Salmonella* spp or *Erysipelothrix rhusiopathiae* in open culture tubes. The composting process disintegrated most of the carcasses and bones, and reached temperatures sufficient to kill all of the *Erysipelothrix rhusiopathiae*, PRV and *Salmonella*. The researchers concluded that composting was a safe, efficient, and sustainable method for managing swine carcasses. Other states have reported success with numerous swine composting projects.

#### PUBLIC CONCERN OVER DISPOSAL OF MORTALITIES AS WELL AS MANURE

The trend towards intensive livestock and poultry production in states like North Carolina has created public concern about environmental safety and health risks. The concern applies to animal mortalities as well as manure. The majority of dead animals are disposed by methods that are not always environmentally sound or biologically secure of the spread of disease. Burial or incineration destroy animal producers' opportunities for nutrient utilization and investment recovery.

In North Carolina, the most common disposal method for poultry mortality is burial in pits, but many farms in the eastern part of the state have groundwater tables that are too high for pit burial. Rendering and composting are the next practiced methods, at about ten percent each, followed by incineration.

Research breakthroughs at the NCSU Animal and Poultry Waste Management Center and at other centers throughout the nation will undoubtedly provide improved options to create value-added products -- not environmental threats. Those options -- as well as on-farm experiences - will be reported in coming issues of BioCycle.

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