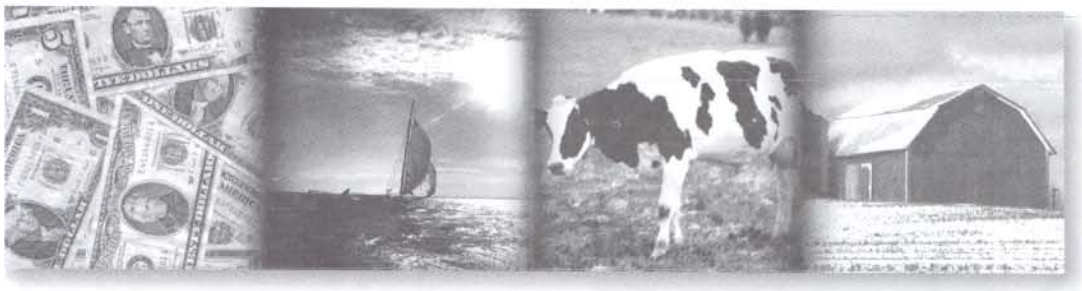

MARYLAND COOPERATIVE EXTENSION
UNIVERSITY OF MARYLAND
COLLEGE PARK•EASTERN SHORE

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NUTRIENT MANAGER

Newsletter of the Maryland Cooperative Extension Agricultural Nutrient Management Program

Focus On COMPOSTING

A dial thermometer with a 3-foot stem measures temperature in poultry mortality compost at the Lower Eastern Shore Research & Education facility in Princess Anne, Md.

In the forest, leaves and twigs fall from trees and animals drop their wastes or die. Meanwhile, soil organisms–termites, bacteria, worms–decompose these organic materials into a soft, rich substance on the forest floor. This is Mother Nature's way of making humus, a dark, relatively stable residue, from the decomposition of organic matter.

People can also produce a humus-like material by the managed composting of organic wastes. Composting creates a valuable soil amendment with stable forms of organic matter and desirable handling and storage qualities. From materials that offend the nose and attract insects, people can make a material that is pleasant to handle and use. While Mother Nature's way of making humus can take years, managed composting can be completed in as little time as eight weeks.

Finished compost can be land-applied at a convenient time or sold off-farm. However, like any other element of an agriculture operation, composting requires planning, time, and commitment.

Composting could be an effective way to deal with manure on animal operations where nutrients exceed land available for manure application. In composted form, animal manure can be a source of income. This *Nutrient Manager* will introduce basic concepts of composting and suggest resources to learn more.

WHAT IS COMPOSTING?

Composting is the *aerobic* (requiring oxygen) decomposition of organic materials by microorganisms under controlled conditions. The control imposed on the decomposition–which speeds the composting process and delivers a superior product–involves caring for the needs of the microorganisms, which are widely dispersed throughout soil, air, and waste materials. If the microbes are supplied with the conditions they need to stay active, they will efficiently decompose raw materials. See Figure 1 for a graphical representation of the process.

Microorganisms need

- "Food"-an appropriate mix of organic materials that is a balanced supply of carbon for energy and other nutrients (a carbon to nitrogen ratio of 25:1 to 30:1 and a pH of 6.5-8.5), and
- Moisture content of 50-60 percent; this provides a favorable balance of water and air for the microbes to multiply.

Manure, the most abundant agricultural compost ingredient, is high in nitrogen

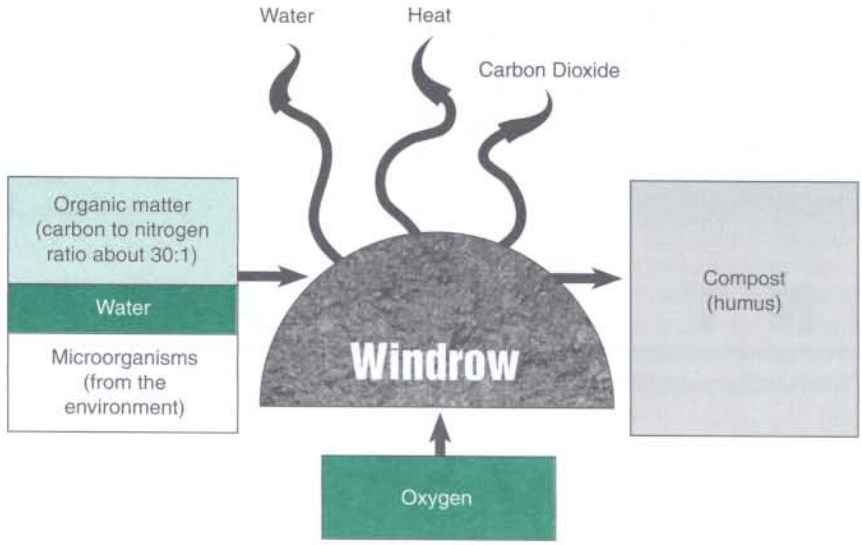

Figure 1: Carbon dioxide, water vapor and heat are lost during active composting by microorganisms, reducing the finished compost to one-half the weight of the raw materials.

and relatively wet. Dry, shredded materials that contain carbon–for example, sawdust, wood chips, straw–need to be added to manure to create the correct carbon-to-nitrogen ratio and to provide air spaces in the dense, wet manure.

WHAT IS A COMPOST WINDROW?

It's a narrow, low pile with a large surface area exposed to encourage *aeration*, or addition of oxygen.

As the microorganisms decompose the organic material, they produce carbon dioxide, heat, and water. Heat is released as a result of the microbial activity. Actively composting materials maintain temperatures between 120 and 140 degrees. Falling temperatures may indicate either that the compost needs aeration or moisture; or that the composting activity is slowing down and entering the "curing" or stabilizing stage of the process. Many composters monitor the activity of the microorganisms by monitoring temperature.

See Figure 2 for a look at the process of composting.

The compost pile or windrow shrinks as the product becomes drier. The end product–compost–has excellent qualities for a variety of uses. It contains beneficial microorganisms, humified organic material, and slow-release forms of nitrogen.

NUTRIENTS IN COMPOSTED MANURE

It is desirable to retain a maximum amount of nitrogen in the compost, as a substantial amount of nitrogen is routinely lost in the composting process. Prevent nitrogen loss by maintaining ideal conditions for your compost pile.

- If the pH of the compost pile is greater than 7.5, gaseous ammonia, a form of the nutrient nitrogen, can escape.
- Minimize runoff of nutrient-rich water. Channel runoff to cropland, a vegetated infiltration area, or a holding pond.
- Additional nitrogen may be lost when excessively damp conditions produce nitrogen gas through a process called denitrification.
- Some nitrogen may be leached in liquids seeping from the pile if it's wet or open to the weather. When composted, some of manure's nutrients change due to the decomposition action of the microorganisms. Finished compost contains nitrogen in a complex organic form, which becomes available slowly. Nitrogen in a slow-release form is less susceptible to leaching or further gaseous losses. The plant availability of phosphorus is unchanged in composted manure.

If you rely solely on compost for nitrogen, application rates of compost will be very high, as compost contains a low percentage of nitrogen, primarily in the form of organic nitrogen. In addition, the organic nitrogen breaks down into a plant-available form very slowly. Compost has a mineralization rate about one-tenth that of comparable fresh manure.

To find out the nutrient content of raw materials or compost, request an analysis through the University of Maryland Soil Testing Lab. Ask your county Extension educator for sampling procedures.

UNIVERSITY OF MARYLAND COMPOSTING EFFORTS

At the Central Maryland Research and Education Center, animal waste systems manager Benny Erez oversees the Center's manure composting operation.

"We had to stop spreading our dairy's manure three years ago because of high soil phosphorus levels," Erez says. "And it's a permanent situation.

"So we compost the manure from our operation and at the moment are export-

Chris Wilson composts horse manure on Obligation Farm in Anne Arundel County.

ing it away from our fields. Shrinkage of the manure is about 50 percent so we can safely store the finished product for some time, until it is sold in bulk to local nurseries and garden centers. We're working with Dr. Bouwkamp and Dr. Carr on developing and improving compost technology for the 'green' industries."

On the Eastern Shore, Dr. Lew Carr is well known for his work with Dr. Herb Brodie on composting chicken and animal mortalities. "Some states are discouraging the burial of dead birds, so we came up with good composting methods. We found that one measure of poultry mortality can be composted with one measure of loose straw and two measures of poultry litter," states Carr. "The process also works well for catastrophic events."

Recently, due to concerns about excessive phosphorus in the Chesapeake Bay, Dr. Carr has given more attention to composting chicken litter. At the Lower Eastern Shore Research & Education Center, Poplar Hill Facility, he is composting poultry litter together with yard waste. The finished compost will be used in University experiments. For example, the compost can be used as a soil amendment in the establishment of a riparian buffer strip, or as a soil amendment for horticultural nursery production.

"Composting works," says Carr. "It occurs naturally over time. With a controlled process and the proper ingredient mix, the time for composting can be greatly reduced."

Composting on a Southern Maryland Horse Farm

Chris Wilson grew up helping to tend the cattle herds on his family's Obligation Farm located in Anne Arundel County, so he always considered manure to be an asset. Yet, when the beef operation was changed to stabling horses, "it was a horse of a different color," he jokes.

"When we spread the horse manure on the pasture, it produced yellow spots on the grasses. It just didn't do pastures any good," says Chris.

Through trial and error and with research, Chris chose to compost the horse manure. With the help of the Soil Conservation District, the NRAES publication *On-Farm Composting*, and Maryland Cooperative Extension's Better Composting School, he earned his license as a composter through the Maryland Department of Agriculture.

"The compost we made was beautiful. It seemed a shame to just spread it on pastureland," says Chris. "So I hung a 'Compost for Sale' sign at the end of my lane.

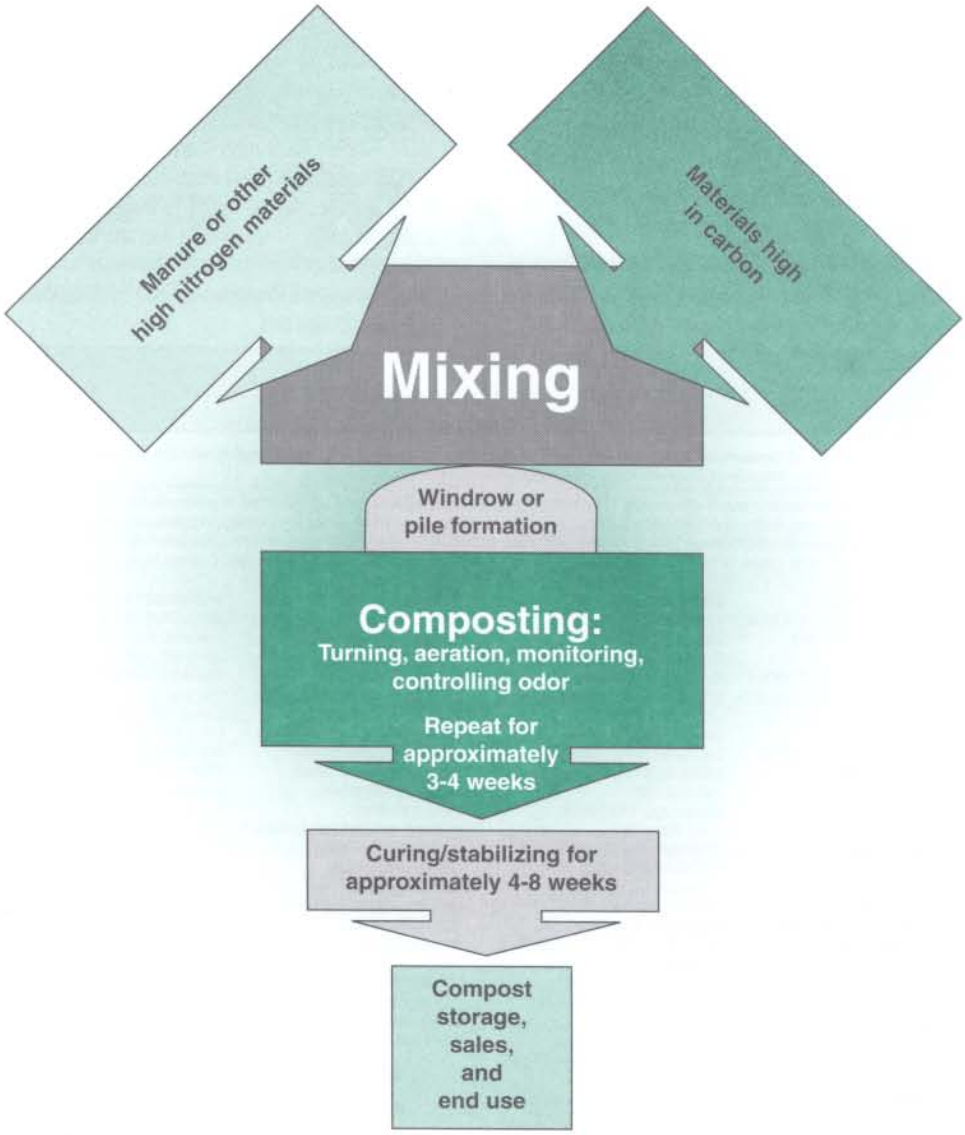

Figure 2: The composting process requires a succession of steps.

"Now I sell 2,500 to 3,000 yards of compost off my farm a year. My son the accountant had told me to look for all of the profit centers on the farm, and compost has helped my cash flow. The additional costs of composting are marginal, especially when I consider that I have to handle the manure anyhow. The only equipment I need is a loader and a long probe thermometer."

Learning More About Composting

- *On-Farm Composting Handbook*, available from Northeast Regional Agricultural Engineering Service, 152 Riley-Robb Hall, Cooperative Extension, Ithaca, NY 14853-5701.
- Maryland Cooperative Extension's three-day "Better Composting School" is held annually during the last week of October. The school includes instruction on composting techniques, health, regulatory and marketing issues, and tours of selected Maryland composting facilities. E-mail Dr. Lew Carr at lc5@umail.umd.edu or phone him at 410-742-8788.
- Compost Recipe Maker Software for IBM personal computers develops compost mix recipes based on carbon, nitrogen, and water. It is capable of producing best custom mix ratios for up to ten different materials. For details, call Pat Lupo at 301-405-1395 and leave a message or email her at PL32@umail.umd.edu.
- A 17-minute MCE video, *Poultry Mortality Composting*, is available for purchase through the Agricultural Nutrient Management Program. Call 301-405-1318 for details.

Credits

On-Farm Composting Handbook by Northeast Regional Agricultural Engineering Service (June 1992) was used as a main source for this newsletter.

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If you do not receive this newsletter by mail and would like to, contact your county Extension office or the address above. The Maryland Cooperative Extension Agricultural Nutrient Management Program is funded by the Maryland Department of Agriculture.

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