



## On-Farm Composting

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A century ago, farmers were avid composters. Methods for composting, however, were crude, often consisting of haphazardly piling farm wastes, then letting them sit and decompose until farmers were ready to use them.

Today, composting has been elevated to a science. Because of manure handling and disposal problems and increased complaints against farms on the fringe of suburbia, it is being revived as a way to deal with manure management, odor, and pollution problems. In some cases, on-farm composting is also helping to solve municipal and food-processing waste disposal problems.

### What is Compost?

Compost is a rich, humus-like material valued for its soil-conditioning qualities. It is formed when a mixture of organic materials, such as manure, bedding,

food processing wastes or yard wastes, decomposes in the presence of oxygen. (See Figure 1.)

### Should Every Farm Compost?

No. While composting does convert manure into a more easily handled form, not every farm has a need for composting. Farms that don't suffer from odor or fly complaints, nutrient management problems, polluting runoff or a lack of manure storage will probably find composting unnecessary. Similarly, farms with severe labor, machinery or resource shortages will probably not want to start a composting program.

### Why Compost?

Composting is well-suited to agriculture. Farms produce an abundance of organic wastes and land availability for compost piles usually isn't a problem.

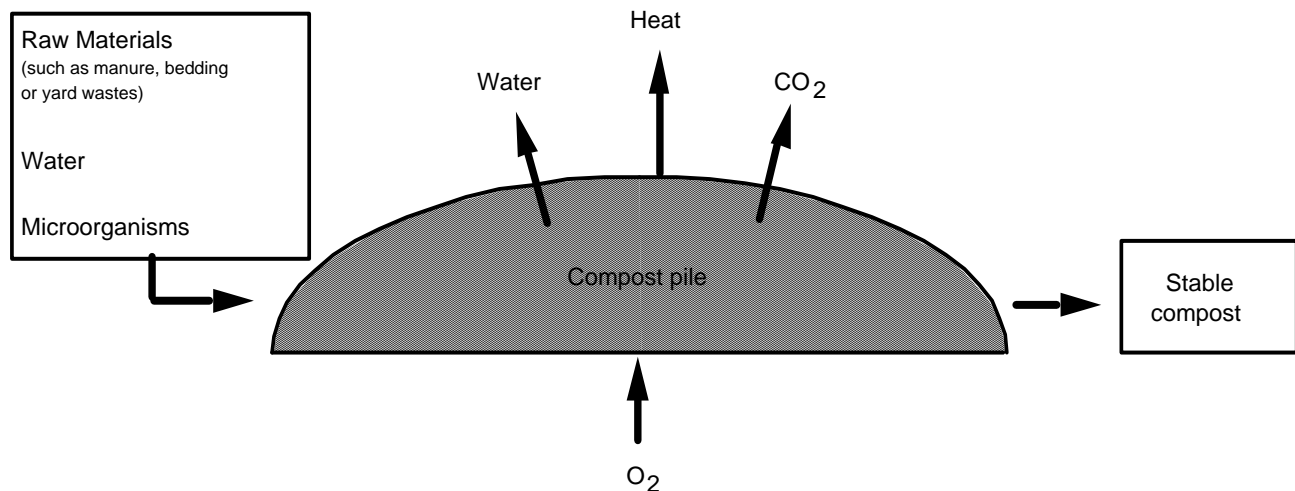


Figure 1. Inputs and outputs of the composting process.

Farmers who decide to compost can reap many benefits from the finished product. Compost is a valuable soil conditioner that enhances soil structure. The organic matter in compost improves soil nutrient-holding and water-retaining capabilities which, in turn, reduces fertilizer requirements and erosion while enhancing soil tilth.

If manure management is a problem, composting can reduce the moisture and biological activity in manure. Composting also reduces manure weight so it can be hauled farther for spreading. Finished compost stores well, causing fewer odor and fly problems than stored manure. And because the nitrogen in compost is more stabilized than the nitrogen in manure, it is less likely to leach nutrients into surface water. Compost releases its nutrients more slowly than commercial fertilizers, too, so it won't burn crops and will feed them over a longer period of time.

Composting has the potential to earn a farmer extra income. Depending on the local market and quality of compost produced, compost can be a saleable product. Greenhouses, landscapers, home gardeners, golf courses, and vegetable producers are all potential buyers. Some farmers are processing off-farm wastes, such as yard or food processing wastes, for which they earn tipping fees. Combining farm and off-farm wastes, however, often involves permitting and adhering to additional local and state regulations.

## **Drawbacks to Composting**

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While there are many attractive, potential benefits to composting, farmers shouldn't be too eager to jump right in and get started in the business. Composting does not promise to solve all manure-handling problems. It is hard work, requiring just as much time and commitment as other farm tasks receive.

A composting operation will take time and money to manage and maintain. When processing only small volumes of farm wastes, the equipment needed is probably already available on the farm. But with larger operations, composting quickly becomes a very capital- and labor-intensive task. Farmers may need to invest in special composting equipment, which can cost anywhere from \$7,000 to over \$100,000. Also, compost windrows and storage facilities for raw materials will take land, and possibly building space, away from other farming activities.

Though the end product of composting is odor-free, the raw materials sometimes used to make compost aren't. Sewage sludge, fish processing wastes, and other food wastes should be composted

immediately. Other materials that might be used in composting, especially if they are stored for long periods of time, might also develop an odor. Even compost piles themselves, if they aren't maintained properly, will begin to smell.

There is some ambiguity as to whether manure or compost provide crops with the most nitrogen. Compost can contain less than half the nitrogen of fresh manure. The nitrogen in manure, however, is less stable than compost nitrogen, which makes it more susceptible to leaching and volatilization. Scientists do know that farmers must apply more compost than manure to farmland to achieve the same results, because compost nutrients are released very slowly. Generally, less than 15% of the nitrogen in compost is released the first year.

## **Composting Methods**

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There are several composting systems farmers can choose from if they decide to start composting. The options vary in cost, labor requirements, and processing time.

**Windrow composting**, while it is the most common method, is also the most labor-intensive. Windrow composting involves stacking raw materials into long piles that are turned regularly with a front-end loader, bucket loader or special compost turner. (See Figure 2.) The advantages of windrow composting are that it requires no source of electricity; windrows can be built in the fields, where the compost will be used; and farmers can usually use existing equipment to make and maintain the piles. On the other hand, farmers must monitor the pile temperature often to avoid odor problems and ensure that the ingredients are composting.

**Passively aerated-pile composting** involves placing the mix of raw materials in piles on top of a bed of coarse materials, such as wood chips. A network of pipes runs through the coarse materials to provide aeration. The advantages of passively aerated piles are that they require less labor than windrow composting and no electricity. This method, however, takes longer to complete.

**Aerated static-pile composting** is similar to the passively aerated method, except air is forced through the aeration pipes mechanically. As a result, static piles require a source of power.

**In-vessel composting** is the most expensive method. Two types of units sometimes found on farms are bin composters and agitated-bed, or channel,

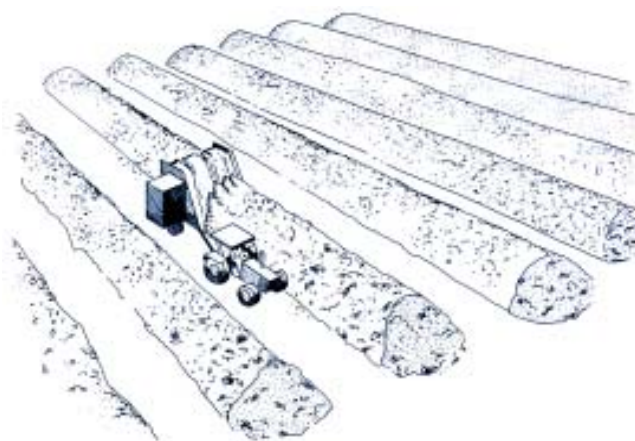
composters. With bin composting, raw materials are placed in bins similar to grain bins or a bulk storage building. The materials are seldom turned, if at all, and are aerated by forced aeration from the bottom of the bin. With channel composters, raw materials are placed in channels. The materials are turned regularly via a machine that travels on a track above the channels. Most channel composters also have aeration pipes. In-vessel compost systems require a substantial initial investment and a higher level of knowledge and skill on the farmer's part.

## **For More Information About On-Farm Composting**

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Complete information about starting and managing an on-farm composting operation is available in "On Farm Composting-NRAES 54," a 185-page manual published by the Northeast Regional Agricultural Engineering Service. In 11 chapters, the manual covers in detail the benefits and drawbacks to composting, the composting process, raw materials used in composting, composting methods and management, site and environmental considerations, and using and marketing compost. Also featured are: a glossary of terms, worksheets and formulas for building and managing compost piles, lists of equipment manufacturers and suppliers, and suggested reading lists corresponding to each chapter.

Copies of "On-Farm Composting-NRAES 54" are available by contacting NRAES (Natural Resource, Agriculture, and Engineering Service), PO Box 4557, Ithaca, NY 14852-4557  
Phone: 607-255-7654 FAX: 607-254-8770  
Email: [nraes@cornell.edu](mailto:nraes@cornell.edu) or visit their website at: [www.nraes.org](http://www.nraes.org)



*Figure 2. Windrow composting with an elevating face windrow turner. (Source: "On-Farm Composting—NRAES 54" reprinted with permission from the Northeast Regional Agricultural Engineering Service Ithaca, NY 14853.)*

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Two additional Fact Sheets, "Farm Composting: Plan Now to Avoid Problems Later—C-4" and "Farm Composting for Profit—C-5," are available from the Agricultural and Biological Engineering Department.

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