Rural Community Yard Waste Composting Systems

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Municipal composting of yard wastes is receiving attention nationwide as an alternative solid waste disposal technique. Composting provides a method to decrease the total amount of waste that is currently being placed in landfills and, in some cases, produces a product that can be marketed. While any organic material may conceivably be composted, the focus of this fact sheet is on municipal yard waste.

Municipal composting probably will not be profitable based on the market value of the end product, but may be feasible based on the reduction of material going to the landfill. Over 24 million tons of yard waste are discarded annually in the municipal waste stream in the United States, and the vast majority of this total is sent to landfills (Franklin Associates, 1986). In central Oklahoma, yard waste comprises over twenty percent of the municipal solid waste (Benham Group, 1991) (Figure 1).

Current systems for disposing of yard wastes are inefficient and expensive. Incineration of yard waste is inefficient because of a high moisture content, and placing yard waste in landfills poses two major problems that composting can solve. First, composting will decrease the total amount of waste being placed in the landfills, thereby reducing tipping fees and extending the life of landfills. Second, yard waste causes problems in landfills by producing noxious gases, by uneven settling, and by adding contaminants to the lechate. Composting is a natural form of recycling where organic materials are broken down by micro-organisms. Oxygen reacts with the micro-organisms to decay the material until it produces humus, a soil-like substance. The process can take from three months to three years, depending on the type of material and the composting technique used. Although nearly any organic material may be composted, leaves, grass clippings, and small brush are excellent composting materials because of their ease of collection and handling. Brush and small branches should be shredded to speed the process.

Humus is an excellent soil additive that improves the soil's texture, water and air absorption, and decreases soil erodibility.

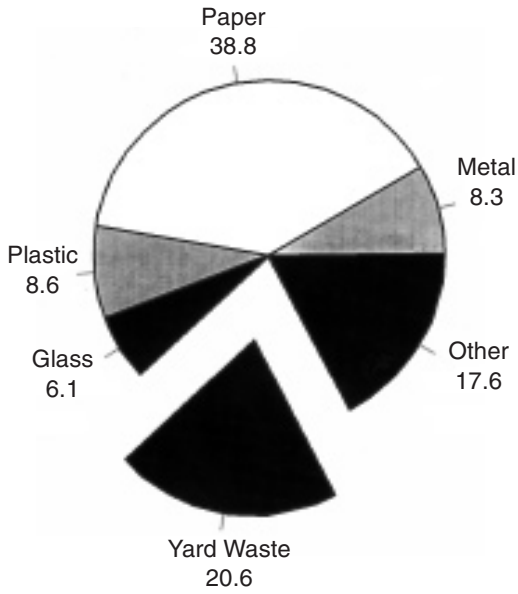

Figure 1. Distribution of materials in Oklahoma municipal solid waste. (Source: Benham and Associates. 1991)

Potential consumers of compost include farmers, landscapers, or any business that requires extra soil for plant growth.

Although composting yard waste appears to be relatively simple, a successful program requires intensive management, significant capital investment, a solid plan of action, and community dedication. There are a number of different collection and composting alternatives for a community to choose from. An example of a successful composting system in currently in operation in Norman, Oklahoma.

Collection System Alternatives

Yard waste can be collected by either a curbside or drop-off type system. The decision of which type to use depends on the expected volume of yard waste and the amount of money a community is able to spend.

With a drop-off system, a number of large containers are placed around the city for residents to unload their yard waste. Each container must be durable, easy to clean, and located in an easily accessible area. Drop-off locations must be closely monitored to prevent contaminants from being placed in the containers, and the containers must be dumped regularly

to prevent the yard waste from producing odors. Drop-off systems result in lower community participation than curbside systems. The containers cost from $300 to $500.

With a curbside collection system, residents place their yard waste at the curb separate from other household waste. The material may be picked up on normal collection days, or special days may be set aside for yard waste pick-up. Curbside systems normally have a high participation rate and allow the yard waste to reach the composting site quickly. However, this system requires more equipment and more labor than a drop-off system. An existing truck can be used to collect the material, or a special truck can be purchased for approximately $25,000 (Stucky and Tyner, 1991).

Yard waste may either be bagged or collected in bulk. Bagging yard waste allows residents to continue their normal routine by placing their leaves, grass clippings, and brush into trash bags. Convenience of bagging yard waste is a major advantage for the residents and collection workers. However, de-bagging can be expensive. A study done in Carver County, Minnesota found that de-bagging by county employees cost the county around four cents per bag (Lein, 1991).

Composting Alternatives

The different methods of composting available to community planners should meet the needs of nearly any community. The various composting options rely on different levels of capital and labor and are referred to as minimum-level technology, low-level technology, intermediate-level technology and high-level technology.

Minimum-Level Technology

Minimum-level technology uses leaves as its only composting material. The leaves are collected and piled into large windrows, 12 feet high and 24 feet wide (Strom and Finstein, 1986). The windrows are turned only once per year and it takes approximately three years to make compost. This operation typically uses only a front loader to make and turn windrows. A front loader of 140 horsepower can be purchased new for approximately $70,000. Rent for the composting site and vehicles for employees will vary and are properly included in the cost of the operation.

Because of minimal equipment and labor needs, this process is the lowest cost alternative for any community. However, the three-year time requirement and the fact that grass clippings cannot be added to the compost with this level of technology makes this option unattractive for most cities.

Low-Level Technology

Low-level technology includes leaves, grass clippings, and brush to make compost. The material is shredded, wetted, and piled into windrows approximately 6 feet high and 12 to 14 feet wide (Strom and Finstein, 1986). Enough water is added to maintain a moisture content of near 50 percent. After the pile has stood for a week, temperatures within the windrow should reach 140° to 160° F (Frigden and Rahman, 1990). The windrow is then turned once every three to four months, with a completion time of nine to twelve months, depending on the number of times it is turned.

Equipment needs for this process include a front loader to make and turn windrows and a grinder, which is used to grind brush and limbs into a uniform size and consistency. A new grinder costs from $20,000 to $100,000, depending on the size and features of the grinder. Planners should be sure to purchase a commercial quality grinder with enough capacity to handle future volume increases.

This level of composting technology is the most common in the U.S. today and produces a quality compost, while maintaining a relatively low cost. Its only major disadvantage is the length of time it takes to complete the compost.

(Note. The city of Norman is experimenting with adding sludge to their low-level composting program. Check with them on their progress.)

Intermediate-Level Technology

The composting materials and processes used in this level are the same used in low-level composting. The basic difference between intermediate and low-level technology is the introduction of a machine that turns the windrows weekly. The machine straddles the windrow while turning and mixing the material. This allows more oxygen to infiltrate the windrow which speeds the composting process.

The completion time with this process is between four to six months and could be a good alternative for communities with a high volume of yard waste. The disadvantage is the cost of the turning machine which can be up to $300,000 depending on the size of the machine (Simpson, 1989).

High-Level Technology

The high-level process uses leaves, grass clippings, brush, and sewage sludge to produce a high-quality compost. The material is put into containers with an in-vessel system, or it is piled inside a building with air and water continually forced through the mixture with a static pile system to produce a compost very quickly. The completion time for this process is normally under four months. The equipment needed for a static pile includes a building, air pipe grid, and a fan. The equipment needed for an in-vessel system includes a rotating drum or a tank with a mixing system included.

This type of technology is suitable only for those communities that wish to mix sewage sludge with their compost. The cost of this type of operation is beyond the scope of most communities.

Composting Site

In general, the space should be relatively flat with a slope of two to four percent and have a hard surface with structures to control run-off. Monitor wells may be required to check for ground water contamination. The site should be placed near the source of the materials to reduce transportation costs. However, it should be carefully placed so that potential odor and day to day operations do not interfere with residents of the community.

The space needed for composting depends on the amount and type of material to be composted and the type of composting operation chosen. As a general rule, a lower technology system requires more space than a higher level system. Two to ten acres should be sufficient for most systems.

Before selecting a site, contact the Oklahoma Department of Environmental Quality, Solid Waste Management Services. A site must be licensed in order to operate. A model permit application is available from Oklahoma State University, Center for Local Government Technology.

Marketing the Compost

Before starting a composting operation, a community must decide what to do with the compost in order to avoid storage problems. There are many ways to dispose of the finished compost, including giving it to residents or selling it to local companies that would use the compost in land reclamation. Community leaders must be creative to find the best possible outlet.

The quality of the end product will be the most important factor in determining where the compost will be used. Screening the compost at the completion of the process is the final step towards producing a high quality compost. This will produce a more uniform material while also removing contaminants. Screening is not required, but if a high-quality compost is needed for marketing, this step must be taken.

Planning and Feasibility

Community leaders who would like assistance in planning and implementing a municipal composting operation may contact the Oklahoma Department of Environmental Quality, Solid Waste Management Services, or their Oklahoma State University Extension office. These agencies can help a community estimate:

- The amount of yard waste expected in the program,
- Capital and Operating expenses,
- The feasibility of the composting operation.

Conclusion

Composting provides an alternative for yard waste disposal that reduces landfill deposits and provides a valuable commodity to the community. Although composting may appear to be easy, it requires good management and community cooperation. A poorly managed operation will incur high costs and produce poor results. Community support may be gained through a community task force or by encouraging citizens through ordinances aimed at increasing participation rates. These ordinances include no-burn policies and penalties for disposing of yard waste through the normal solid waste stream. Newspaper and radio advertisements will increase public awareness of the composting program.

Composting is a cost-effective and environmentally safe part of an integrated solid waste program. Increased public concern over the environment, along with the increasing cost of disposing of waste in landfills, will make composting an even more viable alternative for communities in the future.

References

Franklin and Associates. 1986. Characterization of Municipal Solid Waste in the United States 1960 to 2000. Paper prepared for the United States Environmental Protection Agency.

Frigden, C. and Rahman, D. 1990. Returning Waste to the Soil. One of the Ask the Right Question series. Cooperative Extension Service, United States Department of Agriculture.

Lein, Michael. 1991. “Bigger is not always better.” Waste Age, (August), 87-92.

Simpson, T.W. 1989. Solid Waste Composting. Virginia Tech Agricultural Experiment Paper.

Strom, P.F. and M.S. Finstein. 1986. Leaf Composting Manual for New Jersey Municipalities. Department of Environmental Science, Cook College and NJ Agricultural Experiment Station, Rutgers State University.

Stucky, D.J. and W.E. Tyner. 1991. An Economic Feasibility Study of an Urban and a Rural Recycling Program. Department of Agricultural Economics, Purdue University Agricultural Experiment Station.

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