Roundtable Two

Reducing The NYC Waste Stream: The Potential Role For Composting

April 3, 1998

A Final Report

Conducted by
The Cornell Waste Management Institute

Sponsored by
The U.S. Environmental Protection Agency Region 2

On behalf of The New York City
Department of Sanitation

August, 1998

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ACKNOWLEDGEMENTS

The success of this New York City Composting Roundtable was largely due to the enthusiastic participation of the attendees who shared their knowledge and ideas. Those who came from as far as Germany or as near as the adjacent office in Cornell Cooperative Extension all provided perspectives that will be useful in maximizing the recovery of organic residuals from the New York City waste stream.

The commitment of the New York City Department of Sanitation to waste reduction and in particular the efforts of Robert LaValva and Robert Lange in the Bureau of Waste Prevention, Reuse and Recycling, were key to the development and implementation of this Roundtable. Without the assistance of EPA, Region 2 and the enthusiastic support of John Filippelli, the Roundtable would not have been possible.

Finally, the assistance of the staff of Cornell Cooperative Extension-NYC Programs, particularly Sol Agosto, in providing an atmosphere conducive to productive interaction and the logistical support of Karen Rollo is much appreciated.

Many thanks to all involved – Ellen Z. Harrison, Director

The Cornell Waste Management Institute (CWMI) was established in 1987. CWMI addresses the environmental and social issues associated with waste management by focusing University resources and capabilities on this pressing economic, environmental, and political issue. Through research, outreach, and teaching activities, CWMI staff and affiliated researchers and educators work to develop technical solutions to waste management problems and to address broader issues of waste generation and composition, waste reduction, risk management, environmental equity, and public decision-making. The focus for such work is on multi-disciplinary projects that integrate research and outreach. Working in collaboration with Cornell faculty and students from many departments and with cooperators in both the public and private sectors, issues ranging from management of sewage sludges to waste-prevention are the focus of on-going programs.

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BACKGROUND

A "Plan to Phase Out The Fresh Kills Landfill" was issued by the Task Force established by New York State Governor George Pataki and New York City Mayor Rudolph Giuliani during November of 1996. Central to this plan are strategies intended to maximize the amount of New York City waste that is prevented and recycled, in order to minimize the need to export waste when the Fresh Kills landfill on Staten Island closes at the end of 2001.

The Fresh Kills landfill has long been an inexpensive solid waste disposal option for the City. However, the City's reliance on this landfill is being dramatically reduced in anticipation of the scheduled closure. Concurrently, New York City is increasing its reliance on waste reduction initiatives, recycling, composting, and out-of-City disposal.

The US Environmental Protection Agency (EPA) participated in the Task Force established by the Governor and Mayor. In the Task Force Plan, EPA offered to fund Roundtable meetings with the City to address waste reduction issues. The Task Force recommended and the City agreed that the Roundtable meetings would include representatives of various City, State, local, and private organizations who have studied or implemented waste reduction strategies and who could share information and experiences at these meetings.

The New York City Department of Sanitation (DOS), Bureau of Waste Prevention, Reuse and Recycling (BWPRR) proposed to EPA Region 2 that Roundtables be convened to discuss various waste reduction strategies. DOS provided EPA Region 2 with a proposal setting forth the respective roles of the two agencies. EPA agreed to this arrangement, and subsequently provided funding for the Cornell Waste Management Institute (CWMI) to provide the needed services. These included providing input regarding agendas and selection of invited participants, sending out invitations and following up as necessary to recruit participants, providing meeting space and refreshments, moderating the sessions, writing summary reports, and related services. CWMI and DOS worked closely in developing agendas and selecting participants.

The first Roundtable was held November 14, 1997 at the offices of Cornell Cooperative Extension in New York City. The "New York City Materials Exchange Roundtable" provided a forum for materials exchange program sponsors from throughout the nation, including New York City program operators and interested parties. The purpose was to discuss issues critical to the success of materials exchange operations that were also being tackled by the new NY Wa$teMatch Program launched by DOS in April of 1997. A report is available from the Cornell Waste Management Institute which summarizes the findings of that Roundtable (access is available through the world wide web at www.cfe.cornell.edu/wmi/WastRed/MatlExch.html).

The second Roundtable, "The Potential for Composting Collected Wastes to Reduce the NYC Solid Waste Stream," was convened April 3, 1998, also in New York City. This Roundtable, upon which this summary report is based, was held to explore the possibilities of composting collected wastes to help New York City reduce the waste stream. The focus was on large-scale composting, the constraints and issues surrounding composting in a dense urban setting, and how to complement smaller composting efforts taking place in and around New York City.

Experts from the United States, Canada, Germany, and the Netherlands participated in the session, as well as representatives of local organizations interested in composting. Invitees included New York State agency representatives as well as representatives of the Citywide Recycling Advisory Board and Solid Waste Advisory Boards from each Borough of the City.

The Roundtable was an all-day session, convened on April 3, 1998. The Cornell Cooperative Extension, New York City Programs provided the meeting space. (See Appendix A for list of Invitees and Roundtable agenda.)

WELCOMING REMARKS

The session began with brief welcoming remarks from the cosponsors and organizers of the Roundtable: John Filippelli, US EPA Region 2; Robert Lange, Director of New York City Department of Sanitation (DOS), Bureau of Waste Prevention, Reuse and Recycling, and Ellen Harrison, Director of the Waste Management Institute at Cornell University.

INTRODUCTION TO THE NEW YORK CITY WASTE MANAGEMENT SYSTEM

The total amount of solid waste generated in New York has decreased over the past few years, down from approximately 13,000 to about 11,000 tons per day. While there is little yard waste (approximately 5% of the waste stream), there is a large amount of food scraps generated (between 15% and 40%), mostly from multiple-unit dwellings and food service establishments. Consequently, the DOS is very interested in the potential for composting these organic residuals.

Currently, the DOS collects all refuse and recyclables from City residences and nonprofit institutions housed on tax-exempt property. Other wastes are handled by commercial waste haulers. Robert Lange outlined the magnitude of New York City's refuse and recycling services for 3.5 million residential and nonprofit clientele, 40% of whom live in single-family dwellings. All of the refuse collected by DOS either goes directly to Fresh Kills landfill on Staten Island or is collected at transfer stations in the other boroughs. Most of the wastes collected at the transfer stations are loaded onto barges and shipped to Fresh Kills. Earlier this year, the DOS started taking most of the refuse from the Bronx to a transfer station from which it is exported to Virginia. Source-separated recyclables are collected from residential and nonprofit organizations by DOS; leaves and Christmas trees are collected from selected locations.

Private haulers collect the commercial and industrial wastes in the City. They are licensed by the City Trade Waste Commission. There has been a significant change in New York City private waste hauling operations over the past two or three years. Previously, a series of "family-owned" businesses operated most hauling services. Most have gone out of business, and the large multinationals have taken over much of the hauling in the City. Since private haulers are not franchised, several haulers may be operating in the same areas of the City, duplicating routes which makes efficient collection of materials such as food scraps challenging. Commercially collected wastes may be taken to transfer stations located throughout the Bronx, Brooklyn, or to one of several in Queens, or to landfills.

COMPOSTING IN NEW YORK CITY

Robert LaValva, Director of the DOS Composting Program, described the City's composting efforts to date. New York City has been composting organic wastes for approximately eight to nine years. A large educational effort run through the four botanical gardens in the City promotes smaller scale on-site composting, and in the past year DOS has been involved in an extensive backyard composting pilot project with the botanical gardens that not only promotes composting, but also seeks to measure its effect on waste reduction.

Since 1990, residential leaves and yard wastes have been collected by DOS on Staten Island; and that leaf and yard waste collection program is expanding to the remaining boroughs in the City. DOS is working on the expansion of the program in conjunction with the Park Department which is providing areas in which to compost both residential and Park Department leaves and yard trimmings. The compost will be used for park restoration projects, some of which will involve the application of compost to former landfill sites, turning them into parks. There is an in-vessel composting facility on Rikers Island that currently composts about 400 tons per month of food scraps that are collected from four of the Island's ten prisons. This compost facility is owned by the City and operated by a private company (Organic Recycling Inc.).

COMPOST REGULATION

New York State Department of Environmental Conservation regulations (6 NYCRR Part 360) address both the siting, construction, and operation of compost facilities as well as the composting process and the final compost product. Yard waste composting sites receiving less than 3,000 cubic yards a year or composting only food processing wastes or animal manures are exempt from permit requirements, as are sites composting organic residuals generated on-site. For facilities producing compost from sewage sludges and/or solid waste other than animal manure, yard waste or food processing waste, DEC Part 360 regulations define two classes of compost. Based on heavy metal and PCB contaminant levels as well as particle size, compost is designated either Class I or the less-stringent Class II. Class I compost can be distributed for use by the public on food chain crops and other agricultural and horticultural uses, whereas Class II (Table 1) compost is restricted to use on nonfood chain crops. Composts made from yard trimmings and food scraps typically meet Class I standards.

The US Environmental Protection Agency (EPA) has promulgated rules governing production and use of products made from sewage sludges (so-called Part 503 regulations). While not regulated under these rules, many states which do not have specific rules pertaining to compost utilize the Part 503 "Exceptional Quality" standards to evaluate composts made from input materials other than sewage sludges. State rules must be at least as stringent as the federal rules and may be more restrictive. NYS rules are generally somewhat more restrictive than Part 503.

Table 1: NYS and US Standards

Contaminant	NYS Part 360 Standards[1] (ppm dry weight basis)		US Part 503 "EQ" Standards[2] (ppm dry weight basis)
	Class 1	Class 2	
Arsenic	—	—	41
Cadmium	10	25	39
Chromium	100	1000	—
Copper	1000	1000	1500
Lead	250	1000	300
Mercury	10	10	17
Molybdenum	—	—	—
Nickel	100	200	420
Selenium	—	—	100
Zinc	2500	2500	2800
PCB's—total	1	10	—
Particle size	≤ 10 mm	≤ 25 mm	

1. NYS Part 360-5 rules pertain to composts (NYS DEC Oct. 1993)
2. US EPA 503 rules pertain to sewage sludge products (US EPA Sept. 1994)

At present there are no standards for aspects of compost quality such as nutrient or organic matter content or compost stability and maturity which are important to those using compost. This is due in large part to two factors: the nascency of large-scale compost production in this country, as well as the difficulty of developing such standards and guidelines given their dependence on the specific end use of the compost product and varying field conditions.

Standards in The Netherlands, Scandinavia, and Germany in particular are significantly more stringent than those of NYS and EPA with regard to heavy metal content in compost. In addition, many European countries have national parameters for such measures as pH and minimum organic matter content which do not yet exist in this country.

PROGRAM DESCRIPTIONS

Following brief introductions of all the participants, the Roundtable proceeded with representatives of composting programs presenting the following program descriptions: (See Appendix C for additional program information.)

City and County of San Francisco Recycling Program - Jack Macy, Organics Recycling Coordinator

Approximately 1,000,000 tons per year of solid waste is generated in San Francisco. Residential wastes comprise about one third of this total and commercial and industrial wastes, the remaining two thirds. San Francisco has a permit system for private waste haulers that has created a kind of de facto franchise. Two companies owned by the same parent company divide the City up and collect trash and recyclables from both residential and commercial establishments. The non-recyclable materials are taken to a transfer station in San Francisco, then hauled 60 miles to a landfill. There are no contracts between the City and the hauler, but there are "agreements" that the trash will be taken to the transfer station, and then go to the landfill. If the trash is deemed to have commercial value (i.e., certain paper products and other recyclable materials), there is no charge to the generators and the materials can be collected by anyone, which has created a "healthy dose" of scavenging in the City.

There are 5,000 food-related establishments in the City of San Francisco, with over 60,000 tons of food scraps generated in the commercial sector. San Francisco has a commercial food scrap program targeting food generators that started as a pilot project in 1996. The program started with produce wholesalers, but has since expanded to include produce retailers, food service, and other "green vegetative material" generators. In partnership with a private hauler, the City is currently collecting about 5,000 tons per year, but this may double by the summer or fall of 1998. The program may further expand depending on funding and processing capability. The City also started residential yard trimmings and food scrap collection in the summer of 1997 and is conducting a number of pilot projects in ten neighborhoods serving a total of more than 6,500 residents. In six of the ten routes, vegetative food scraps are included with yard trimmings. For comparison, yard trimmings only are collected in the other four routes.

Most of the organic materials collected curbside are transferred into trailers and hauled to a regional composting facility 25 miles away which charges $24/ton tipping fee. There the food and landscape materials are ground and composted in an open windrow system. Other pilot projects are investigating composting within the City itself. These include composting yard trimmings in City parks, composting university food scraps in an on-site in-vessel system, and utilizing large and small vermicomposting systems in schools. However, for the most part, composting in the City has been found to be challenging.

Compost produced at the regional facility is sold primarily to area landscapers and some agricultural operations. The price range is $6-14 per cubic yard. Compost produced by the City's Park Department is used by the department for landscaping in the parks.

The City is looking into the possibility of composting all food scraps, not just vegetative scraps, as a means of meeting California's mandated goal of reducing the amount of trash going to the landfill by 50% by the year 2000. There is a current lack of available permitted capacity to take these materials, but several composting facilities are considering applying for necessary permits.

San Francisco is also working on programs for edible food recovery or redistribution. Through a grant given by the City to the nonprofit San Francisco Food Bank, 40-60 tons of edible food is collected a month from the wholesale district; 60% of which is redistributed as edible food to member agencies (meal programs) and the remaining 40% is used by a local farmer for animal feed. Another grant enables a local nonprofit organization to collect prepared food from the food service industry and deliver it directly to local meal programs.

Prairieland Integrated Solid Waste Management System, Truman, Minnesota - Sigurd Scheurle, Acting Director

Minnesota has a ban on yard wastes in landfills and incinerators. Consequently, there are hundreds of small-scale leaf and grass composting sites throughout the state. Most of these are publicly-owned, but private sites in the metropolitan areas handle at least 50% of the composting. There are eight large-scale mixed waste composting facilities in the state; two of the eight are privately owned. Some of the publicly-owned composting facilities handle yard trimmings mixed with a portion of MSW or mixed organics. Composting in the larger facilities takes place under very controlled conditions.

Collection is primarily handled by private haulers, and Minnesota has suffered from the overturning of flow control. Currently much of Minnesota's waste is being shipped to neighboring states, principally Iowa, where there are cheaper landfill tipping fees. There have been many lawsuits between public entities in Minnesota which own waste management facilities and private haulers as a result.

Prairieland is a mixed waste composting facility in Truman Minnesota that serves and is owned by two counties. The facility receives approximately 90 tons per day of unsorted residential (60%), institutional (5%), and commercial (35%) solid wastes. The plant recovers refuse derived compost (20%), refuse derived fuel (40%), ferrous metal (2%), glass aggregate (2%), and non-ferrous scrap metal (1%). About 10 % of the waste cannot be recovered and is landfilled. Another 25% of the waste delivered is lost as CO_2 and water vapor during biological and physical processing. Markets for the compost include crop production (corn and beans) (65%), land reclamation (mining and landfills) (20%), animal bedding (10%), and nursery/landscaping (5%).

In order to keep tipping fees competitive, Prairieland is subsidized from local taxes ($60 per household; $160 per business, per year). The initial cost of the plant was about $7,000,000, with the state returning $2,000,000 in grant funds. Currently, negotiations are taking place with the largest hauler in the state to deliver waste to Prairieland in an effort to reduce disposal costs.

Sevier Solid Waste, Inc., Sevierville, Tennessee - John DeMoll, Director

Sevier County owns a co-composting facility serving the county, three cities, and a tourist population of over 9 million visitors a year. The facility was formed as a nonprofit corporation in 1990 with a board of directors made up of three City managers, and an elected county executive. The facility handles approximately 200 tons per day of mixed solid waste and 80-100 tons per day of sewage sludge. The enclosed facility covers approximately two acres, with an additional eight acres for a biofilter and parking facilities. Bedminster Bioconversion Corporation operated the Sevier facility for five years, however, this past year, Professional Services Group, PSG, underbid Bedminster and assumed operation. The tipping fee is $36/ton, which covers the bond issue and operation of the landfill, composting, and recycling facilities.

When designing the solid waste management system, Sevier had to keep in mind the 9 million tourists visiting the area each year, and decided an easy to follow source-separation system was necessary in order to capture recyclables and prevent collection of improperly sorted materials. Curbside collection is provided for cardboard and drop-off centers are available for newspapers, magazines, phone books, and used oil. Demolition debris is taken to a landfill. All the remaining wastes go to the co-composting facility. This system allows for the recovery of a significant portion of the waste stream without requiring source separation, which is not considered practical given the large percentage of wastes generated by tourists. In addition, the large tourist population means that there is a high proportion of compostable food scraps in the waste stream.

Once received at the facility, wastes are dumped on the tipping floor and any large uncompostable items are removed. The compostable waste is then put into a rotary digester and mixed with sewage sludge. Air is pumped into the system to keep it aerobic. After three days in the digester, the very immature compost is put through a 1¼ inch screen to remove materials that have not broken down. Aluminum and ferrous metals are separated out during this stage. One to two hundred tons per year of aluminum is screened out and sent through a shredder and trommel screen. A magnet is used to remove ferrous metals. Both the aluminum and ferrous metals are sent to a plant in Tennessee for recycling. The other materials removed by the screen are primarily plastics and textiles which are landfilled. After screening, the immature compost is moved by a front-end loader to the aeration floor where the material continues composting for an additional four to six weeks and is then screened prior to distribution. The finished compost is sold to a soil mix company in Knoxville, used for strip mine reclamation in Kentucky, and distributed to local residents for use as a soil amendment.

nv VAM, The Netherlands (state-owned company) - Joop van Tubergen, Manager R&D

In The Netherlands, municipalities are responsible for household waste and its disposal. There are source-separation programs for paper, glass, organics, textiles, and toxic/ dangerous waste. Private or public haulers, depending upon the municipality, collect the materials. Currently, a household collection fee pays for collection, with a cost differentiation between two person households and three or more person households. The Netherlands has found that charging by weight can reduce the amount of biowaste generated by as much as 30%, and plans are to implement collection fees based on the weight of the wastes generated. The total amount of collected biowaste (the organic fraction of household refuse) in The Netherlands is 1.5 million tons per year from 15.5 million inhabitants. nv VAM, which has been involved in composting for more than 75 years, and subsidiary companies process approximately 675,000 tons of source-separated biowaste per year.

Since the 1990s, the Netherlands has had a separate source collection program for organic residuals. All food scraps and garden trimmings can be included in the collected biowaste. Vacuum cleaner bag contents, diapers, cat box contents, and beverage containers are not accepted. Initially, biowastes were composted in open windrows that were turned two or three times over a composting period of 13 weeks. Odor complaints led to the construction of enclosed systems with forced aeration and biofiltration.

The VAM in Wijster plant has a capaCity of 400,000 tons per year. The feedstock is approximately half yard trimmings and half food scraps, with some seasonal variation. It is an enclosed system with five bins for flat windrows with forced aeration and biofilters that treat exhaust air and recirculate it back through the system. The compost is turned weekly and temperature and moisture are adjusted. The materials spend about five weeks in the enclosed system, then are moved to another site for at least two months to mature. Investment in the facility was about $50,000,000. The current tipping fee is $48/ton, but that is soon expected to increase to $55/ton. The compost is sold for between $2 and $10/ ton, depending upon quality.

Arbeitsbereich Abfallwirtschaft, Hamburg, Germany - Prof. Dr. Ing. Rainer Stegmann

Municipal solid waste in Germany is collected by the municipality, the county, or private companies and disposed of in landfills (70%) or incinerated (30%). Due to the “green dot” system and the separate collection of packaging materials and biowaste (kitchen and yard waste), waste disposal has decreased by 25-30% in recent years.

New regulations in Germany define two kinds of waste: waste for disposal and waste for recovery. Materials having a high calorific value (greater than 11,000 kilojoules) and meeting some further requirements can be incinerated for energy recovery and counted as recovered; materials with lower heat values can also be incinerated, but this is considered disposal. By the year 2005, all waste will have to be incinerated prior to landfilling. Consequently, landfill operators are currently offering low prices in order to fill up the landfills by the year 2005. Due to lower landfill tipping fees and reduced waste generation, less waste is going to the incinerators, which are responding by reducing their tipping fees.

Germany's waste regulations require separate collection of biowastes. Biowastes are placed in special "bio-bins" and collected by the municipality. Most collected biowastes are composted using one of several different systems. These include aerated windrows; aerated pellet systems where the materials are formed into squares with air circulating between the pellets; aerated box container systems; enclosed aerated tunnel systems; and rotating drums. Open windrows are being phased out in Germany due to water pollution. Some smaller facilities use windrows covered with a fabric that is impermeable to rain, but allows the compost to breathe.

COMPOST INPUT AND COMPOST QUALITY

Participants in the Roundtable represent composting facilities that practice different levels of source separation of materials prior to composting. There is general agreement that the cleaner the input materials, the cleaner the compost product. Thus source-separated organic materials will produce a compost with lower levels of chemical and physical contaminants than a compost produced from mixed municipal refuse. However, there are trade-offs. Collection of source-separated materials will result in less diversion since some compostable materials will remain in the waste stream destined for disposal. Separate collection also presents significant costs since collection costs are often the largest fraction of municipal waste management expenses. Convenience and potential nuisance (odors, vermin) issues can also present challenges for acceptance of source separation by residents and businesses.

Because input materials are key, a waste analysis should be conducted prior to facility design. A plan can then be developed to address desired components of the waste stream and necessary compost quality to meet desired end uses.

A Dutch analysis of heavy metals in separately-collected organic household waste shows lower levels of heavy metals than found in mechanically-separated organic household waste. However, the heavy metal content even in the mechanically-separated waste may still meet US EPA standards for sewage sludge (Part 503) (Table 1). Dutch standards are stricter than the US Part 503. The following table details the results of the Dutch analysis.

Table 2: Heavy Metals in Compost Types				
metal	refuse	mechanically separated	source separated organic fraction	Dutch standards bio-waste
Cd	7.3	2.1	0.5	1
Cu	512	290	31	60
Ni	112	40	8	20
Zn	1,640	870	161	200
Pb	850	740	56	100
Cr	164	75	13	50
Hg	3.3	n.d.	0.13	0.3
As	7.3	n.d.	4	15

Source: Joop van Tubergen, nv VAM

Mechanically separated wastes at Prairieland and Sevierville produce composts which meet Part 503 "EQ" standards. It is possible that NYC could meet applicable NYS standards (at least for Class II compost) by collection and processing of mixed MSW (see Table 1 for NYS standards). Such a system would have the benefit that separate collection, and its attendant costs, could be avoided provided that the quality of the product was determined to be satisfactory for its intended use.

Even with source separation, contamination can be a problem if generators do not sort appropriately. In Germany and The Netherlands, experience with collection of biowastes from residences in densely-populated areas where several families use one "bio-bin" showed that joint bins become more contaminated than single-family units. With joint bins, no one feels responsible for the bin and there were problems with odors and flies. In Germany, they found that the contaminant levels in joint bins were up to 15%, as opposed to 1% in single-family bins.

To attract clean organic residuals to the facility, Prairieland offers a discount on tipping fees to grocery stores which provide source-separated organics. Separate roll-out bins at the stores collect cardboard and pre-consumer produce scraps. The materials are relatively clean and make a good feedstock.

Roundtable participants agreed that the composting system must be designed to meet the needs of the end users of the compost. Composting should be viewed as producing a product, rather than disposing of wastes. Thus the level of separation required is related to the desired end product quality. For example, the quality of a compost that is going to be used as a landfill cover is not as critical as the quality of an end product intended for marketing to landscapers or to the public.

The following observations by Roundtable participants illustrate these conclusions:

- Organic Recycling Inc. will only accept pre-consumer vegetative waste and clean wooden pallets for composting at most of the facilities the company operates. Beng

Leong Ooi explained the company's philosophy: "When 70% of your revenue comes from product sales and 30% from tipping fees, you become very selective about what you take. What you put into compost must match what you want to sell in the marketplace."

- Organics recovery in Minnesota began in response to the banning of grass and leaves from Minnesota's landfills. Sig Scheurle suggested that in hindsight, they would look at organics recovery like they looked at aluminum recovery. Is there a recoverable value that could go to some value-added product? He also pointed out that while there are good technologies to deal with MSW composting, the product still has film plastics in it and has the potential for lead content in the 200 ppm range which can be acceptable, depending on the needs of the users.

- Roger Tuttle, Compost America, stressed that it is feasible to operate a facility capable of receiving mixed municipal solid waste and turning it into a quality compost, but it is not inexpensive.

- Will Brinton of Woods End Laboratories confirmed that the studies from his laboratory are consistent with the findings of others in demonstrating the relationship between input quality and the quality of the compost product. The question is whether the customers, regulators, or the public view the quality of the compost produced from different input materials as a problem.

- The need to increase the awareness of consumers about biodegradability and what can be composted was raised by Brinton. Even the compost industry and scientific community know little about biodegradable plastics, for example, and there are no standards for biodegradability.

COLLECTION AND TRANSPORTATION

Collection and transportation expenses are a large proportion of the costs incurred in managing solid wastes. Currently, it costs New York City $150-$175/ton for collection, $40/ton to operate Fresh Kills, and $55/ton to export wastes. In determining relative costs of various waste management options, it was suggested that consideration be given to the cost of transporting the materials, road maintenance costs, and time lost due to congestion of New York City roads. One approach could be to manage waste more locally where feasible, especially organics which tend to be heavy and wet. San Francisco uses a compactor truck to remove the water from collected food scraps, reducing the weight by about 25%. The waste water must be collected and diverted to the sewer system. If such a system were used in New York City, the impact of the waste water on the City's sewer system would need to be evaluated.

There are a number of problems facing New York City in regard to collection of organics. The fact that collection of commercial wastes is handled by the private sector with overlapping geographic coverage makes it difficult to design an efficient collection system for separated organics. In some areas a "milk run" for collection from restaurants and other food service establishments and grocery stores has been suggested, but in New York City this would be complicated by the nonexclusive collection routes.

In California, several supermarket chains use delivery trucks in dual roles. On the initial run, materials are delivered from the distribution center to the supermarket for marketing. On the return run, the truck "backhauls" packaged organic waste materials back to the distribution center where the waste is then transferred to a compost center. Unfortunately in New York City, one truck often stops at several different stores to make deliveries which would preclude loading wastes into the partially-full truck. The use of trailers hauled behind the delivery trucks might provide a solution, but in tight City streets this might be a problem and it might also pose a problem for unloading the truck.

Another aspect of source-separated collection of organic residuals is the need for on-site storage of materials while awaiting collection. Space limitations and proximity of neighbors make storage a major issue in the City. Most grocery stores, restaurants, and cafeterias do not have a suitable location or sufficient space to collect and store food wastes prior to collection.

In Europe, yard trimmings are collected together with food scraps. The dry yard trimmings mixed with the heavy wet food scraps make the biowastes easier to collect. Even so, The Netherlands is considering stopping separate collection of biowastes in its larger inner cities, Amsterdam for example, because collection in dense urban areas is too problematic and costly. The problems are restricted to the "Old City" areas, where multiple families use a common bio-bin; the suburbs have posed no problems. Both Germany and The Netherlands will focus on collection of biowastes from areas where collection is less problematic.

COMPOSTING TECHNOLOGIES

All methods of composting can potentially work well. Economics, space availability, and type of feedstock are factors in selecting the appropriate technology. A system has to be designed for the particular feedstock materials and quantities and for the particular site. Proper management of facilities is key to composting success.

Open windrows, the most basic composting system, are not well suited to composting in dense urban areas. Open windrow composting takes more time and space than more intensive systems. Organic wastes collected in San Francisco are composted in an open windrow system, but it is located 25 miles away from the City, with few neighbors.

A variation of the open windrow system is aerated static windrows. In Germany some facilities cover the piles with a fabric that lets the compost breathe, but is impermeable to rain. Where adequate space is available, this is an inexpensive but effective method for composting. Space requirements make this an unlikely option for in-City composting.

More intensive controlled technologies in enclosed facilities are generally employed where large amounts of mixed organic wastes are composted, especially in areas with nearby neighbors.

Tunnel technology is a relatively recent approach which was developed in the mushroom industry. Tunnel systems are used in some places in The Netherlands and Germany for composting biowastes and for some sewage sludge processing in the US. It is a highly controlled batch-loading system. Current tunnels have evolved into sophisticated computerized systems that maintain uniform conditions. Every tunnel is controlled individually, so it is possible to treat organic residues with different qualities differently, or to produce different qualities of compost in different tunnels. Tunnels also have the advantage of potentially releasing fewer odors than other systems. Potential drawbacks may be cost of such systems for handling very large volumes.

There is increasing interest in anaerobic digestion in Germany. Anaerobic digestion replaces the intensive phase of composting and is generally more suitable for homogeneous liquid waste, but relatively dry mixed waste can also be successfully anaerobically digested. When successful, the end products include methane gas suitable for fuel and a compost-like material. This process reduces the odor emissions significantly and has in contrast to composting, a positive energy balance.

Biofilters are an effective means of controlling odors. They can be as simple as a 6-inch cover layer of finished compost, shredded bark, and/or other materials laid over a static pile, but usually involve a blower or ventilation system to collect odorous gases and transport them through a filtration medium. Typically, in an open system, the gases are distributed through the bottom of the filter media via perforated piping systems surrounded by gravel. Closed systems usually utilize a perforated aeration plenum where the pressure inside the enclosure is greater than the outside pressure–forcing the gas through the filter. As the gases filter through the medium, odors are removed through biological, chemical, and physical processes. In containerized modular systems, a specially designed biofilter can be installed to capture exhaust air and recirculate the air back through the system.

The Sevier plant experienced some problems with the original biofilter system that was installed when the plant was built. The exhaust air is drawn out of the compost and piped to a biofilter that is made up of a combination of compost, wood chips, and sand. Rain hitting the biofilter caused the materials in the biofilter to compact, requiring frequent excavation and reconstruction. This problem was solved with the addition of a new compost turning machine that agitates and turns the biofilter materials about once every four to six weeks. New wood chips are added to the mixture and additional moisture is added during very dry seasons.

Exhaust air piped into biofilter tends to be dry due to the increased temperatures in the composting system. Compaction problems in the biofilter in the Dutch facility have been eliminated by saturating the air before it enters the biofilter. Introducing a high pressure drop in the scrub floor and a small pressure drop in the biofilter itself can also help with air distribution in the biofilter.

A combination of wet scrubbers and a biofilter are used in some German facilities. The bioscrubber reduces the amount of organics that are carried into the biofilter. This reduces the temperature increase experienced in the biofilter by reducing the biological activity. As a consequence, the biofilter is less prone to drying out. This is a more costly process, but it does promote lower odor emissions. Another new development is the operation of a multi-storage biofilter. Rather than a large shallow bed, biofilter materials are placed in a container where the air is forced from the top to the bottom. The forced air follows the natural flow of the water, and helps to control the moisture content in the biofilter material.

GOOD MANAGEMENT PRACTICES

As discussed above, facility design, compost quality, and end uses are all related to input materials. Thus ensuring that input materials are of the quality anticipated is a critical management issue. Education of generators and haulers of source-separated organics regarding what materials are to be included and how they should be handled is necessary and must be repeated and reinforced. This includes training of workers responsible for separation at commercial facilities which generate organic residuals.

Operation of the composting facility has a large impact on the efficiency of the process and the compost product. Involvement of plant operators in design and refining of the composting process is suggested. Training needs include process operations to promote an understanding of the "cause and effect" relationship to compost quality. For example, workers should not only be trained in how to monitor and adjust moisture content, but also the significance of moisture content and how it can affect odor generation, corrosion of equipment, and fire hazard. Workers should also be trained about health and safety issues.

Maintenance of composting facilities is critical and maintenance considerations should be part of facility design. A schedule for periodic maintenance should be established. Where facilities are owned by one entity but operated by another, maintenance responsibilities need to be clearly spelled out in a contract since the incentive for maintenance would rest with the owner and not the operator.

Where space is limited, there may be pressures to distribute compost that has not matured sufficiently. The necessary extent of curing depends on the end use. For end uses requiring mature compost, facilities should be designed with sufficient storage area for curing. In addition, storage may be needed when the market for compost is seasonal.

MARKETS AND END USES OF COMPOST

Plans for the end use of a facility's compost should be part of initial program planning. As discussed above, the quality of the final product will vary depending on input materials, process design, and process management. In addition to quality related to levels of metals or plastics residues, compost maturity is an important quality criterion. Different end uses require different quality considerations. For horticultural uses, quality consistency is critical. This is the market targeted by Organic Recycling, Inc. which leads them to be very restrictive in regard to input materials. On the other end of the spectrum, final landfill cover is an end use for compost that may not be of a quality suitable for agricultural or horticultural uses. The potential to use compost as final cover for the Fresh Kills landfill was discussed, but the time frame both for how quickly cover is needed and the duration of potential use of only several years makes that an unlikely option.

Composts produced by Roundtable participants are used in numerous applications. The Netherlands distributes its compost mostly to agricultural operations, as well as for use in parks and home gardens, and for land reclamation. Sevier sells its finished compost to a soil mix company and for land reclamation, and provides it to local residents. Organic Recycling Inc. sells composts to landscapers, nurseries, and gardeners. In Germany, the compost is given away, mostly for agricultural operations.

Beneficial properties of composts continue to be investigated. There is developing interest in using compost for controlling plant pathogens. Studies have shown that some mature composts are effective as fungicides in controlling some forms of leaf wilt and root rot. This presents opportunities to create a market for specialty composts.

The timing of demand for compost is an important consideration. A number of uses are limited to certain times of year. Compost facilities must plan for storage of compost during times when demand is down. In considering composting of organic wastes within New York City, if local gardens are the potential end use, a significant concern is the seasonality of demand and the lack of space to store compost during the rest of the year.

For some uses it is not necessary to have a fully mature compost. However, compost maturity is a critical aspect of compost quality for horticultural use. Composts may seem to be ready for use based on appearance, feel, and odor, but may not be fully mature. Use of immature compost can result in plant mortality. Users of such immature compost are likely to conclude that compost is an undesirable product. Compost operations need to provide sufficient space for curing and test composts to ensure that they are adequately mature prior to distribution.

FINANCING COMPOSTING FACILITIES

Construction of compost facilities can be funded by public, private, or mixed financing. Bonding of major capital costs with recovery either through taxes, tipping fees, or a combination would cover costs of publicly-supported facilities. Grants may also be available to municipal entities. The NYS Department of Environmental Conservation, for example, has funds available for such construction. Pilot projects may also be eligible for funding from the NYS Energy Research and Development Authority and from the Empire State Development Office of Recycling Market Development.

Compost facilities may be operated by either public or private entities. Roundtable participants represented facilities that are fully public owned and operated (Prairieland), others that are publicly funded and receive public oversight, but are operated by the private sector (Sevier), and fully private facilities. The present trend is to use private management companies to run facilities. Establishment of clear contractual responsibilities where there is a public/private mix is critical, particularly in regard to long-term maintenance activities.

The overturning of flow control by the courts has made the funding of compost facilities problematic. Tipping fees at compost facilities must be competitive with costs of other waste management options in order to attract input materials. With the current low landfill tipping fees, some communities are finding it necessary to subsidize compost facilities through taxes or other fees beyond tipping fees.

Costs are not the only factor driving waste reduction options such as composting. In New York City, for example, a local law mandating recovery of a certain percentage of materials from the waste stream may encourage composting even when disposal may be less costly in the short run.

Private investors in large compost facilities look at two major components when considering investment in a composting facility. The first component is the technology risk factor to determine that the facility as designed can handle the volume of materials and produce a quality product at the quoted operating price. The second component can be called a marketing risk factor. The investor is likely to want a long-term contract in place which specifies that generators promise to deliver a minimum amount of waste over a given period of time which is sufficient to amortize the debt service (a so-called “put or pay” contract). Usually these factors require a two-part package with the design and operation contract on one side, and the market supply contract on the other side.

RECOMMENDATIONS TO HELP NEW YORK CITY’S DECISION-MAKING PROCESS

The development of composting plans should be part of an integrated plan based on a holistic look at the entire waste stream and waste management options. Waste prevention is the most desired waste management option. Ways to reduce the amount of organic waste being generated include using landscaping materials that generate minimal trimmings and diverting food scraps for use by food pantries or for animal feed rather than composting. Some edible food scraps generated in the City are currently being distributed through programs such as City Harvest, Inc. Another innovative solution would be implementing portion control or student choice in school and other cafeterias.

Economics will clearly play a large part in determining the role of large-scale composting in New York City. However, political and social considerations also play a key role. With current economics, the high costs of collection and processing of separated organics and low landfill tipping fees favor export to landfills or perhaps composting of unsorted MSW. On strictly economic terms, then, it will be difficult to justify to the NYC taxpayer the reasons for separate collection of organic wastes and composting when it is cheaper to landfill the materials, at least in the short term. On the other hand, waste reduction is mandated by City law and source separation is State-mandated, and both mandates are favored by many of the citizens.

In NYC, other options for reducing the quantity of organic residuals going to disposal, such as smaller scale composting, may be more feasible than large-scale collection and composting. The scale of New York City can be daunting. Rather than conceiving of a single "solution," continued expansion of localized composting may be effective. Examples might include expansion of programs to encourage small scale on-site composting at homes, schools, and businesses; increased composting in parks; composting at Housing Authority properties; and composting at community gardens. Programs focused at the community level can help people see what can be accomplished. Programs might begin with sectors likely to be successful and tackle more problematic neighborhoods or sectors after initial successes are documented. Thus areas with many restaurants or cafeterias and single-family homes might be first targets.

Additional pilot projects to evaluate different collection schemes or to focus on collection from selected generators (types of businesses or residential neighborhoods) could be useful. The opportunity for mechanical separation of mixed waste, for example, might be tested as an economically attractive method to reduce the volume of the waste that has to be landfilled, provided the quality of the product was determined to be satisfactory. Some City wastes might be diverted to existing composting facilities on a test basis to determine compatibility and compost quality (e.g., send some wastes through the Sevier plant).

Finally, continuing dialogues such as this Roundtable to learn from experiences in other urban areas will provide ideas and practical information that can help the City reduce the quantity of organic residuals being disposed.

Appendix A
List of Invitees and Attendees to April 3, 1998 NYC Compost Roundtable
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Appendix B
AGENDA FOR ROUNDTABLE ON

The Potential for Composting Collected Wastes to Reduce the NYC Solid Waste Stream

Sponsored by U. S. EPA, Region 2 and The Cornell Waste Management Institute
on behalf of the NYC Department of Sanitation

April 3, 1998 8:30 am - 5 PM
Cornell Cooperative Extension Office (212 340-2900)
16 E. 34th Street, NY, NY

8:30 - registration, coffee and pastry

Issues: *to consider throughout:*
practicality in densely urban setting; impact of lack of flow control -economics

9:00-10:00
INTRODUCTIONS

Welcome
EPA, Region 2
NYC Dept. of Sanitation
Overview of the Roundtable
CWMI
Composters and Program Managers briefly (~5min each) describe their programs
your role
type and quantity of inputs and sources
type of compost system
end use
who is responsible for what (public/private)
funding and staffing
current tip fee
how is composting integrated with management of other solid wastes
Other participants briefly (~1min) introduce themselves
why are you here, what are your plans

10:00-11:00
WHAT GETS COMPOSTED?

what components
separated by whom
when (on-site source sep. vs. post-collection vs. post composting)
quality of the compost

Issues: *potential trade-offs of quantity vs. quality (mixed waste composting vs. source sep. organics)*
costs
educational or other strategies to promote source separation
any regs or policies that help promote separation (e.g. ban on organics in landfills or incinerators; differential trash fees)

11:00-12:00
COLLECTION AND TRANSPORTATION

collection/transportation options

mixed waste vs. organics
temporary holding of scraps on-site or at transfer stations
"milk runs" for institutions and businesses

Issues: *dewatering to reduce costs and handling problems*
costs
hauler willingness

12:00-1:00
LUNCH

1:00-2:30
COMPOSTING METHODS

technologies (including anaerobic design)
enclosed vs. open
scale of facility - relationship of TPD to area of facility
siting

Issues: *trade-offs of "remote" sites vs. space and nuisance issues in NYC*
costs/flexibility of different options
fires
odors

2:30-2:45
BREAK

2:45-3:45
COMPOSTING OWNERSHIP, MANAGEMENT and FINANCING

tip fee
how facilities are financed (capital and operating costs)
who owns facilities
who operates facilities

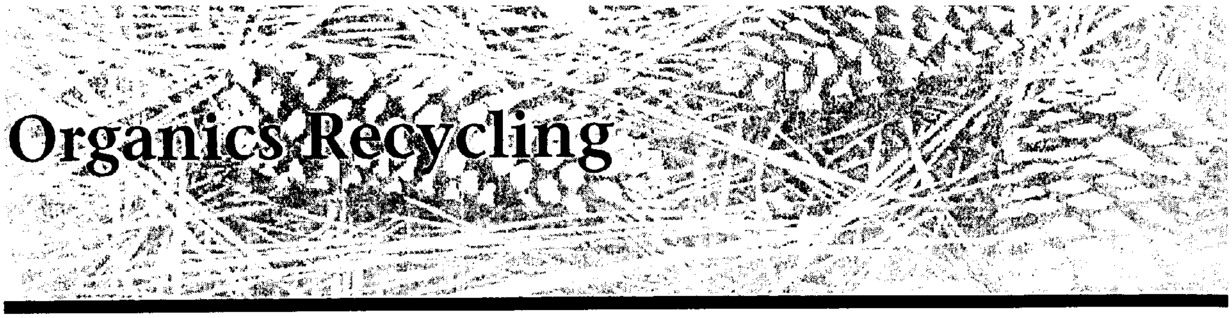
Issues: *pros and cons of public vs. private vs. mixed ownership and operation*
trade-offs of municipal control vs. financial responsibility
political impact of out-of-town wastes at private facilities
impact of the changing costs of non-compost options
impacts of lack of flow control

3:45-4:45
MARKETS AND END USE

landscapers
bagged product
procurement by city agencies
landfill cover
agriculture

Issues: *ensuring quality/developing a product*
relation of quality to inputs and compost processing
how to encourage procurement

4:45-5:00
UNFINISHED BUSINESS



Organics Recycling

OBJECTIVES:

To reduce San Francisco's total waste stream by 50% by January 1, 2000. To help meet this goal by recycling as much as possible of the City's organic wastes.

FOR INFORMATION CONTACT:

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BACKGROUND

The primary organic components of the San Francisco solid waste stream include green waste (e.g., backyard and park landscape trimmings, Christmas trees, flowers and manures), food waste and wood waste (e.g., pallet and construction debris). Green waste, food waste and wood waste make up more than one-quarter of the City's waste stream.

Estimated Organics Generation, Disposal and Recovery in San Francisco, 1997 (35% Residential and 65% Commercial/Industrial)

Waste Type [1]	Tons Generated	% of Total Solid Waste Stream	Tons Disposed	Tons Recycled	% Recycled
Food Waste	152,000	15%	122,000	30,000	20%
Wood Waste	80,000	8%	65,000	15,000	19%
Green/Yard Waste	55,000	5%	33,000	22,000	40%
Organics Total[2]	287,000	28%	220,000	67,000	23%

[1]Includes residential, commercial and industrial sectors. [2]Does not include paper products, textiles or biosolids.

CURRENT PROGRAMS

FOOD REDISTRIBUTION

Non-profit agencies, such as the San Francisco Food Bank and Food Runners, collect more than 2,000 tons a year of edible discarded food from produce wholesalers, food processors, supermarkets and restaurants. This food is redistributed through more than 300 agencies to those in need, partially funded by grants from the San Francico Recycling Program.

ANIMAL FEED

Produce waste separated from edible food (at the Food Bank), as well as brewery and tofu food processing waste is collected and used as cattle feed. Bakery waste from a number of businesses is collected and processed for animal feed. More than 13,000 tons per year of food waste go to animal feed (not including rendering).

RENDERING

Most food processors, meat markets and restaurants that generate grease, fats, bones or fish waste are collected by renderers to recycle into various products.

At the rendering facility, materials are processed or "baked" and then mechanically separated into four main by-products: animal feed, soap, hide and fatty acids. They are used to produce everything from lubricants to cleaners to plastic goods. More than 11,000 tons per year of material goes to rendering.

COMPOST/MULCH PRODUCTION

Compost has many beneficial properties including providing valuable organic matter, increased aeration, improved water and nutrient retention, erosion control, and plant disease suppression when applied to soils. Composting or mulching is being accomplished through the following programs:

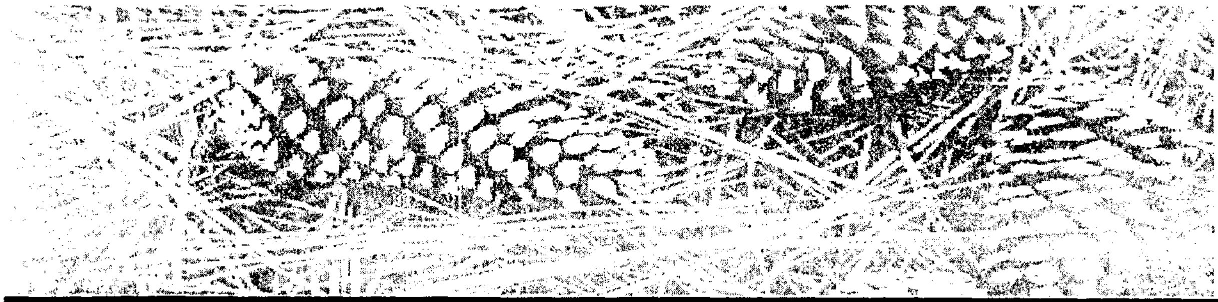
HOME COMPOSTING

The San Francisco Recycling Program, in partnership with the San Francisco League of Urban Gardeners (SLUG), promotes and implements a comprehensive residential composting program. This includes a Community Composter Training Program to train volunteers to conduct outreach in their communities; distribution of discounted compost bins; free composting workshops; educational centers and hotline consultations.

San Francisco RECYCLING PROGRAM

April 1998

PRINTED ON RECYCLED PAPER



NEXT STEPS

Further evaluation and testing of organic recycling options and local and regional markets are needed before large scale implementation of organic recycling and product marketing can occur.

Pilot projects will continue to be implemented to demonstrate collection, processing and product viability.

Page Two

HOME COMPOSTING (CONT'D)

Over 3,000 tons of organic material were diverted by home composters in 1997.

SCHOOL/COLLEGE COMPOSTING

Classroom and cafeteria composting programs in San Francisco's public and private schools have been developed with Recycling Program assistance. Programs at 7 schools included training and distribution of worm bins. This program is being expanded. University composting programs include a large worm composting system at the University of San Francisco and a 1,000 lb./day food and yard trimmings "in-vessel" composting system at San Francisco State University, both set up with City grants.

CITY PARK COMPOSTING

The City's Recreation and Parks department composts and mulches approximately 22,000 tons per year of landscape debris and manure in City parks. Most of the end-product is used in the parks and the rest is used on road ways.

COMMERCIAL COMPOSTING

Fruits, vegetables, floral waste and waxed cardboard boxes are being collected, through a partnership between the San Francisco Recycling Program and Sunset Scavenger Company and recycled into compost at a regional composting facility. As of February 1998 over 100 businesses participated in this program, diverting more than 4,000 tons per year. This is expected to increase to over 200 businesses and 8,000 tons per year in 1998.

RESIDENTIAL COMPOSTING

Yard trimmings and/or fruit and vegetable scraps are being collected from more than 6,000 households in 9 areas of the City. This program is a partnership between the San Francisco Recycling Program and Sunset Scavenger Company. This material is recycled into compost at a regional compost facility.

More than 200 tons were diverted in the first 5 months of the pilot program. Depending on the success of the progam, it may be expanded to additional neighborhoods.

CHRISTMAS TREE RECYCLING

More than 75,000 Christmas trees (750 tons) were recycled in early 1998, through a city-wide curbside collection and several drop-off sites.

WOOD REUSE AND REMANUFACTURING

Clean wood waste from pallets or construction debris is collected and remanufactured into new lumber, such as particle board. Wood items, such as pallets, are collected, repaired and resold by various businesses. The San Francisco Recycling Program supports organizations that buy and sell used building materials such as doors and windows.

THE CHALLENGE

To significantly increase organics recycling, the infrastructure to collect and process large quantities of organics into marketable end-products must be expanded. For example, the biggest potential market for green/yard waste and (inedible) food waste is likely compost use. This option currently depends on utilizing regional composting facilities, which can take only vegetative material and not all food waste. In the future, facilities may be able to take all types of food and soiled paper products that cannot be otherwise recycled. The success of organics recycling depends not only on the above infrastructure but also on funding and participation.

REVISED APRIL 1, 1998

Joop van Tubergen, manager R&D
nv VAM, The Netherlands (state-owned company)

OVERVIEW OF VAM COMPOSTING ACTIVITIES

1929 - 1983 Production of compost from household refuse (15 - 20% of the private households in the Netherlands). Van Maanen process: 6 metres high windrows of compacted refuse, turned twice or three times during a composting time of several months.

1983 - 1989 Production of compost from the organic fraction that was mechanically separated from household refuse (fraction < 40 millimetres). Composting was done in windrows (4 metres high) with forced aeration in the open air. Residence time 12 weeks.

1984 - to date Production of compost from source separated bio-waste (organic fraction of household refuse). First projects were running in 1984. Composting system was identical with that of the fraction < 40 millimetres.
Odour complaints enforced the development of an enclosed system, operational in 1993, comprising: sorting (150 millimetres), enclosed composting with forced aeration in a building with a residence time of 5 weeks, turning once a week. Temperature and moisture are controlled. After the intensive phase in the building the raw compost is sieved (40 millimetres), the raw compost matures in piles during 2 - 3 months. The mature compost is sieved (10 - 16 millimetres).

markets
- 38% agriculture;
- 32% recreational areas;
- 20% private gardens;
- 10% others.

composting plants
Wijster
400,000 tonnes per year (11,000 tonnes per week) from 3.3 X 10^6 inhabitants, established in 1993, investment $ 50 X 10^6, staff 36 persons, energy consumption 35 kWh per tonne bio-waste, yield 40% on bio-waste, current tip fee $ 48 per tonne ~~(under negotiation is~~ an increase to $ 55 per tonne. (under negotiation)

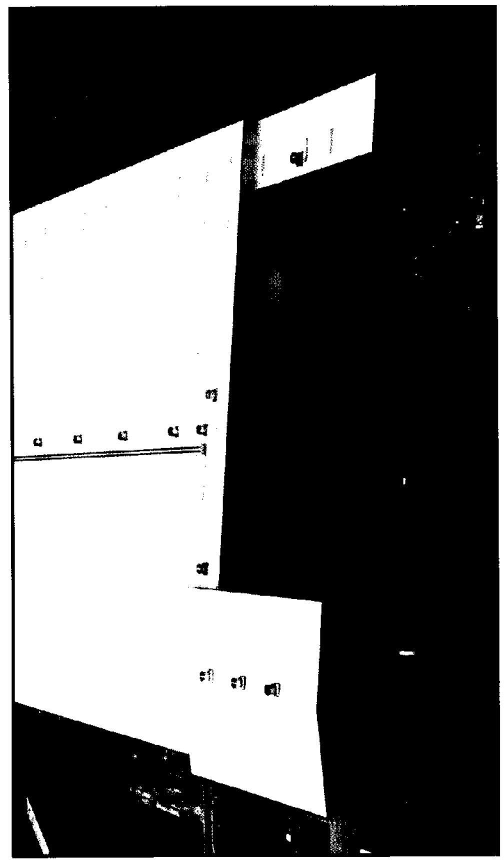
Other plants in:
- Purmerend (75,000 tonnes per year);
- Moerdijk (100,000 tonnes per year);
- Rotterdam (100,000 tonnes per year),
- Gescher (Germany, 37,500 tonnes per year);
- Beerse (Belgium, 60,000 tonnes per year).

SEVIER SOLID WASTE, INC

Sevier Solid Waste has one of the most comprehensive solid waste management programs in the state.

The non profit corporation was formed to service the rapidly expanding solid waste disposal needs of Sevier County and the cities of Sevierville, Pigeon Forge, Gatlinburg, and Pittman Center.

Since this area is the western gateway to the Great Smoky Mountains National Park, Sevier Solid Waste also is managing the waste of over 8 million visitors a year.



CO-COMPOSTING & CARDBOARD RECYCLING facility in Sevier County, Tennessee. The three digest are in the foreground.

SOLID WASTE TONNAGE

MATERIAL	TONS
Garbage	53,537
Demolition	12,173
Sludge	5,813
Tires	560
Recycling Containers	266
Cardboard	391
Grease	57
TOTAL TONNAGE	**72,797**

Residuals put in landfill: 20,141 tons

Recycling/Reduction Rate: 72.3%

RECYCLED AMOUNTS

MATERIAL	TONS
Composted (Paper, Food Waste, Sludge, and Grease)	38,509
Mulch (Wood Waste)	1,200
Ferrous Metal (Tin Cans, etc.)	651
White Goods (Appliances, Sheet Metal)	60
Cardboard	391
Newspaper	258
Plastic	15
Aluminum	106
Wood Pallets	100
Used Motor Oil	1,800 gal.
Tires	560

Solid waste is collected by each city and county. The four cities (Sevierville, Pigeon Forge, Gatlinburg, and Pittman Center) operate their collection vehicles and provide curbside collection of waste. Sevier County has been operating a convenience center system providing service at eleven sites located throughout the unincorporated areas.

Since October 1992, waste from the above mentioned entities has been brought to the composting/recycling facility at 1855 Ridge Road. Currently, the waste is dumped on the tipping floor where large items are pulled out and placed in the residual trailer. Then a front end loader pushes the material into one of three loading hoppers and a ram pushes the materials into a rotary composting digester. In each digester over 75 tons a day of solid waste and sewage sludge are mixed and the compostable materials (paper, food waste, and sludge) are broken down over a three day period.

After the three day retention period, the digester material is discharged and sent through a trommel screen. Screened materials are moved by front end loader to the aeration floor where the material continues composting for an additional 4-6 weeks. Oversized items are conveyed under a magnet which recovers ferrous metals that are sent to Southern Alloy for recycling. In addition, the compost plant has an aluminum separation system. This aluminum also is collected and recycled by Southern Alloy.

Sevier Solid Waste operates a landfill for the less than 30 percent of materials that are not recycled or composted. Additional recycling programs operated by Sevier Solid Waste include a demolition site where wood waste is ground into mulch utilizing a tub grinder and an area where tires and metals are dropped off for recycling. Currently, Sevier Solid Waste has provided recycling trailers at local tire dealers. Used tires are shipped by TR Systems to Signal Mtn. Cement in Chattanooga to be recycled.

Sevier Solid Waste also provides containers for local businesses to recycle cardboard. Each day a Sevier Solid Waste side loader truck runs a route to collect cardboard. The paper is brought back to a 12,000 square foot warehouse adjacent to the compost plant to be baled and loaded onto a truck for shipment to nearby mills. In 1995, 391 tons of cardboard was collected and recycled.

There are drop-off centers at eleven locations for newspaper, magazines and phone books. These materials are collected by Paper Stock of Knoxville or Southeast Recycling Corporation and shipped to paper mills for recycling. In 1996, well over 300 tons of this material will be recycled. Also, during the past three years, used motor oil drop-off centers have been provided at eleven locations. The oil is collected and recycled by Industrial Oil Service of Knoxville. Recently, plastic recycling has been started on a trial basis at the compost plant.

The Sevier Solid Waste composting and recycling facilities have received a great deal of attention not only nationwide, but worldwide. Visitors from places as far away as St. Petersburg, Russia, Bejing, China, and many countries in Europe have come to Sevierville to tour these facilities.

COLLECTION SITES FOR NEWSPAPER, MAGAZINES AND PHONE BOOKS

- * Seymour High School
- * Seymour Middle School
- * Sevier County High School
- Sevierville Community Center
- Pigeon Forge Patriot Park
- City of Gatlinburg Service Center
- Sevier County Convenience Centers
  - Newport, Hwy 411
  - Kodak/Douglas Dam Road, Hwy 139
  - Boyd's Creek, Hwy. 338
  - * White's School, White School Road
  - Pigeon Forge, Wears Valley Road

* *Newspaper Only*

USED MOTOR OIL RECYCLING CONTAINERS

Sevierville

Sevier Farmer's Co-Op

Monday, Tuesday, Thursday, and Friday	8 a.m.-5 p.m.
Wednesday and Saturday	8 a.m.-Noon

Pigeon Forge

City Garage, McGill Street

Monday - Friday	8 a.m.-4:30 p.m.

Gatlinburg

Service Center Complex, Newman Road

Monday - Friday	8 a.m.-4:30 p.m.

Sevier County

Newport, Hwy. 411: Monday-Saturday	8 a.m.-6 p.m.
White's School, White's School Road: Sunday	1 p.m.-5 p.m.
Pigeon Forge, Walden's Creek Road	
* Kodak, Douglas Dam Road, Hwy. 139	
* Boyd's Creek, Hwy. 338	
* Pittman Center, Hwy. 73	
* Seymour, Chapman Hwy.	
Sevier County Solid Waste, Rainbow Road	7 a.m.-2:30 p.m.

* *Closed on Tuesday*

Prairieland Memorandum

DATE: March 30, 1998

TO: **CWMI Composting Roundtable**

FROM: SIGURD SCHEURLE, ACTING DIRECTOR

Purpose

The purpose of this memo is to provide a written summary of the Prairieland integrated solid waste management system, its MSW composting facility and my role. Since 1986 I have served in various solid waste planning and facility development posts for the State of Minnesota. Currently, I am on loan from the Minnesota Office of Environmental Assistance (OEA), serving as Prairieland's Acting Director.

Background on Prairieland

Since 1991 Martin and Faribault Counties acting together as the Prairieland Board have owned and operated a 100 tpd (26,000 tpy) mixed waste composting plant in Truman Minnesota. The Counties are served by curb-side and drop-off recycling programs and by a very active household hazardous waste collection program. Recycling rates exceed 30%. Currently the project receives approximately 90 tpd of residential (60%), institutional (5%), and commercial (35%) solid wastes.

Prairieland selected the vendor, OTVD (Omnium de Traitements et de Valcrisation des Dechets) in association with Ryan Construction of Minneapolis, to build the composting project. The turn-key procurement was successfully implemented with the usual debugging. Waste flow control ordinances implemented by Counties were overturned by the Eighth Circuit in 1993, prior to Carbone. However, the types and quantities of waste delivered to Prairieland have been stable since 1994.

Production/Mass Balance

The plant recovers the following products: refuse derived compost (20%), refuse derived fuel (40%), ferrous metal (2%), glass aggregate (2%), and non-ferrous scrap metal (1%). About 10% of the waste cannot be recovered and is landfilled. About 25% of the waste delivered is lost as CO2 and water vapor during biological and physical processing.

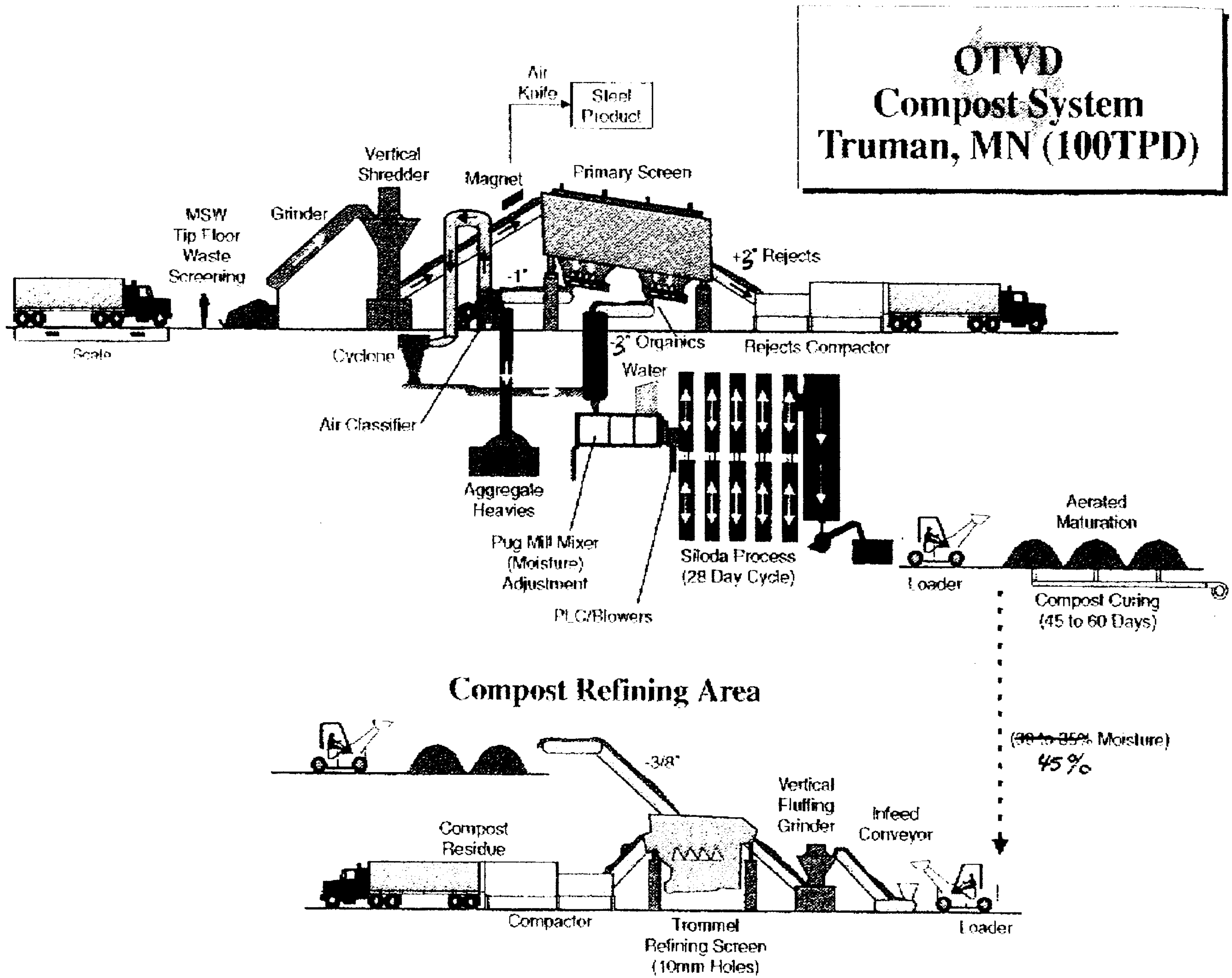
Markets for the compost include crop production (corn and beans) (65%), land reclamation (mining and landfills (20%), animal bedding (10%), and nursery/landscaping (5%). Prairieland incurs costs in marketing compost.

Financial

The total capital cost of the plant was about $7.3 million. The annual budget for 1998 is about $2.1 million including $700,000 in RDF and landfill costs, $630,000 in P&I, $125,000 in utilities and about $300,000 in salaries for 9 staff people. Revenues include $1.2 million in service fees and about $900,000 in tipping fees (set at between $35 and $60 per ton depending upon origin and composition).

Future Plans

A major modification to capture and treat odors from the project is now being planned. Prairieland is trying to gain the cooperation of the largest local waste hauler in voluntarily delivering waste. Related negotiations are underway to reduce the costs of RDF and residual disposal.


OTVD
Compost System
Truman, MN (100TPD)
Air Knife
Steel Product
Vertical Shredder
Magnet
Primary Screen
MSW Tip Floor Waste Screening
Grinder
-1"
+3" Rejects
Scale
Cyclone
-3" Organics
Rejects Compactor
Water
Air Classifier
Aggregate Heavies
Pug Mill Mixer (Moisture) Adjustment
Siloda Process (28 Day Cycle)
PLC/Blowers
Aerated Maturation
Loader
Compost Curing (45 to 60 Days)
Compost Refining Area
Moisture)
45%
-3/8"
Vertical Fluffing Grinder
Infeed Conveyor
Compost Residue
Compactor
Trommel Refining Screen (10mm Holes)
Loader

Cornell Composting

http://www.cals.cornell.edu/dept/compost/Composting_Homepage.html

This website provides access to a variety of composting educational materials and programs developed at Cornell University. Everything you ever wanted to know about composting, but were afraid to ask? Not quite, but we do hope we've assembled some useful information.

Rot Web

http://www.indra.com/~topsoil/Compost_Menu.html

Provides information on a variety of issues related to home composting. Includes a list of home composting publications and links to other sites.

The Composting Resource Page

http://www.oldgrowth.org/compost

Provides access to information on composting from backyard to large scale systems. Includes an interactive bulletin board for questions and answers.

Home Composting

http://www.mastercomposter.com

If you are a non-profit home composting group, this site will provide a free web page for you and link it to their site. Also included: a list of organic materials with appropriate compost methods for each, as well as instructions for building bins, composting with worms, and other composting methods.

BioNet

http://www.bionet.net/

Includes access to technical publications and a database of waste management sites, in German and English.

The Composting Council

http://CompostingCouncil.org

Involved in research, public education, development of composting standards, expansion of markets and the enlistment of government officials support for composting as a solid waste solution. (A trade and professional organization.)

Woods End Agricultural Institute, Inc.

http://www.maine.com/woodsend/inst.htm

Woods End Institute was established to provide research and education that meets the practical yet demanding needs of modern farmers and growers interested in successful conversion to sustainable, organic and Biodynamic practices in a supportive framework of multi-disciplinary scientific practice.