A COMPREHENSIVE SURVEY OF GEORGIA'S COMPOST INDUSTRY[1]

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Abstract

An assessment of Georgia's composting infrastructure was conducted in the fall of 2001 and it was found that 38 facilities are composting 553,600 tons of organic waste material each year. Mulching operations were not included in this study. A brief survey completed with the operator during a site visit helped to ensure the highest level of data accuracy possible. Participating in this study were twelve institutions, eight municipalities and eighteen private operations. The primary feedstocks (% of 553,600 tons) for each operation include foodwaste (5.1%), agricultural waste (6.5%), yardwaste (9.0%), animal manure (15.3%), municipal biosolids (28.7%) and industrial wastes (35.5%). The various types of operational permits for composting were compared to facility size and tonnage composted. The survey includes questions concerning marketing, equipment and operational management. The assessment also includes a study on the quality of finished compost from each operation.

Keywords**:** Compost, Survey, Waste Management, Organic, Waste, Manure, Biosolids

Introduction

The general definition of the word compost is actually rather simple but incomplete when taking into account the wide range of properties of various types of compost. Since no definition is universally accepted, a useful explanation of composting is the biological decomposition and stabilization of organic substrates, under conditions that allow the development of thermophilic temperatures as a result of biologically produced heat, to produce a final product that is stable, free of pathogens and plant seeds, and can be beneficially applied to the land (Haug, 1993).

One of the main concerns associated with surveying composting operations arises with yardwaste/woodwaste processors, who commonly dispose of this type of waste by mulching rather than by composting. Therefore, a working definition was developed to differentiate these two types of operations prior to conducting this survey. A composting operation is considered to be any operation that receives organic waste and purposefully mixes and/or processes them in any of a variety of methods in order to achieve and maintain specific temperatures for a length of time, with the final material free of weed seeds, vectors and/or pathogens. A mulching operation is considered to be any operation that receives yardwaste, land clearing debris, green waste and/or wood waste either from private or public sources and reduces the material via mechanical means and/or separates contaminants before end market use. Active turning or processing to reach an elevated temperature (above 113°F) is considered the most significant difference between mulching and composting, and thus, is the main criteria for the study.

A recently published study by Cotton (2001) analyzed California's composting and mulching industries. This study is unique in its endeavor to more accurately characterize and quantify the organics processing industries. Because of the ever-changing dynamics of these industries, information gleaned from such surveys is only a snap shot in time. Yearly surveys are required to keep this type of information up to date. The State of California provided Cotton a preliminary list based on their records of established composting facilities to use as a basis for his survey. Out of the original list of 400 facilities, 148 have exited the organics processing business in the five years prior to the survey. The 104 composting operations in the state composted approximately 3.4 million tons of waste per year.

In 1990, the Georgia General Assembly passed the Georgia Comprehensive Solid Waste Management Act. This act stated that by July 1, 1996, Georgia should reduce the amount of materials going to landfill by 25%. While this goal was not achieved, this Act established many new initiatives such as public education and beautification programs, ban on yard trimmings from landfills, annual solid waste reporting and other activities to promote the reduction of waste going into landfills (GA DCA, 2000). Tax credits were also offered to businesses in less developed areas of the state to encourage the creation of recycling or source reduction jobs (EPA, 1998). The need to better describe and understand traditional solid waste streams in Georgia has led to intrastate departmental relationships to synergize solid waste reduction efforts. To assist in achieving Georgia's goal, the Georgia Environmental Partnership was created, which is a partnership between two major universities and a state governmental department whose sole purpose is preventing pollution. Through this partnership, complete waste characterization studies were conducted pertaining to forest products, textiles, food processing industries and municipal biosolids production (Governo et. al., 2000). These studies are the basis for providing extensive outreach and technical assistance to industries in these areas where solid waste can be reduced or recycled.

In 2000, an assessment of Georgia's recovery potential of waste from the food processing and institutional food sectors showed that 231,100 tons/year of food processing waste, mainly fruit and vegetables, and 474,000 tons/year of institutional foodwaste were still being disposed of in landfills with only a small portion being composted or land applied (Magbanua et. al, 2000). A study involving Georgia's municipal wastewater treatment plants, where data was gathered from regulatory

departmental records, determined that 378,745 tons of biosolids were still being landfilled each year (Governo et. al, 2000). During 2001, the Georgia Environmental Partnership identified approximately 1.7 million tons of processed residuals that could be diverted from landfills (GEP, 2001). Such waste studies and industrial technical assistance shows the potential feedstocks that could be composted rather than landfilled.

In 1999, a national Municipal Solid Waste (MSW) study performed by the Environmental Protection Agency, indicated that 61.1% of the total MSW stream is organic in nature (EPA, 1999). The organic portion of the waste stream consists primarily of paper and paperboard (38.1%), yardwaste (12.1%) and foodwaste (10.9%) (EPA, 1999). The rate of MSW organics recycling in the US has increased from 14% in 1992 to 32% in 2001, while during that same time period the number of landfills in the United States decreased nearly 60% from 5,345 to 2,142. During this same time period, MSW generation has increased 145%. (Goldstein and Madtes, 2001; EPA, 1996). In 1999, U.S. residents, businesses and institutions produced approximately 4.6lbs/capita/day of solid waste, up from 2.7lbs/capita/day in 1960 (EPA, 1999). A yearly survey of garbage in America can be used to indicate the levels of yard trimmings composting in the United States (Goldstein and Madtes, 2001). The 2000 survey reported that the number of yard trimmings composting operations has risen 280% in the last decade to over 3,800 facilities across the nation (Goldstein and Madtes, 2000). Even with an increase in yardwaste composting facilities, there is still a tremendous amount of organics, that could be composted that goes into landfills.

The need for organics recycling is recognizable as landfills continue to close, waste generation increases and local and state governments set recycling and reduction

goals. Composting is becoming a more desirable waste management alternative as landfill tipping fees increase, new markets develop and as more decision makers learn of the environmental benefits of organics recycling.

Purpose of Study

Byproducts from agriculture, forestry, industry, business and municipalities have substantial economic value. Agricultural residuals, industrial byproducts, municipal solid wastes, animal wastes, biosolids, and many additional organic materials can be converted into a product through composting. This activity can create sizeable revenue streams and cost savings while yielding significant environmental benefits.

The purpose of this study is to provide a detailed assessment of Georgia's composting facilities. This project identified the number, size, location, and type of processing facilities as well as information concerning existing feedstocks, additional potential feedstocks, market sectors, marketplace dynamics and growth. This information will be used to identify opportunities and impediments to expanding the compost industry in Georgia. Information from this study can be used to connect waste generators and composters, which can potentially benefit both industries economically. Individual site visits were conducted to ensure accurate data, provide educational and technical assistance, and to relieve regulatory concerns about the purpose of the work.

Selection of Facilities

The Georgia Department of Community Affairs (DCA) financially supported this assessment of Georgia's compost infrastructure. DCA serves as the state's lead agency in providing comprehensive planning, technical and research assistance to local

governments and serves as the lead agency for the state's solid waste reduction efforts (GA DCA, 2000). Each year DCA sends out a solid waste survey to all municipalities to get an update of the status of solid waste management in Georgia. GA DCA (1999-2000) reported that 27 out of 159 counties and 29% of all cities in the state of Georgia compost yard trimmings. In this same survey, 70% of all counties and 66% of all cities mulch residential yard trimmings. Because of the many similarities between the composting process and mulching, it is sometimes difficult for municipal employees to distinguish which process is being performed. DCA was inclined to believe that the number of municipal composting facilities reported was inaccurate and further verification was required. It was believed that the only way to accurately verify operational procedures was to first conduct a telephone survey and then perform a follow up site visit.

To determine those sites that would warrant onsite evaluations, DCA provided a contact list of what they believed were composting and mulching operations. An initial phone survey was performed which determined that many municipalities that reported that they were composting were actually mulching. Only 45 facilities of the original 130 facilities were determined to be similar enough to composting to warrant an onsite visit.

In addition, a number of private composting operations throughout the state were also identified. Those facilities that met the definition and welcomed onsite evaluation to discuss their operation were added to the previous list that DCA provided. Additional operations were determined by speaking with private composters who identified a few additional small facilities that had just recently started.

Description of Survey

The goal of the survey was to determine facility-specific data with regards to feedstocks, processing equipment, compost quality and actual design parameters. The survey has six sections, four quantitative and two qualitative. A sample survey used at each operation can be found in Appendix A. The first section asked for general contact information, whether it was institutional, municipal, or private and the type of permit the facility operates under. The second section requested information about the tons per year composted and the origin of each feedstock. The bulk density and the amount of stockpiled finished compost are also addressed in this section. Section three was one of the subjective portions of the survey that considered the quality of the finished compost. Finished compost sales comprised section four. Operators were asked how the final product was used and if it was sold. Section five asked questions about the equipment the operation used. Section six was also subjective and addressed such questions as projected maximum throughput capacity, the general appearance and odor of the site. This section also provided for any additional comments or concerns not addressed elsewhere.

As with all surveys, gathering of accurate data/information was difficult. This fact was especially true for private operations where many of the desired answers are confidential and not able to be disclosed. Where information was considered proprietary, it was left off the survey. Three animal manure composting operations refused to participate in the survey or allow visits. These are relatively small operations and their nonparticipation does not significantly affect the results of this survey.

Results and Discussion

Georgia currently has 38 facilities that are composting according to the definition in this study. Figure 1 is a map of Georgia with symbols representing each compost operation grouped as private, municipal or institutional. There are 18 private operations that handle 73.1% (404,854 tpy) of the total composted material (553,600 tpy). Eight municipalities handle 24.3% (134,540 tpy) of the state's compost. The institutional group consisted of eight prisons, three middle schools and one university. This group processed only 2.6% (14,206 tpy) of the state's compost (Table 1). One private operation accounted for 95.8% of the private facility stockpiled compost and 74.6% of the compost for the entire state. Facilities also reported on their maximum potential capacity or throughput that they could handle without upgrading equipment. The cumulative total of compost facilities' present maximum permittable potential capacity is 1,147,530 tons per year, over double what is currently being composted. This figure does not include either new and/or developing facilities.

Facilities by Feedstock

There are a wide variety of feedstocks that were composted at each type of operation. The main types of feedstocks were agricultural waste, animal manure, biosolids, foodwaste, industrial waste and yardwaste (Table 2). Agricultural waste, 6.5% of total composted, included cotton waste, vegetable culls, peanut hulls and other crop residuals. Animal manure (15.3%) included broiler litter, horse, cow and hen waste. Biosolids are the waste by-product of wastewater treatment facilities and are the second in total compost processed at 28.7%. Foodwaste (5.1%) included kitchen preparation waste and industrial food processing residuals. Industrial waste included a wide range of

materials such as MSW, tobacco processing waste, paper mill sludge and wood processing residuals and was the highest in percentage of materials composted at 35.5%. Yardwaste included any leaf, grass or tree trimmings that are primarily from a residential setting and comprise 9% of the feedstocks composted.

In Table 3 are shown the origins of the primary feedstocks utilized by these operations. Those feedstocks and amendments classified as "Other" feedstocks came from sources other than municipal, industrial or onsite. All institutions derived their material from within their own operation. Municipalities as expected received almost all of their feedstocks from services offered to the public. Private operations derived their feedstocks from numerous sources depending on location, availability, cost, and logistics.

Twelve compost sites were designated as institutional. Eleven of the twelve institutional operations were found to be composting foodwaste while one composted yardwaste, although pilot foodwaste tests had also been conducted at this site. Of the twelve institutional sites, one operation was responsible for 28.2% of the 14,206 tpy composted. Of the eight sites classified in the municipal category, four composted biosolids, two yardwaste and two industrial wastes (MSW and tobacco sludge). At these sites, stockpiled compost was relatively dispersed among these sites except for one operation which accounted for 98% of the stockpiled biosolids compost and 57.5% of all municipal stockpiles. Private facilities composted all types of feedstocks but the predominant ingredients composted were animal manures and yardwaste which comprised 33.3% and 27.8%, respectively (Table 4) of their total capacity. Although only one private operation composted biosolids, it accounted for 33.8% of all private materials composted and 25% of all materials composted in the state.

The methods of composting practiced throughout the state at these 38 facilities varied with twenty-two using windrow composting, ten static-pile, five in-vessel and one aerated static pile. Windrow systems were used regardless of the type or volume of feedstocks composted. Four foodwaste, four yardwaste and two industrial feedstock composting operations utilized static pile systems. These operations used small loaders (bobcat style) and tractors with buckets to turn and aerate their piles. In-vessel systems were used at two biosolids, two animal manure and one industrial waste operations. In-vessel systems tended to be more capital intensive than alternative methods and were predominantly used at sites where the tipping fees for incoming materials could be realized. Tipping fees at the biosolids and industrial sites and ranged from $25-$38/ton.

Facilities by Size and Feedstock

For the purpose of this study, facility size was broken down into four main groups; small operations were classified as less than 1,000 tons per year (tpy), medium operations were between 1,001 and 10,000 tpy, large operations are between 10,001 and 25,000 tpy and very large operations were those composting greater than 25,000 tons of material per year (Table 5).

Small and medium operations accounted for 28 of the 38 operations but combined for less than 11% of the total 553,600 tpy composted. Almost half (12 out of 28) of the small and medium facilities composted foodwaste, however the largest quantities of material composted was from animal manures which composted approximately 22,480 tpy (37%) of the total material composted by these operations. Small operations used windrows and static piles as the dominant type of compost system.

Four compost facilities were classified as large operations which accounted for 11% of the total amount of material composted in Georgia. Of these four one composted primarily animal manures, one biosolids, one foodwaste and one yardwaste. The animal manure operation composted the most material at 20,000 tpy. Surprisingly, these large facilities have very little stockpiled material with only a combined 0.44% of the state's total. This could be related to the fact that three out of the four operations are private and the one municipal operation has an extensive marketing program which utilized the finished product.

The very large operations, those composting more than 25,000 tpy account for 78.2% of the total material composted. These six facilities primarily composted industrial and biosolids wastes, which comprised 44.8% and 31.6% respectively of all materials, composted. It is notable that five out of the six operations were privately owned and though they were responsible for stockpiling 80.4% of the state's total, one site had 92.8% of this amount. Privately owned facilities were dominant in the larger categories while institutional operations were more prevalent in the small to mid size sites. Municipal sites were represented in each size category with three small, three medium, one large and one very large.

Facility by Size and Permit

Georgia's permitting process for composting facilities can sometimes be difficult to understand. Permits are obtained from various departments within the State Department of Natural Resources. The department, the type of feedstock and in some situations the amount of material processed determines the type of permit required by a facility. The same size and type of facility can require different types of permits

depending upon who owns the land the facility is located on. For example, a municipal wastewater plant that composts an arbitrary amount of biosolids on site requires an amendment to its NPDES permit in order to compost. The same amount of biosolids if it was to be composted off site would require a solid waste handling permit, the same type of permit required for a landfill.

Permits for composting fall into one of nine categories: agricultural exemption; NPDES amendment; Permit by Rule; Recovered Materials Processing Facility (RMPF); Solid Waste Handling Facility (SWHF); verbal agreement; written permission; yardwaste exemption and a non descript Others category. Agricultural exemption status is given to operations composting primarily agricultural waste generated on or nearby the site. NPDES permits allow wastewater treatment plants to discharge clean water into surface waters and an amendment to this permit is needed to begin onsite processing of biosolids. Permit by Rule is a unique permit that is done on a case-by-case basis for all types of operations except those composting biosolids. RMPF permits are not common but for sites that have it, they must show that for all material received on site there is a 40% reduction in total volume, either from biological or physical processing, after a period of 90 days. SWHF permits normally pertain to landfills and is required for biosolids and some large-scale composters who handle materials such as MSW and large quantities of foodwaste. Verbal agreement and written permission between the composter and the state are used on a case-by-case basis usually for very small operations or demonstration projects. Facilities that compost yardwaste are exempt from state regulations under a yardwaste exemption.

Table 6 shows the number of facilities categorized by permit type along with the amount of compost processed. Fifteen of the sites were permitted under either agricultural or yardwaste exemption status. Verbal/written permission and Other type permits were used at five operations. Permit by Rule was used with nine facilities. Permit by Rule was most often used at institutions. RMPF permit was only used at one site. Four municipal and one private operation had an amendment to their NPDES permit. Only three operations; two municipal, and one private had the SWHF permit. In Table 7 are shown the facilities classified according to their size along with their permit data.

Compost Quality and Markets

Characteristics of product 1) contaminants, 2) odor, 3) heat process, 4) moisture and 5) screening were chosen to evaluate the finished compost. A quality score on a scale of one to five (one is the lowest and five the highest) was given to each characteristic. Each operation was given a compost quality score by totaling individual quality scores. The highest score attainable is 25. Contaminants included plastics, glass, metals, and large inert materials that decrease the aesthetic quality of the compost. Odor was based on the absence of original material scent and how much it smelled like "good soil". The heat process was judged by touch and the operator's record of attained temperatures. The squeeze test, a common subjective test that is conducted by squeezing a handful of compost, was used to approximate the moisture content of the compost and points were counted off for being either too moist or too dry. The screening test focused on the large (greater than one to two inches) objects left behind after screening or if the operation screened at all. Table 8 describes the standards used to determine the compost

quality scores. To maintain consistency, the authors scored all composts instead of relying upon survey participants to judge their own compost.

Table 9 presents the finding from the compost quality section of the survey. No facility's compost scored below 12 and none scored a perfect 25. The scores were divided into four ranges: 10-13, 14-17, 18-21 and 22-25. The table shows the number of institutional, municipal and private facilities in each range. Only one operation, a municipality, scored in the lowest category. Each type of operation was equally represented in range between 14-17. Private composting operations predominantly comprised those facilities in the highest two ranges, making up 50%, in both of the 18-21 and 22-25 ranges. Institutions ranked second in both upper ranges. There was a distinct inverse relationship between the number of municipalities in a particular range and the level of quality.

Compost samples from the majority of facilities were taken and analyzed for moisture, volatile solids, pH, soluble salts, nutrients and some heavy metals. To protect the anonymity of the individual facilities, basic statistical analysis was performed on the lab data and presented in Appendix B grouped into private, institutional and municipal operations. Average compost pH was consistent between 6.4 to 6.9 regardless of the type of operation from which it was derived. The soluble salts were lowest at the institutional facilities that composted food waste and highest among the private composters, especially those that composted chicken manures. The finished compost C:N ratio was generally lower at the institutional facilities composting foodwaste because of the relatively short composting cycles and the limitation of carbon feedstocks in the initial recipes.

The final market or end use of finished compost was either sold, given away or used internally (Table 10). Institutions used all of their compost generated internally on their own property. Municipal operations varied, using it internally, providing it free to the public, or selling it both by the cubic yard or by the ton. Private sites predominantly sold their compost by the cubic yard, although it was used internally and even given away free at two sites. The two private operations that gave their compost away for free were under contract by cities to provide this service for residence. Of the 11 operations that sold compost by the cubic yard, four bag the majority of their compost.

Georgia vs. California

The results of this survey were compared to Cotton's (2001) assessment of California's composting infrastructure. Table 11 displays the comparison of the two studies. According to the US Census Bureau's (2001) population estimates as of July 1, 2001, Georgia's 38 facilities composts approximately 132 lbs/person-yr as compared to California's 104 facilities composting 197 lbs/person-yr. Georgia primarily uses smaller sized facilities averaging 14,568 tons/facility-yr as opposed to California's facility average of 32,759 tons/facility-yr. One attribute of both state's composting facilities is the fact that on average, the overall throughput can be doubled before reaching maximum capacity at present conditions. There are many reasons that can attribute to this excess capacity of which are management practices, design considerations, feedstock logistics or permit limiting capacities.

Conclusions

The overall goal of this study was to provide a detailed analysis of Georgia's composting infrastructure. The level of response to this study was very positive with only three small facilities not participating. It was apparent that there is a significant amount of work still needed in educating the operators at many of the sites. This includes both the mulching and composting operators. The lack of education is most prevalent among the institutional and municipal operations. Many times the composting operation is simply an added responsibility for an employee who often receives little or no training in the correct management of compost. This seemed to result in lower quality finished compost and more operational problems. This trend was apparent in the results presented in Table 9. The economic motivator for private operators was readily apparent in the way they manage both the operational and the marketing of the business.

Another major concern of the composting industry stems from the logistical problems associated with feedstock acquisition in relationship to site location. Obtaining economically available land that can be developed for composting in a logistically feasible proximity to high waste producing areas is very difficult and often economically impossible. While at other times, public opposition and lack of knowledge on the part of local decision makers are the greatest deterrent to a new composting facility startup. Compost markets are also a limiting factor for operations. One of the reasons stated by operators for not expanding throughput capacity or including new feedstocks was the regulatory concern of obtaining more permits. The fear of being required to obtain a solid waste-handling permit restricted many operators, mainly the private ones, from exploring many new opportunities in waste management. Present operational throughput

capacity at these facilities could easily be doubled, allowing for over 500,000 tons more waste to be recycled through composting rather than going to another type of waste disposal, which is most often landfilling. This would go a long way toward achieving the 25% waste reduction goal Georgia is trying to attain.

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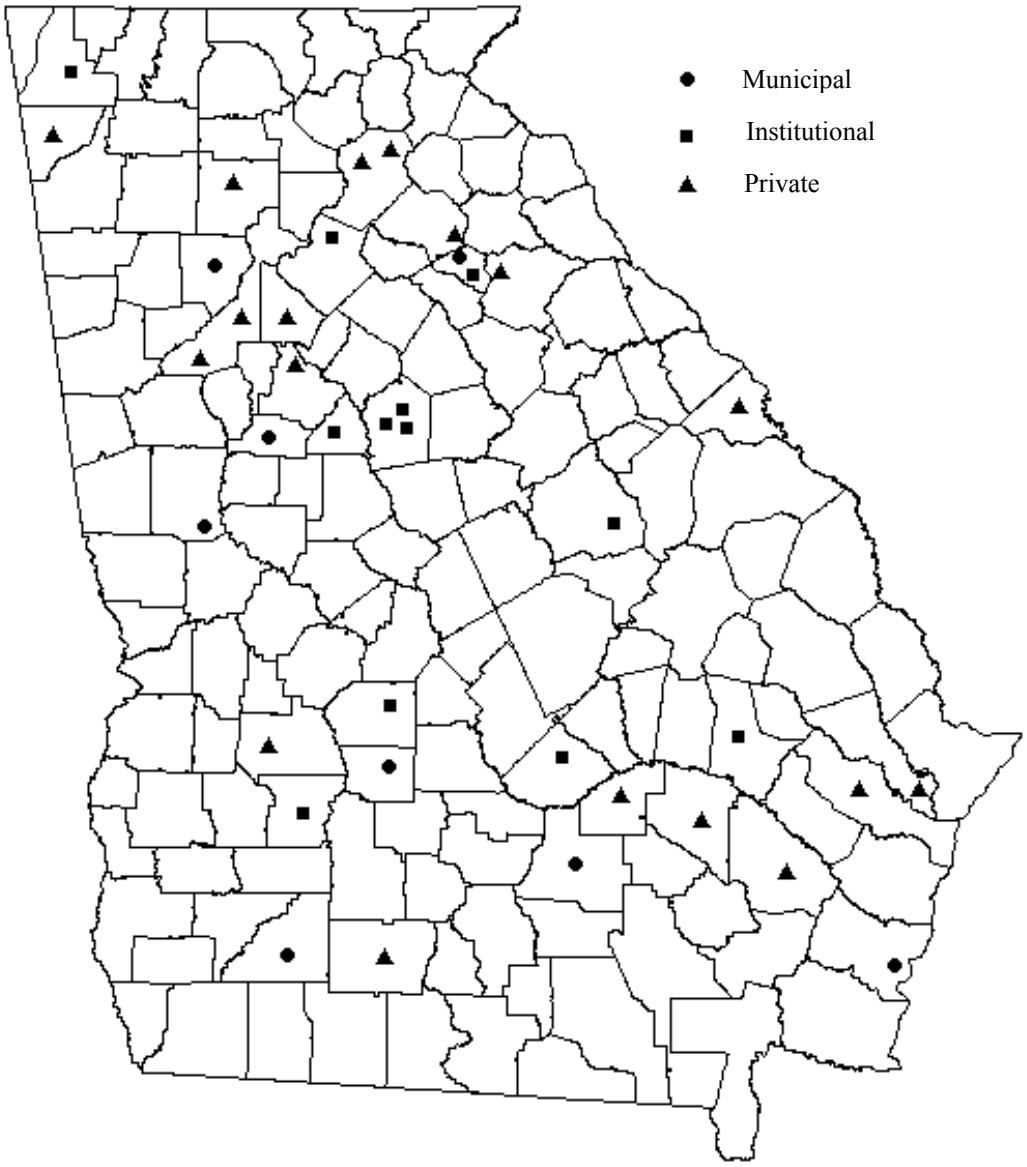

Figure 1. Location of 38 Georgia composting facilities, which participated in the survey, represented as municipal, institutional and private operations.

Table 1. Amount of compost processed and stockpiled at 38 Georgia composting facilities.

Type of facility	No. of facilities	% of total facilities	Processed (tons/yr)	% of total processed	Stockpiled (yds)	% of total stockpiled
Institutional	12	31.6	14,206	2.6	10,140	2.3
Municipal	8	21.1	134,540	24.3	87,000	19.8
Private	18	47.4	404,854	73.1	343,021	77.9 (3.3)[1]
	38		553,600		440,161	

[1] One private facility accounts for 74.6% of the total stockpiled in Georgia. The percent of total stockpiled without the one private facility is 3.3%.

Table 2. Types of feedstocks used by composting facilities in Georgia.

Feedstock type	No. of facilities	% of total facilities	Processed (tons/yr)	% of total processed	Stockpiled (yds)	% of total stockpiled
Ag waste	2	5.3	35,780	6.5	0	0.0
Animal	6	15.8	84,820	15.3	4,110	0.9
Biosolids	5	13.2	158,684	28.7	51,000	11.6 (0.2)[1]
Foodwaste	13	34.2	28,206	5.1	10,290	2.3
Industrial	4	10.5	196,350	35.5	354,671	80.6
Yardwaste	8	21.1	49,760	9.0	20,090	4.6
	38		553,600		440,161	

[1] One municipal biosolids facility accounts for 11.4% of the total stockpiled in Georgia. The percent of total stockpiled without the one municipal biosolids facility is 0.2%.

Table 3. Origins of feedstocks by type of compost facility in Georgia.

Type of facility	City/County	Onsite[1]	Industrial/ Commercial	Other[2]
Institutional	0	12	0	0
Municipal	7	0	1	0
Private	4	7	5	2
	11	19	6	2

[1] Onsite means materials were received from within their own operation
[2] Other means materials were received from sources other than municipal, industrial or onsite

Table 4. Composting facilities in Georgia by type and feedstock.

Type of facility/waste	No. of facilities	% of type facility	Processed (tons/yr)	% of type processed	Stockpiled (yds)	% of type stockpiled
Institutional						
Yardwaste	1	8.3	1,300	9.2	0	0.0
Foodwaste	11	91.7	12,906	90.8	10,140	100
	12		14,206		10,140	
Municipal						
Biosolids	4	50.0	21,810	16.2	51,000	58.6
Yardwaste	2	25.0	1,730	1.3	10,000	11.5
Industrial	2	25.0	111,000	82.5	26,000	29.9
	8		134,540		87,000	
Private						
Ag waste	2	11.1	35,780	8.8	0	0.0
Animal	6	33.3	84,820	21.0	4,110	1.2
Biosolids	1	5.6	136,874	33.8	0	0.0
Foodwaste	2	11.1	15,300	3.8	150	0.0
Industrial	2	11.1	85,350	21.1	328,671	95.8
Yardwaste	5	27.8	46,730	11.5	10,090	2.9
	18		404,854		343,021	

Table 5. Compost facilities in Georgia by size and feedstock.

Size of Facility/Size (x 1000 tons/yr)	No. of facilities	% of size facility	Processed (tons/yr)	% of size processed	Stockpiled (yds)	% of size stockpiled
Small (<1)						
Ag waste	0	0.0	0	0.0	0	0.0
Animal	1	9.1	680	15.2	350	2.9
Biosolids	1	9.1	310	6.9	0	0.0
Foodwaste	5	45.5	2,135	47.6	40	0.3
Industrial	1	9.1	1,000	22.3	11,000	90.3
Yardwaste	3	27.3	360	8.0	790	6.5
	11		4,485		12,180	
Medium (1-10)						
Ag waste	1	5.9	2,300	4.2	0	0.0
Animal	3	17.6	21,800	39.4	960	1.3
Biosolids	2	11.8	10,200	18.5	51,000	70.7
Foodwaste	7	41.2	12,271	22.2	10,100	14.0
Industrial	1	5.9	1,300	2.4	100	0.1
Yardwaste	3	17.6	7,400	13.4	10,000	13.9
	17		55,271		72,160	
Large (10-25)						
Ag waste	0	0.0	0	0.0	0	0.0
Animal	1	25.0	20,000	32.7	800	41.0
Biosolids	1	25.0	11,300	18.5	0	0.0
Foodwaste	1	25.0	13,800	22.6	150	7.7
Industrial	0	0.0	0	0.0	0	0.0
Yardwaste	1	25.0	16,000	26.2	1,000	51.3
	4		61,100		1,950	
Very large (>25)						
Ag waste	1	16.7	33,480	7.7	0	0.0
Animal	1	16.7	42,340	9.8	2,000	0.6
Biosolids	1	16.7	136,874	31.6	0	0.0
Foodwaste	0	0.0	0	0.0	0	0.0
Industrial	2	33.3	194,050	44.8	343,571	97.1
Yardwaste	1	16.7	26,000	6.0	8,300	2.3
	6		432,744		353,871	

Table 6. Number and volumes of Georgia composting facilities by permit type.

Type of Facility	No. of facilities	% of total facilities	Processed (tons/yr)	% of total processed	Stockpiled (yds)	% of total stockpiled
Ag Exempt	9	23.7	135,800	24.5	5,110	1.2
EPD Written	1	2.6	13,800	2.5	150	0.0
NPDES[1]	5	13.2	105,860	19.1	379,571	86.2
Permit by Rule	9	23.7	13,621	2.5	10,140	2.3
RMPF[2]	1	2.6	2,300	0.4	0	0.0
SWHF[3]	3	7.9	247,874	44.8	26,000	5.9
EPD[4] Verbal	3	7.9	585	0.1	0	0.0
Yardwaste Exempt	6	15.8	32,460	5.9	19,090	4.3
Other	1	2.6	1,300	0.2	100	0.0
	38		553,600		440,161	

[1] NPDES stands for National Pollutant Discharge Elimination System.

[2] RMFP stands for Recovered Materials Processing Facility.

[3] SWHF stands for Solid Waste Handling Facility.

[4] EPD stands for Environmental Protection Division (Georgia's regulatory agency)

Table 7. Permit data for compost facilities in Georgia by size class.

Size/Permit (x 1000 tons/yr)	No. of facilities	% of size facilities	Processed (tons/yr)	% of size processed	Stockpiled (yds)	% of size stockpiled
Small (<1)						
Ag Exempt	1	9.1	680	15.2	350	2.9
NPDES[1]	1	9.1	310	6.9	0	0.0
Permit by Rule	2	18.2	1,550	34.6	40	0.3
SWHF[2]	1	9.1	1,000	22.3	11,000	90.3
EPD[3] Verbal	3	27.3	585	13.0	0	0.0
Yard Exempt	3	27.3	360	8.0	790	6.5
	11		4,485		12,180	
Medium (1-10)						
Ag Exempt	4	23.5	23,300	42.2	960	1.3
NPDES	2	11.8	10,200	18.5	51,000	70.7
Permit by Rule	7	41.2	12,071	21.8	10,100	14.0
RMFP[4]	1	5.9	2,300	4.2	0	0.0
Yard Exempt	2	11.8	6,100	11.0	10,000	13.9
Other	1	5.9	1,300	2.4	100	0.1
	17		55,271		72,160	
Large (10-25)						
Ag Exempt	2	50.0	36,000	58.9	1,800	92.3
EPD Written	1	25.0	13,800	22.6	150	7.7
NPDES	1	25.0	11,300	18.5	0	0.0
	4		61,100		1,950	
Very Large (>25)						
Ag waste	2	33.3	75,820	17.5	2,000	0.6
NPDES	1	16.7	84,050	19.4	328,571	92.9
SWHF	2	33.3	246,874	57.0	15,000	4.2
Yard Exempt	1	16.7	26,000	6.0	8,300	2.3
	6		432,744		353,871	

[1] NPDES stands for National Pollutant Discharge Elimination System.

[2] SWHF stands for Solid Waste Handling Facility.

[3] EPD stands for Environmental Protection Division (Georgia's regulatory agency)

[4] RMFP stands for Recovered Materials Processing Facility.

Table 8. Compost quality scoring criteria

	Quality Score		
Characteristics	1	3	5
Contaminants[1]	Large foreign objects/ visually obvious/ aesthetically offensive	Minimum amount of foreign objects	No apparent foreign objects
Odor	Strong odor of original feedstocks	Mild odor of original feedstocks	No apparent original feedstock odor/ smells like soil or dirt
Heat Process[2]	"Finished" compost is warm/hot to the touch	Low heat in compost process/ short time maintained	Extended heat process / 503 regulations followed
Moisture[3]	Won't clump/bleeds excess water/too wet or too dry	[4]Reference	Retains good clump during test
Screening	Not screened at all/large particle size/unfinished composted feedstocks/ large foreign objects	Minimum amount of foreign objects and large particle sizes	Consistent particle size for specific market

[1] Performed by visual inspection
[2] Inspected operators records and felt/touched the finished compost
[3] A squeeze test was used to help determine on-site moisture content
[4] The quality score fell within the extreme parameters

Table 9. Number of facilities in each quality range for composting facilities in Georgia.

	Compost quality range[1]			
Type of facility	10-13	14-17	18-21	22-25
Institutional	0	1	5	6
Municipal	1	1	4	2
Private	0	1	9	8

[1] Quality judged on scale (1-lowest, 5-highest) for contaminants, odor, heat process, moisture, and screening. Highest score is 25.

Table 10. Final use of compost for composting facilities in Georgia.

Type of facility	Internal use only	Free to the public	Sold by the yard[1]	Sold by the ton
Institutional	12	0	0	0
Municipal	3	2	2	1
Private	5	2[2]	11	0
	20	4	13	1

[1] Four operations that sell by the yard also sell compost in bags
[2] Both of these operations are under contract by municipality to provide compost to public for free

Table 11 Results from Georgia and California compost infrastructure surveys.

	California	Georgia
State population	34,501,130	8,383,915
Number of compost facilities	104	38
Materials processed		
(tons/yr)	3,407,000	553,600
(lbs/person-yr)	197	132
Maximum capacity (tons/yr)	6,100,000	1,147,530
Facility Size (tons/day)		
< 50	40	28
50 – 100	19	4
> 200	45	6