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COMPOST
quality and management issues

New research identifies the major concerns and needs of the still-emerging compost industry.

by William F. Brinton, Ph.D.

Significant attention has been focused recently on issues surrounding the integrity of recycling and cleanliness of composts. In many cases, the compost producer also is a user and has developed a keen sense of quality traits that are important. Yet in other cases, a considerable distance exists between producer and end market. Under these circumstances, feedback about quality may take a considerable time, if ever, to come back to the producer. Furthermore, as the year's events have shown, issues-oriented publicity may develop very suddenly, as has been the case in the matter of herbicide residues in composts (see also "Clopyralid: The Battle Fought, the War to be Won" elsewhere in this issue). This publicity can overwhelm a compost facility that is unprepared for it.

To examine the issues of compost quality and user-producer feedback, Woods End Research Laboratory (Mt. Vernon, Maine) launched in early 2002 an independent survey of nearly 5,400 composters and municipal recycling facilities, stressing identification of source materials and a general inquiry of a variety of quality and quantity topics. WERL clients are composters and horticulturists either making or using composts. These professionals are fairly aware of their products and how they are being used and, in this sense, they might anticipate topics of concern. As a laboratory with many years' experience in this area, WERL also believed that the organization itself

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Table 1 Ranking of compost production, by state

	Number of respondents	Annual cubic yards	Rank
Alabama	1	NA	>41
Alaska	0	NA	>41
Arizona	4	418	34
Arkansas	1	60	38
California	10	430,324	2
Colorado	1	3	39
Connecticut	2	60,005	16
Delaware	1	250	37
Florida	2	120,600	9
Georgia	1	NA	>41
Hawaii	2	63,000	15
Idaho	1	200,000	4
Illinois	3	80,764	12
Indiana	9	77,964	13
Iowa	3	332	36
Kansas	3	2,787	31
Kentucky	5	184,850	7
Louisiana	0	NA	>41
Maine	10	20,015	25
Maryland	3	5,600	30
Massachusetts	6	34,300	20
Michigan	8	108,102	10
Minnesota	6	8,014	28
Mississippi	0	0	41
Missouri	4	7,680	29
Montana	2	2	40
Nebraska	0	NA	>41
Nevada	1	30,000	21
New Hampshire	5	1,008	33
New Jersey	7	51,540	18
New Mexico	2	2,175	32
New York	13	69,194	14
North Carolina	4	240,000	3
North Dakota	0	NA	>41
Ohio	11	86,622	11
Oklahoma	0	NA	>41
Oregon	2	60,000	17
Pennsylvania	17	199,032	5
Rhode Island	1	15,000	27
South Carolina	1	400	35
South Dakota	3	25,060	23
Tennessee	4	152,005	8
Texas	9	776,100	1
Utah	2	28,000	22
Virginia	6	191,090	6
Vermont	4	35,225	19
Washington	3	20,000	26
West Virginia	0	NA	>41
Wisconsin	6	22,250	24
Wyoming	0	NA	>41

NA Not applicable.
Source: Woods End Research Laboratory, 2002.

might anticipate topics from the nature of the responses.

Looking state by state

Several states within the top 10 of compost volumes ranked significantly higher than was statistically expected when compared with other national recycling surveys (see Table 1). These include Idaho, Vermont, Hawaii, Kentucky and Indiana. WERL attributes this partly to sampling error, but also to the high level of current interest in composting within some of these particular regions. For example, Vermont has an emerging and active organic farming sector that uses compost and has had several compost seminars in recent years, in addition to new university extension initiatives regarding compost stan dards. Similarly, Idaho recently added compost specifications to the state's transportation department's procurement program. These observations point to comments made by many respondents when asked what kinds of activities would promote the industry. The major fraction (17 percent) replied that more public information about composting is desired, perhaps indicating that state-led initiatives pay off in the numbers and quality of activities.

On the other side of response statistics are those states that in the WERL survey scored appreciably lower on compost statistics than expected. In this rank were Georgia, Minnesota, Missouri and New Jersey. A combination of factors, from sampling error to changes in state programs, explains the drops. Like many states, Missouri has in place a disposal ban that prevents yard debris from being landfilled, and small yard debris facilities are exempt from permitting (and, therefore, may not show up on recycling contact lists). Data suggest many private activities may not be on the state radar screen, while official state recycling statistics appear to overestimate composting based on this database of names.

Types of feedstock materials

WERL examined the major source materials for all surveyed composters (see Table 2). Nearly 80 percent of surveyed sites accept yard debris containing leaves, and 58 percent include grass clippings (accepted by all facilities that also take leaves). A surprisingly high percentage (28 percent) accepts food scraps. The diversity of source materials is indicated by the high percentage (28 percent) of "other" materials, which includes specialty wastes such as paper pulp, food-processing residues and brewery wastes.

Data from this survey account for nearly 3.5 million cubic yards of annual compost. The range of numbers is noteworthy, with composters annaully processing from three to 420,000 cubic yards per single facility. The mean facility size is 20,000 cubic yards, with a standard deviation of 51,000 yards. Twenty-five facilities responding to this survey failed to report data; if their production were at the average rate, then another 518,000 cubic yards would be expected.

Table 2 Source materials for composting facilities

	Number of facilities that accept this material	Percent of total
Leaves	151	79
Grass clippings	110	58
Food scraps	53	28
Manure	67	35
Sludge	20	11
Other (1)	54	28

(1) Includes specialty wastes such as paper pulp, food-processing residues and brewery wastes.
Source: Woods End Research Laboratory, 2002.

Types of compost facilities, methods and products

Of the 80 percent of respondents that listed processing technologies, windrow methods

rose to the top of the list, accounting for 45 percent, or 1.6 million cubic yards (see Table 3). This is not surprising considering that the survey pool focused on yard debris facilities.

Composters also were asked to list the handling practice for finished product (see Table 4). While bulk distribution clearly is the preferred route (65 percent), 23 percent offer some form of bagging, estimated by WERL to account for about two million bags of product.

In terms of the actual composting process, respondents were asked to list the time involved for active and curing phases of composting (see Table 5). The average overall length of the compost process in terms of total active and curing time is about one year. However, a surprising variance was found in the reported active composting phase, ranging from three days to 60 months (an MSW plant versus a yard debris facility, in these particular examples).

Although two of the largest facilities in this survey report the shortest composting time, this survey did not find any relationship of size of facility to length of active composting. However, when the relationship of cure time to facility size is graphed, a strong relationship with a normal bell-shape curve distribution appears. This curve peaked at 5,000 cubic yards (meaning the most cure time at that volume) and declined steadily as the volume grew. Thus, very small and very large facilities have the shortest cure times, perhaps indicative of space constraints for each. Certainly, the average picture that emerges is that the facilities have adequate time for active and curing phases.

Concerns of composters

A primary focus of this survey was to examine how composters thought about industry issues. Each was asked first to identify concerns related to quality and quantity. Then, within each grouping of quality versus quantity concerns, respondents were asked to choose one of several options, with additional space to designate other choices. For example, concerns about quantity broke out into "too much," "too little" or "too variable," with responses spread fairly evenly among the three options. The quality concerns broke out into a group of interrelated topics of physical contaminants, maturity/stability, and nutrients and salts. The survey did not list specifics, such as odor and weeds, yet several composters mentioned these.

Quality concerns scored very high, at 46 percent of respondents, while 19 percent listed quantity issues (see Table 6). A full 27 percent of respondents wrote in "none" for concerns, presumably indicating they are satisfied with their operation and product.

Thirty-six percent, however, list contaminants as the primary concern. In this group, trash, plastic and glass were the primary topics. These findings do not surprise, considering that most yard debris facilities accept residential green waste with varying amounts of foreign matter present, including leaves in plastic bags.

Ranking second among quality concerns (at 16 percent of respondents) is maturity or stability of product, followed closely by nutrient or salt concerns (13 percent). Thus, composters appear to focus on product usefulness and are aware that these quality factors have a bearing on market acceptance.

A much smaller group of respondents specified quality concerns of a chemical nature. Only 4 percent list herbicides and pesticides (including the recently well-publicized clopyralid herbicide), and 5 percent list antibiotics. Of this latter group, all included manure in their compost recipe. Combined with pesticides, only about 8 to 9 percent of respondents express concern about agricultural chemical residues.

At the bottom of the list (at 1 percent of respondents) was odor, followed at second lowest by weeds. The low ranking for odor was particularly surprising relative to the large debate on odor and bioaerosols occurring among scientists at national composting conferences.

In the manner that respondents answered these topics, it is not clear if concerns are based on actual product analyses or not; WERL thinks most likely not. Half of those mentioning clopyralid did not list grass clippings, the primary route for this herbicide to enter the waste stream. Furthermore, it is not likely that antibiotics, which ranked higher than clopyralid, are actually being found by testing. Clearly they are of concern, however, to a subgroup of agricultural composters, and this may relate to having consumer or

Table 3 Compost processing methods

	Number of facilities	Annual cubic yards	Percent of cubic yards
Windrow	84	1,550,109	45
Static	40	177,851	5
Aerated	26	598,018	18
In-vessel	4	184,020	5
All processes	3	125,800	4
No response	32	773,973	23

Source: Woods End Research Laboratory, 2002.

Table 4 Bulk versus bagged compost products

	Number of facilities	Percent of total facilities	Annual cubic yards	Percent of total cubic yards
Bulk	110	58	2,204,459	65
Bulk blended	14	7	284,054	8
Bulk and bagged	16	9	390,484	11
Bagged	19	10	390,820	12
Nonresponsive	30	16	139,954	4
Total	189		3,409,771	

Source: Woods End Research Laboratory, 2002.

Table 5 Compost curing times, in months

	Average	Minimum	Maximum
Active phase	6.56	0.10	60
Curing phase	5.35	0.00	36
Total	11.91		

Source: Woods End Research Laboratory, 2002.

Table 6 Concerns of composters

	Number of facilities	Percent of total
Quality	88	46
Quantity (too high, too low or variable)	37	19
Contaminants, including plastics, metal and glass	68	36
None (no concerns)	51	27
Maturity/stability	31	16
Salts/nutrients/pH	24	13
Herbicides/pesticides	8	4
Antibiotics, chemicals	9	5
Clopyralid, picloram presence	7	4
Pathogens, disease	3	2
Weeds	3	2
Odor	2	1

Source: Woods End Research Laboratory, 2002.

organic grower markets, which was not examined. Overall, the picture that emerges is that factors of physical cleanliness (or appearance) and maturity, followed closely by nutrient composition, are the primary driving factors for quality issues; chemical contamination is not yet high on the list.

Needs of composters

Closely related to perceived concerns are composters' views of the areas that are in need of more development (see Table 7). The need for more public information was felt strongly by the largest group of composters. Surprisingly, "lower lab fees" came in second place, at 13 percent of the total survey. This indicates that many, but not all, composters feel under pressure with regard to required testing and find that it represents a significant portion of costs. However, closely related was the expressed interest in development of quality standards (indicated by 10 percent of respondents). With the overall high ranking of quality issues, it is curious that quality standards did not rank even higher among composters' needs.

Table 7 Needs of composters

	Number of facilities	Percent of total
Public information	33	17.4
Lower lab costs	24	12.6
Quality standards	19	10.0
Research contaminants	20	10.5
Better regulations	7	3.7
On-site testing	7	3.7

Source: Woods End Research Laboratory, 2002.

Yet, a conflict is apparent here. Standards may be seen to reflect the potential for increased regulation (and increased lab testing) while at the same time aiding successful marketing. In contrast, the need for more "public information" which the majority of composters list, represents in simple terms composters asking for states to assist them in publicity and perhaps also in market development. Although this suggests the need for an awareness campaign, it also may reflect the fact that composters do not apportion a significant enough budget for marketing, or do not feel the need to do so, and would like the government to pick up some of the tab. For yard debris composting, of course, governments and composters are joint stakeholders. That composters want to see more public information is a fair request considering the enormous quantitative service in achieving organics recycling these and many other composters are performing. **RR**

Woods End Research Laboratory is an analytic firm that focuses on compost process quality control and final product evaluation. Further information about this study and other composting issues can be found on its Web site at www.woodsend.org. Composters that have not yet participated in the survey still may do so; contact WERL at (207) 293-2457 to request a survey form.

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