GREEN WASTE, DARK GOLD…

COMMERCIAL OPPORTUNITIES IN ORGANIC WASTES & SOIL BUILDING

(A TOOLKIT)

By

Ruthanne Cecil, J.D.

&

Andrew Jolin

Graphics and design by Matthew Marshall

Prepared for the

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

By the

CENTER FOR ENVIRONMENTAL ECONOMIC DEVELOPMENT

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TABLE OF CONTENTS

Disclaimer:
This toolkit provides ideas for consideration, not recommendations. Readers should discuss and carefully evaluate composting strategies with other professionals or experts. The Center for Environmental Economic Development and the authors take no responsibility for the performance of any particular technology or product mentioned in this toolkit.

ACKNOWLEDGEMENTS

This toolkit became a reality through the vision and work of many. It began as an idea and a dream in the minds of Kerry Klosterman and Joe Rasmussen. It blended into a compost festival on our local campus, Humboldt State University, with the help of Campus Recycling staff and the Campus Center for Appropriate Technology, along with a grant from the Humboldt Area Foundation to the Center for Environmental Economic Development (CEED).

When the United States Environmental Protection Agency, Region 9, announced a granting opportunity in organic recycling, CEED brought in the expertise of Maggie Gainer, Maureen Hart, Dan Ihara, and Ruthanne Cecil, to design and craft the Organics Recycling Board project, and we were on our way. After the U.S. EPA said yes, startup and work began in the fall of 2002. The excellent oversight of the EPA's Program Officer, Adrienne Priselac, throughout this Cooperative Agreement is appreciated. She recognized our regional approach, and was there when we needed her, with expert professional advice and useful suggestions.

In its early stages, staffers Ruthanne Cecil and Kerry Rasmussen were assisted by Ed Boisson of Boisson and Associates to design the details of the startup phase of the Board. When Kerry moved to southern California, we added the expertise of Maureen Hart and Andrew Jolin to the project, and their work carried us through to completion.

The documentation, writing, and authorship of the toolkit was in the hands of Ruthanne Cecil and Andrew Jolin, with short sections also written by Maureen Hart and Dan Ihara, Ph.D. We would also like to thank Adrienne Priselac, Dan Ihara, Deborah Giraud, and Andrew Jolin for their willingness to assist the process of peer review of the final draft. (Individuals who peer reviewed the report do not necessarily endorse all of its analysis.) Finally, the production of a beautiful and usable toolkit would not have been possible without the artistry and graphics ability of Matthew Marshall, CEED's very talented artist and researcher.

We gratefully acknowledge the involvement and willingness of the members of the local Organics Recycling Board to spend time and energy in this "think tank" approach. We especially appreciate the time and service of Julie Neander and Melanie Drabel of the City of Arcata; Gerald Kinsfather of the Humboldt Waste Management Authority; Deborah Giraud and Annie Eicher of the University of California Agricultural Extension; Eddie Tanner of the Arcata Educational Farm; Larry Schussler of SunFrost; Maureen Hart of the Recycling Market Development Zone;

Carolyn Hawkins and Louise Jeffrey of the County of Humboldt; Alec Cooley of Humboldt State University, and T. Griffin. These folks were faithful meeting attendees or assisted the project in other ways. The assistance of Tall Chief Comet at the Blue Lake Rancheria of the Wiyot Tribe was very helpful. Others who attended meetings or offered assistance or answered our questions included numerous gardeners, landscapers, restaurateurs, zookeepers, farmers, and others too numerous to mention. We are grateful or their time as well.

A BRIEF NOTE TO THE READER....

Organics recycling, especially commercial organics, is as much about the soil as it is about waste diversion. As we developed this toolkit, we realized that the importance of returning nutrients to the soil may have greater immediate value than current short term economic benefits. However, this reality should not hamper the search for viable business opportunities in organics diversion. Compost, especially high quality compost, is truly "dark gold." Yet the raw materials to make that gold are still being tossed into too many landfills across the state and nation. When will the policy makers of local jurisdictions grasp the nature of this alchemical wonder, and the gap in their thinking? It is to this end that our toolkit has been developed.....

WHO SHOULD USE THIS TOOLKIT?

Policymakers, local recyclers, environmental thinkers, gardeners, and potential entrepreneurs may all learn from the ideas put forward in this toolkit.

WHAT IS IN THIS TOOLKIT?

There are sections on the rationale for composting, and some definitions; commercial opportunities; some facts about physical operations; a small case study; and a few policy recommendations. A short glossary, bibliography, and resources list are also offered.

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CHAPTER 1
INTRODUCTION, INSPIRATION, AND EXAMPLE

Organic recovery removes a significant percentage of the waste stream from landfill disposal. Yet even though composting is now being used in many U.S. jurisdictions and throughout the world, it is still considered by some to be an "alternative" technology. The natural processes of bacterial action convert waste to valuable humus, and the technology is stable. However the markets are still uncertain, and more action is needed to bring the commercial side of the industry up to its potential. Perhaps part of the problem is the waste diversion goals themselves, which have set up a quantitative approach to an essentially qualitative problem.

"The science of land doctoring is being practiced with vigor, but the art of land health is yet to be born."

--Aldo Leopold

This toolkit suggests that the goal of organic waste conversion should be viewed as the production of compost, and the purpose of compost is to restore healthy soil. The organic waste conversion process could be viewed mainly as a soil restoration effort, to bring life back to depleted or damaged soil. Certainly the process also results in increasing the amount of waste diversion from landfill, but that can be viewed as a benefit rather than the overall goal. Even if there were unlimited landfill areas and energy efficient transportation to reach them, we would still be wise to increase compost for its soil enrichment use: to restore and maintain the life and health of the soil.

Composting experts such as William Brinton of Woods End Research Laboratory explain that the errors of the so-called "green revolution" took a long time to discover. Farmers and scientists alike were misled for years by high crop yields from doses of chemical fertilizer. Assuming they were on the right track, they continued or increased use, until the life and structure of the soil collapsed, "killing" the soil by destroying its basic complex structure. The "death of the soil" comes in several forms: erosion (due to loss of holding power and resulting runoff); acidification (due to overuse of chemical fertilizers); salinity (due to flood irrigation necessitated by lack of water holding power); loss of organic matter itself; and compaction (due to lack of organic matter). The loss of organic matter contributes to the other four problems. And the cure is to replace the humus that has been removed over the years, and to recreate soil structure.

Soil should be viewed as complex habitat, and valued for itself, in its healthy state. It is not an inert raw material. If damaged, attempts must be made to restore it. These attempts will pay off in the value of the soil itself: in its power to nourish plants and hold water. Composting itself recreates humus. The more compost is added, the more the soil structure comes "alive" and returns to its complex, healthy, state.

"The soil is not a factory but a habitat. Good soil is not only a question of inputs and outputs, but structure and biology. The soil's health depends in large measure on how well water, air, and nutrients are able to circulate through it, nourishing the diverse populations of soil flora and fauna."

--William F. Brinton,
Woods End Research Laboratory, Maine, from "Compost and Regeneration," in *Orion, Special Section: Living Soil*, Spring 1992

Overall, then, the most important commercial value of organic waste diversion is in composting, because it is a valuable investment in soil restoration. Eventually, farmers or society will be willing to pay for advice and technology to restore soil. They have been paying for chemical fertilizers, and are learning the limits and damages of that option. Over time, and with the buildup of the knowledge base and a market for appropriate technology, they will receive the replacement technologies they need to restore their soil. Expert composters, vermi-composters, and technicians in biosolids and bioremediation will be in increasing demand. The "black gold" of creating compost is the knowledge and technology that leads to the restoration of healthy soil.

Compost Provides a Source of Organic Material

Soil organic matter can come from a variety of sources, including crop or plant residues, cover crops, and compost. Compost consists primarily of organic matter, which serves a variety of vital functions in the soil:

- **Provides food for microorganisms**. Bacteria and fungi that release nutrients from soil use organic matter as their food or source of energy. Thus, compost provides a source of both microorganisms and their fuel. Compost also provides an excellent habitat for microorganisms.
- **Holds nutrients and water**. In addition to providing a source of nutrients, organic material can hold onto many nutrients through its cation exchange capacity. Because compost molecules are negatively charged, they attract and hold onto positively charged ions, such as calcium, potassium, ammonium, and magnesium.
- **Forms aggregates and increases porosity**. Organic matter increases the aggregation of soil that results in a crumb-like structure. Changes in porosity can alter water retention properties and the water infiltration rate. Consequently, consistent compost use may improve irrigation efficiency.

From "*Compost Microbiology and the Soil Food Web,*"
California Integrated Waste Management Board
http://www.ciwmb.ca.gov/publications/default.asp?pubid=857

For example, Woods End Research Laboratory worked to improve the soil health while serving the commercial sector:

• Disney World landscapers in Florida requested assistance in reducing chemical fertilizer use. The laboratory researched and provided tailored compost recipes using all of Disney World green wastes to enrich the sandy, porous soil on their lands for water and nutrient retention.

"Composting takes diverse materials that are not useful or desirable in themselves and converts them into a new product, one that is superior to any one of its source materials in stability, smell, and plant nutrients."

-- Brinton

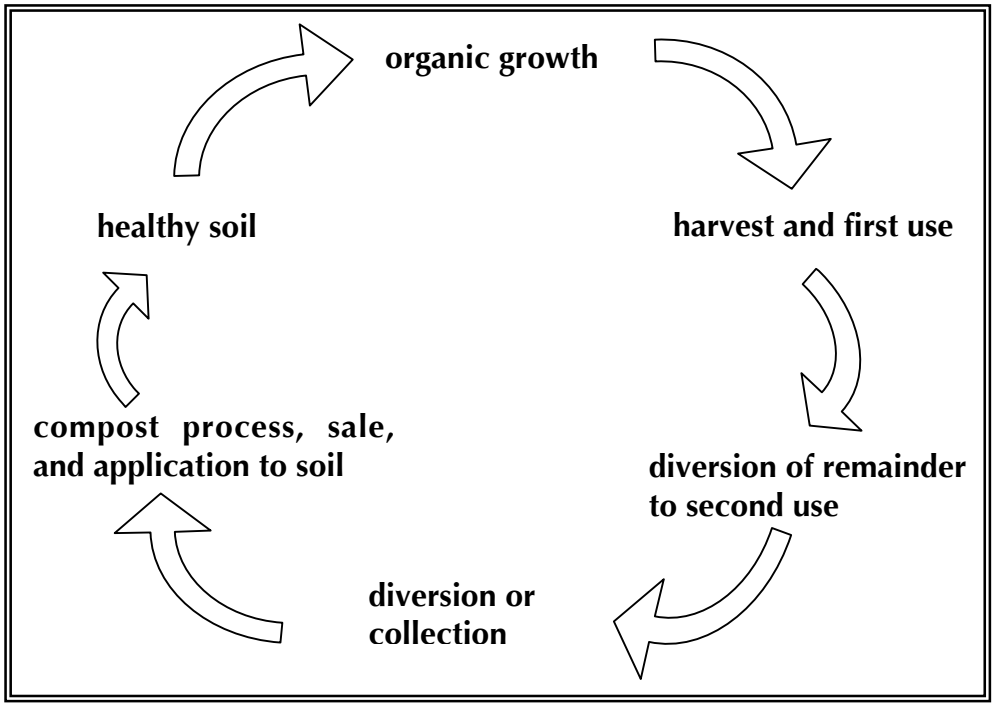
• The laboratory worked with aquaculture farms in British Columbia to mix dead salmon, dairy manure, and straw. "The finished compost was sweet-smelling," and most of it was returned to the dairy farmer's fields.

• A chicken farmer in Maine lost 100,000 chickens that suffocated in a fire. He buried them, but near an aquifer, and enforcers required he dig up the decomposing chickens and dispose of them some other way. The Woods End laboratory mixed them with sawdust and chicken manure in long windrow compost piles. Within a month the result was humus and even the bones had disintegrated. In one more week, the farmer had returned the sweet, rich compost back onto his land to grow more chicken feed.

These examples are more than a "should be" vision of organic materials management. They provide a recipe for a zero waste approach. As organics users understand the value and the character of organic materials, their high nitrogen or high carbon content and their living structure, they will forward the unused part of their product on to the next consumer or processor, until the final product returns to the soil. As a simple flow chart, zero waste in organics management, whether vegetable or animal matter, looks like this:

"Structure is a magic word in understanding soil. A healthy soil is an assembly of stable aggregates...each one not only holds its own envelope of liquid and gas, but creates enclosed channels and vessels, protected habitats where more air and water can be stored. Humus is the architect of this structure."

-- Brinton



Zero waste in organics management flows from soil to growth to harvest to consumers/users to compost producer to soil, in a dynamic cycle. Of course, this is still an ideal-world view, but by incorporating this principle into waste diversion programs, actors – including commercial actors -- will see "value" where others see only "waste."

"When I work with farmers and we begin to compost on their farms, they know, without seeing my data, that this is what they want. 'I don't want to sell this, or give it away,' they conclude. 'I want to use it to build my own soil.'"

-- Brinton

What policies will create an enabling environment for commercial actors to increase their overall diversion rates? And what policies will lead to higher quality products such as compost effectively sold to an ever-increasing market? What will it take to increase demand even further?

Logistical problems and obstacles also exist, in addition to policy questions, but this toolkit is geared to encouraging more commercial actors to participate at some point within the cycle. Whether they are commercial generators of organic feedstock, or producers of finished compost, they need to exchange ideas and solve problems together. As a demonstration in one rural county, the ORB Project (see case study in Chapter Three) sought to bring together existing organics players into an active discussing network to look at their industries and approach these problems with an eye to solving them.

CHAPTER II
PRODUCTS AND SERVICES:
ORGANIC WASTE AS COMMERCIAL OPPORTUNITY

COMING TO AGREEMENT ON A FEW BASIC DEFINITIONS

Organic materials are the complex living products of living systems. Organic "waste" then is simply the unwanted living products. Like "weeds" in gardens, they are in the wrong place at the wrong time, at least for human use. Gardeners trim away unwanted plant parts, chefs toss their vegetable trimmings, and homemakers throw out unwanted food from overflowing refrigerators or overfilled plates. Thrifty cooks have learned to utilize the trimmings in "minestrone"-type soups, but this is probably the exception rather than the rule in much of middle America.

Commercial organics, then, as this toolkit defines it, is the entrepreneurial activity of moving organics to the next user in a potentially zero waste cycle. And *composting is the recycling of vegetative or animal byproduct materials through decomposition of valuable nitrogen-rich organic materials mixed with carbon-rich woody materials and held at certain temperatures, turning and aerating over time, to result in the formation of humus.*

The definition of "compost," according to the California Integrated Waste Management Board is: "the product resulting from the controlled biological decomposition of organic wastes that are source separated from the municipal solid waste stream". This waste-centric and urban-centric definition views compost raw material as "waste," rather than as a valuable ingredient in a rich recipe for living soil. We prefer the more technical definition above (see italics).

Mulch is differentiated from compost, and is "a soil covering used to control weeds or erosion; retain moisture in soil; and insulate soil from cold weather" (CIMWB definition). As such, it can be, but need not be, compost. Its purpose may be to shade and protect soil and plants, to retain water, keep soil in place, or even to retard weed growth. Some mulch is even non-organic, such as plastic mulch. Such materials serve limited purposes, and do not enrich the soil. However, they may create conditions, such as shading or heating, that encourage bacterial processes to enrich the soil.

The term "organic" in modern usage has become quite confusing. First, there is the scientific usage, which separates organic chemistry from inorganic chemistry. In this approach, any materials that contain C, H, O, and N (Carbon, Hydrogen, Oxygen and Nitrogen) are organic, and any materials that do not, are inorganic. While it is true that plant and animal protein, enzymes and other living things always contain these 4 elements, many trace chemicals are also required in the form of minerals. Additionally, the movement of modern chemistry into synthetic organics has created plastics, biomedical substances, and many other non-living materials out of the CHON configuration. However, "organic waste" comes from living materials, and CHON are the basic building blocks. Carbon is always the dominant element, even in nitrogen-rich "green" waste, however the amount of carbon in the ratio is lower than it is in woody materials.

ORGANIC MATERIAL, is broken down further into the following "waste" categories:

'**Greenwaste' or 'Yard Waste'** –landscape or plant trimmings, leaves, and grass. This is usually nitrogen-rich, unless it contains a preponderance of brush and twigs, which are more carbon-rich.

'**Wood Waste**' includes woody debris, branches, twigs, stumps, and sawdust. These are carbon-rich. Some definitions also include construction waste.

'**Food Waste**' – means food material resulting from the processing, storage, preparation, cooking, handling, or consumption of food and comes from industrial, commercial and residential sources. It tends to be nitrogen-rich. It includes
- pre-consumer (kitchen trimmings)
- post-consumer (off-the-plate).

Other Organic Waste – includes manure, agricultural crop residue and other miscellaneous compostable organic materials. Manure is more nitrogen-rich, and crop residue such as the stems of corn or the hulls of rice are more carbon-rich.

Further confusion in the terminology of "organics" comes from the field of "organic agriculture'" another term of art. The National Organic Standards Board definition is: "Organic agriculture is an ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain and enhance ecological harmony".

Further, "organic" is a labeling term that denotes products produced under the authority of the Organic Foods Production Act. The principal guidelines of organic production are to use materials and practices that enhance the ecological balance of natural systems and that integrate the parts of the farming system into an ecological whole.

For purposes of this toolkit, we are defining organic waste to include discarded or remainder material of previously living vegetable and animal matter, regardless of whether it was grown to meet the stringent requirements of organic certification. Although this means that some material may contain traces of chemicals, it creates a broad enough definition to allow for the growth of highly needed soil enhancement materials. Good healthy soil will grow trees, flowers, ornamentals, and

non-certified food. Organic agriculturalists may decide to take additional steps to be assured that their soil improvement sources meet additional standards for certified organic food growing purposes.

Organic Food Registration and Certification

Organic registration was initiated in Humboldt County in 1992, in compliance with the California Organic Foods Act of 1990. The Act required all persons engaging in the production or handling of agricultural commodities sold as organic to register with the county agricultural commissioner, who submits the information to the California Department of Food and Agriculture (CDFA). The registration must be renewed annually.

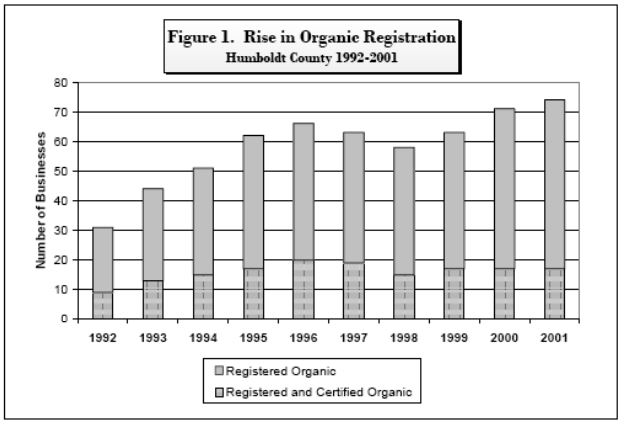
In 1992, 31 businesses registered organic in Humboldt County. By 2001, the number of organic registrants had climbed to 74, an increase of about 10% per year (figure 1). Consumer demand for organic produce continues to grow. Local farmers' markets have become very popular. The higher prices reaped for organic products are a lure for some, but many farmers are going organic for environmental and philosophical reasons. The boom in organics seen in Humboldt County reflects similar statewide and nationwide trends over the last ten years (Swezey and Broome 2000, Greene 2000).

In 2001, organic registrants in Humboldt County included two handlers, one processor (cheese), one dairy, and 70 growers. The dairy had 115 acres of pasture and the growers in combination had 300 acres, with a total of 415 acres of agricultural land registered organic.

Of the 74 businesses registering organic in Humboldt County in 2001, about one fourth were certified organic (figure 1). Certification is performed by an approved certifying agency. Of the 17 businesses certified organic in Humboldt County in 2001, the most frequently reported certifying agency was California Certified Organic Farmers (CCOF). One registrant was certified by Quality Assurance International (QAI), one by Quality Certification Services (QCS), and the rest (15) were certified by CCOF.

From "*Organic Agriculture in Humboldt County*,"
University of California Cooperative Extension, Agriculture & Natural Resources, 2002

Using these definitions, much organic waste diversion goes unmeasured, and may not even be considered waste by the actors. We do not know the amounts of voluntary and informal waste diversion. We do know, however, that anywhere from 25 to 50 percent of waste going to landfill is organic. The problem is to recapture a significant portion of that percentage in order to successfully decrease landfill size, as well as to further enrich and restore the soil.



From "*Organic Agriculture in Humboldt County*,"
University of California Cooperative Extension

FARMS, GARDENS, YARDS, LAWNS AND LANDSCAPING WASTE: A COMMERCIAL OPPORTUNITY

Organic materials are the ingredients for producing compost. They are generated by commercial players and others, often unaware of their value in the soil cycle. But they represent an opportunity for commercial and non-commercial actors alike.

Yards, Lawns, and Garden Opportunities

Gardens and lawns provide the most controllable and predictable raw materials for compost. These nitrogen-rich green materials, a combination of weeds, leaves, and clippings, provide the "N" for the C:N mixture that compost needs. This rich material has value, yet its owner often must pay to have it hauled away. Thus, the major issue is transportation. Contamination by pesticides is also a concern, but if the transporter is a landscaper or gardener, they will be able to disclose this, if requested, to the collection site.

An alternative commercial venture is the on-site backyard composting service. A landscaper or gardening business may maintain, feed, and turn a compost bin or pile on site, may run a chipper or add sawdust or other carbon-rich materials to the compost, and many charge the client extra for this gardening service. Thus, the green waste stays on site to enrich the owner's soil, the client benefits, and the landscaper receives additional income. All that may be needed is the purchase of a commercially- or municipally-available backyard compost bin (the sales of which is another market opportunity), and the owner is freed from the "trouble" of compost maintenance if the gardener adds this to services offered. A well-tended bin can be attractive and has little odor. The client may also decide to add kitchen cuttings to the bin, since the material will stay on site.

"We give our customers some literature about grasscycling. And we make a strong commitment to making the lawn look good, so the customers are usually willing to try it. Once they see the results, they say, 'Keep doing it.'"

– Richard Applebaum,
East Bay Landscaping Co, San Leandro, from "A Landscaper's Guide to Grasscycling", of the Alameda County Waste Management Authority)

Compost bin sales are another commercial opportunity associated with yard waste composting. Theoretically, every yard should have one, and every bin owner should receive educational services or bin compost maintenance services. A more commercial approach may be the combined sale of a

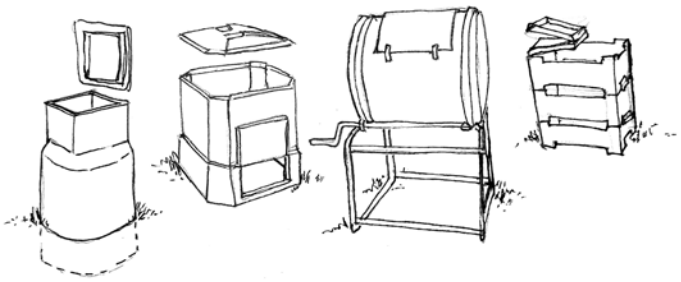
compost bin and a regularly maintained service contract. (See "*Description of state backyard composting bin markets*," Gainer and Associates, December 1993. Also search the web for current bins available commercially.)

The landscaper or gardener may be asked to haul away green waste and brush. At this point, they may decide to sell their hauling as an additional charge; or they may establish their own compost site and become intermediate owners of the green waste. Unless they choose to establish and maintain a compost site, or convince some clients to do so, they will probably haul the green waste to either a compost or collection facility or a waste transfer station or landfill.

Alternative commercial options include cooperative transportation or collection, cooperative landscapers' compost sites, and onsite backyard bin maintenance services by landscapers and gardeners.

Other opportunities come from grasscycling – the process of leaving the finely cut and dispersed clippings on the lawn. Cordless electric mulching lawnmowers are available for commercial sale, and produce a fine mulch that enriches the lawn. Reel lawnmowers, manually operated, have also made a comeback, and they too disperse grass clippings in a spray, without clumping. Each blade of grass has high moisture content, as well as fiber and nitrogen, and will decompose in a few days, adding water and fertilizer to the soil, and requiring less chemical fertilizers. This can be important in situations of parks, golf courses, recreational lawn use or children's play areas.

According to the US EPA's GreenScapes program, a country club and golf course landscaping program in Glenview Illinois has switched to organic products for turf



EXAMPLES OF FOUR DIFFERENT BACKYARD COMPOSTING SYSTEMS (from left to right):

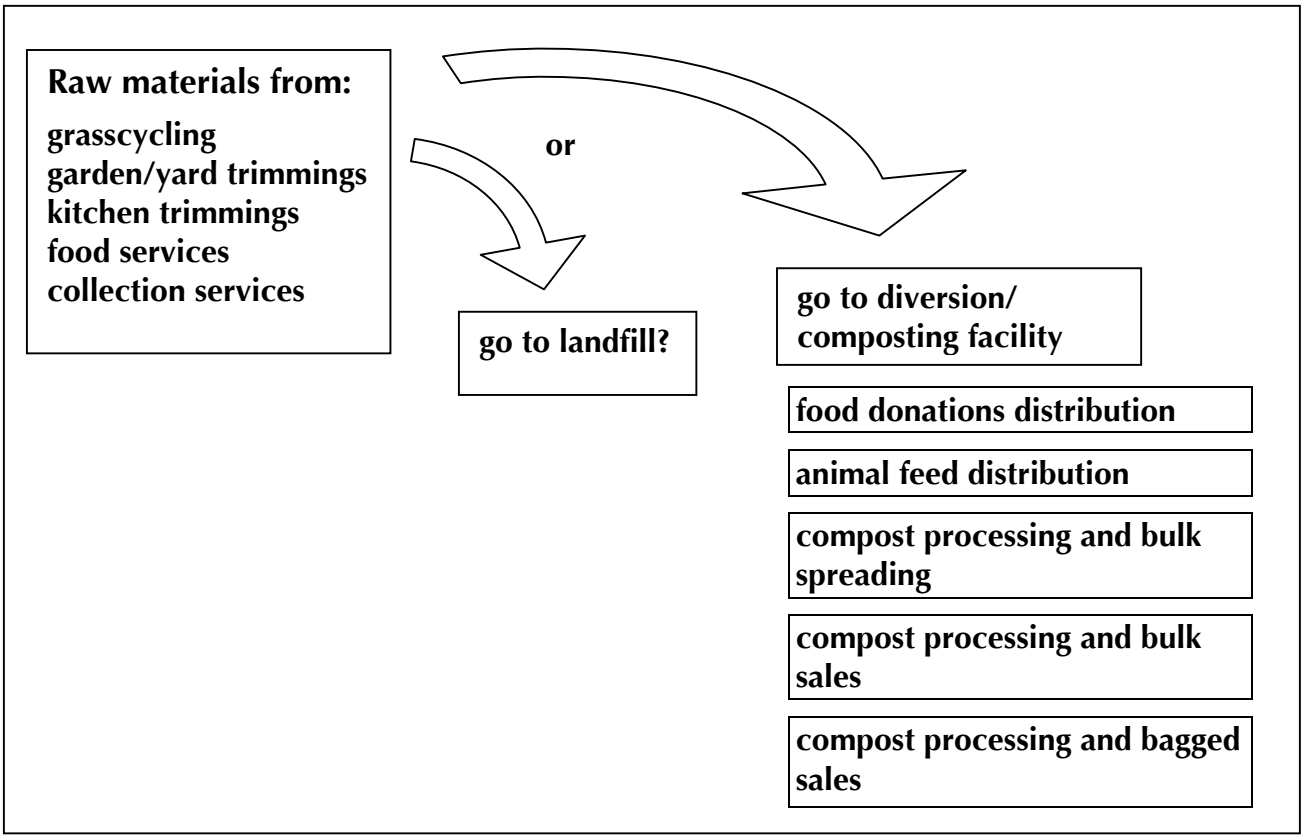
Anaerobic composters are fully enclosed systems that require no turning or aerating.
Static bins you keep feeding, with some aerating, allow you to add materials to the top and eventually remove finished compost from the bottom.
Tumblers, though comparatively complicated, make turning compost simple.
Modular bins allow for good ventilation and easy turning.

Compost – An On-Par Alternative
The soil on the North Shore Country Club (Glenview, Illinios) golf course had elevated sodium levels too high to maintain quality turf. Standard procedure called for the installation of a well to solve this problem, but that solution came with a quarter million dollar price tag. With a little research, North Shore found compost to be the economical alternative to enhance the quality of its soil.

--GreenScapes, U.S. EPA,
http://www.epa.gov/epaoswer/non-hw/green/

management. They use a 50-50 biosolids mix processed by the Chicago Sanitary district, and they use compost made from yard waste. Their turf has improved, and they are pleased with the outcome.

In summary, landscape and yard operators can save money and increase soil and garden quality by yard waste processing and use of compost. They may also increase the services they offer to clients, including compost bin maintenance, and hauling to composting sites. Workshops to outreach to this commercial sector should prove effective.



The farm opportunity. Farm wastes, such as manure, straw, and culled apples, are another commercial opportunity, either for the farmer or an enterprising collector, hauler or composter. Farmers do not always know the value of their raw materials, and neither do regulators and enforcers. Often, valuable compostables are turned under without the value-added rich organic structure that a few weeks in a compost pile can provide. Or regulators will focus on the runoff and pollution issues associated with high nitrogen sources such as manure, instead of cooperating to reach the stabilized end product. Since farming involves so many crops, livestock, and other variables, the subject is further broken down here for analysis of commercial opportunities:

Manure. Many dairy farmers have realized the commercial value of manure and have put it back into their land, with or without composting. Raw manure may be too nutrient rich, and may leach into nearby water systems during storms. A better solution is to add sawdust or straw, and turn into windrows, allowing a few weeks for compost to form. Regulations are stringent on runoff due to the possibility of water pollution. However, covered windrows, where manure is turned with a high carbon source such as sawdust, is a good solution. Where the farmer has neither the time nor the labor, however, she may be able to find a transporter or collector who will haul it away, or actually pay her for the valuable ingredient. The same is true for hog farms and goat dairies.

TARGET AUDIENCES

Outreach activities and events to implement organic materials reduction programs in local jurisdictions will be directed toward three *primary* audiences:

• **Professional yard, tree and landscape maintenance operators** include individuals and companies who are in business to provide landscape maintenance services to homeowners and commercial property owners. Members of this group encompass individual landscapers, professional gardeners, arborists, landscape contractors, lawn and yard maintenance companies, and tree care services.

• **Large landscape site managers** are usually employed by public agencies or private business to manage the landscape on a public or private facility. These large landscape sites can be significant generators of greenwaste within a local jurisdiction.

Various sites have different titles for the person in charge of managing the landscape. At some sites that person can be called a Facilities, Maintenance or Landscape Supervisor or Superintendent. At other sites the title can be the Landscape Director or a Grounds Service Manager. The Type of landscape sites managed by this group can include:

- Public parks, community gardens and urban recreation areas;
- Educational and school facilities;
- Industrial plants and office parks;
- Government or public agency facilities;
- Condominium and apartment complexes;
- Hospital and health care institutions;
- Public housing and retirement home facilities;
- Mobile home parks and homeowner association community grounds;
- Hotels and resort facilities;
- Religious edifice and cemetery grounds;
- Military and prison installations;
- Golf course and sports complexes

• **Landscape design and installation contractors** are included as a target audience because source reduction of landscape trimmings begins with rethinking the use and need for urban landscapes that generate high volumes of biomass then taking steps to promote the design and establishment of *Low Input Waste Efficient Landscapes*.

Secondary audiences include the following two groups:

• **Commercial and public agency organic product end users** include residential and commercial landscape maintenance operators, professional gardeners, landscape contractors, large site managers and groundskeepers, and procurement agents for public and private agencies that buy products for use in urban landscapes.

• **Private homeowners and estate managers** who have an interest in learning about environmentally friendly landscape management practices and using the techniques of greenwaste reduction on their own property will be given the opportunity to participate in certain Program activities.

(California Integrated Waste Management Board)

Crop Waste. Certainly the highest use of unharvested or culled food crops is gleaning, where such a service is available. Volunteer gleaners may gather the food for donation or distribution through a local food bank to families in need. Some crop waste, however, is non-food, such as cornhusks or rice hulls. Some fibers are useful for paper. However, these carbon-rich leavings could be considered as carbon components in an on-site composting situation, or be hauled to a composting facility.

3. Wood waste generators. In addition to brush from gardens, wood waste includes the more bulky and carbon-rich woody debris from logging sites, lumber mills, and construction sites. Again, commercial opportunities may exist for someone, where others see only waste. Some of this valuable, carbon-rich, material is being burned on-site, where fuel buildup may otherwise create fire danger. A well-designed controlled burn may actually be good for soil and native species. However, because of the loss of carbon to the soil and the addition of carbon dioxide to the atmosphere, alternatives to burning should also be examined.

Wood waste processing equipment in action

A once-a-year opportunity for collection and use of wood waste comes with Christmas tree recycling. Whether municipal or privately collected, enterprising individuals may charge for the pickup service and transport of the carbon-rich trees to a nearby composting site. In Santa Clara County one year, curbside pickup was available until the 10th of January, and one drop-off site was open. They recovered 93 tons of trees, then chipped in tub grinders, and a private contractor was the end-user of the mulch. This was a collaboration with local government and private industry. ("Christmas Tree Recovery Programs," a CIWMB publication, 1992)

Equipment for wood waste. In small woodlots an onsite chipper may help to restore forest soil by leaving material on site. Wood products, if used for furniture, flooring, etc, will continue to sequester carbon in perpetuity. Where carbon can be preserved and wood created into a useful product, this is preferred to burning as biomass. At composting facilities, chippers, shredders, and grinders are useful for processing wood waste for composting.

One way to preserve carbon is to combine it with nitrogen to make rich, alive soil, through composting. Where possible, finely chipped or shredded woody debris and sawdust should be used this way, and is especially effective with odiferous nitrogen sources such as fish waste or manure.

FOOD WASTE AS OPPORTUNITY: SERVING THE COMMERCIAL FOOD SERVICE INDUSTRIES

Food waste generators are either residential or commercial, and generate "pre-consumer" and "post-consumer" food waste. This nitrogen-rich material often heads for the transfer station or landfill, so commercial opportunities exist at this point in the cycle. Residential kitchen waste, especially from the cutting board, is a good addition to a backyard compost bin, or a small consumer-sized "worm bin". These are available commercially, and marketing as well as consumer education could increase sales. Landscapers or hired gardeners may also suggest to their clients the addition of kitchen trimmings to the backyard compost bin, and may offer to maintain the bin as an additional commercial service.

"Post-consumer food waste" may contain pathogens and commercial composting is recommended. A good compost pile will heat enough to destroy the pathogens. (Home gardeners may choose to use their own post-consumer waste in a limited setting.)

On the commercial scale, food waste generators generate large quantities of cutting board trimmings, and include food processors, restaurants, hotels, institutional food service vendors, and festival events. Training, labeling, and separation are recommended.

Equipment for smaller food diversion varies from small backyard bins to larger tub-compost systems. These bins are available commercially, and can also generate savings on avoided disposal fees.

Food waste is nitrogen rich!

"Pre-consumer" food waste: This is kitchen trimmings, "off the cutting board," and is as safe as any farm product.

"Post-consumer" food waste: This is after the consumer has eaten, and is defined as what is left on the plate, or "scrapings off the plate," and may contain human pathogens.

Food processors, wineries and breweries generate "clean" kitchen waste, free of post-consumer contamination. As such they should be sought out first by composters for the quality of their raw materials. Cutting board and cooked waste may be added to commercial compost facilities as valuable source materials. For liquid food composting, see *BioCycle*, June 1999.

Restaurants and hotels generate quantities of kitchen waste at the pre-consumer level. Commercial collectors and composters of this material should encourage owners and managers to train and work with staff to keep this valuable nitrogen-rich additive as free from post-consumer waste as possible. A simple signage program, with signs such as "cutting board trimmings here" and "plate waste down the disposal here" or "NO off-the-plate waste here" may be enough.

Large outdoor events such as festivals with food booths, and catered weddings may involve some cutting-board waste, but often the food preparation step is done off-site beforehand. Food booths may generate trimmings, but separate colored cans should be located inside the booth, and signage posted to prevent addition of trash to the cans.

Institutional food service provides the same opportunity as restaurants and hotels. Training and signage are equally important in this setting.

Food Scraps and Wine: An Agreeable Combination
GreenScapes, EPA

Fine wine and garbage aren't usually an appetizing combination, but a new venture by Jepson Prairie Organics brings the two together. Compost made from the food scraps of more than 1,500 food related businesses and thousands of residents in San Francisco is being used on vineyards throughout Northern California's wine country to enhance the quality of the soil.

Jepson Prairie Organics began making compost with food scraps from the city in 1997, and in 2002, a vineyard management company approached Jepson to purchase compost for use in its vineyards. More than 300 tons of food scraps are sent to Jepson's composting facility each day, and 12 vineyards are currently using Jepson's compost. The Organic Material Review has analyzed the finished compost and deemed it appropriate for use on organic farms.

Everyone involved in this project is excited about the program because it is one example of "closing the loop"—organics are taken from San Francisco tables, composted, put back into the soil, and returned to San Francisco restaurants as wine. Chris Choate, regional manager for compost facilities, says, "San Francisco likes the program because it shows how restaurants can do their part to divert waste from the landfills."

Linda Hale, vineyard manager at Madrone Vineyards, thought using Jepson's compost was a great opportunity. "Farmers are environmental stewards and must be careful with the soil," she notes. Using compost produced with food scraps allows the vineyard to help both the soil and the environment. Since it was so easy to get involved, Hale could see no reason not to take advantage of this opportunity.

"Participating in this program is a win-win situation," agrees Darek Trowbridge, vineyard manager at Everett Ridge Vineyards and Winery. "The quality of the compost is better than what we used before, it is cheaper, and we are recycling a waste product." He attributes the good quality of the compost to the diverse feedstock. Trowbridge estimates a $5 to $10 savings per yard from using Jepson's compost at his vineyard since food scraps are seen as a waste product and therefore cost less than a new product. In addition, trucking costs less than transporting compost from afar. He thinks this program is a successful way to reuse some of the items society consumes.

Choate anticipates the partnership between Jepson and local vineyards will continue to thrive, as it is beneficial to the growers and the environment. There are no additional costs for growers, people are seeing the farm and city connection, and the program is right in line with current trend in the United States towards sustainable and organic agriculture.

Supermarkets and grocery stores generate "clean" produce, removed from the shelves after it begins to look less attractive to consumers. Some of this food is donated to food banks. However, some supermarket chains (including Safeway) have begun to backhaul their older produce to compost facilities located near their produce farmers. "Backhauling" is the usage of an otherwise empty truck for the return trip and is more energy efficient. Some local stores have added separate collection bins for hauling to a regional compost facility. There are commercial opportunities here for haulers and for commercial composting facilities. Smaller composting bins may be used onsite or by nearby enterprising landscapers for supermarket or mall landscaping. A program in Massachusetts called WasteCap has been highly successful with supermarket waste.

(See also the EPA publication "*Don't Throw Away that Food; Strategies for Record-Setting Waste Reduction*" and the California Integrated Waste Management Board website at www.ciwmb.ca.gov/FoodWaste.)

LABELING AND CERTIFYING QUALITY COMPOST PRODUCTS

For premium-bagged soil, quality control may extend beyond simple specifications like pH and nutrient content to "organic" standards set forth in the National Organic Programs Rule.

A VIRGINIA SUPERMARKET EXAMPLE

"RICHMOND, VA. Ukrop's Super Markets, Inc. is excited about our partnership with Watkins Nurseries, Inc. Through this partnership, Ukrop's is able to recycle fruit and vegetable trimmings from our Central Kitchen into organic compost.

"Ukrop's Organic Compost is made from thousands of pounds of fruit and vegetable trimmings that are produced each day as a result of our fruit and vegetable cutting operation. While consisting primarily of leaves and fruit and vegetable trimmings, minor amounts of liquids from our central cooking operation and dairy products may be added to promote the composting process. (No manure is added to the compost.) The residuals from Ukrop's Central Kitchen are transported to Watkins Nurseries, where the composting process occurs."

"Ukrop's Organic Compost was then made available in 20 pound bags at all its supermarkets, and could also be purchased at the Watkins nurseries."

Organic Consumers Association, www.organicconsumers.org/supermarket/ukrop_compost.cfm

Smaller compost sites depend more on plant response than physical and chemical analysis. Composters with experience tend to know what mature compost looks and feels like, and see and feel the compost to determine if its moisture and particle size is right. Because cleaner feedstock is often being used at these smaller operations, issues like heavy metals are not as much of a concern for smaller operations. The following represent frequently asked questions coming from the sites and generators ORB staff worked with to help increase quality compost production. (See chapter 3 for explanation of the ORB project).

Q- What organizations provide certification services for quality compost producers?

Several organizations are involved in certifying quality compost including:

US Composting Council (USCC) – This non-profit created and administers the Seal of Testing Assurance (STA) program where participating compost producers can display the seal if they submit samples to a certified laboratory for analysis of select physical and chemical parameters and if they meet US EPA standards for nine metals. There is a fee for this program, and information is available at *http://tmecc.org/sta/index.html*. They also publish the *USCC Field Guide to Compost Use* that contains guidelines for different uses.

California Compost Quality Council (CCQC) – CCQC administers a program where compost producers can display the CCQC logo if they submit samples to a certified laboratory for analysis of select physical and chemical parameters. Participating compost producers also receive statewide exposure through the web site directory and CCQC displays at trade shows and conferences, and networking opportunities. In addition, soil scientists and laboratory professionals are available to answer questions regarding compost production and use. A number of

composting operations are currently registered with the CCQC. For information visit their web site at *www.crra.com/ccqc*.

Organics Materials Review Institute (OMRI) – This organization provides more of a review process then a testing process. This review process costs about $500, and ensures organic growers, ranchers and processors that compost products labeled "organic" are in compliance with standards set forth in the National Organic Programs Rule. There are 35 composters that have gone through OMRI review process (as of the year 2004) and their brand name products list can be found at *www.omri.org.*

Q- What kinds of specifications do compost buyers often require?

According to state and federal agencies and certifying organizations the compost specifications desired by compost buyers include:

• **Particle Size** – quality compost is usually screened to 3/8" minus
• **Salt Concentration** – high salt concentrations > 4.0 mmhos/cm are harmful to plants
• **Stability/Maturity** – mature compost has carbon to nitrogen ratio of <20
• **Feedstock Materials** – green waste, food waste, manure, biosolids, etc.
• **Nutrient Content** – N-P-K, Ca, Mg, S, Bo and others are slowly released from compost
• **Trace Contaminants** – US EPA 40 CFR 503 regulates heavy metals in compost
• **pH** – Compost helps buffer soil toward neutral (pH = 7)
• **Visible Contaminants** – glass, plastic, paper should not be visible (Caltrans requires <0.1%)
• **Moisture Content** – 40-50% is preferred. Wet compost has odor and dry compost is dusty
• **Organic Matter Content** – 50-60% preferred
• **Bulk Density** – 800 lbs./cubic yard preferred for handling, transportation and application.

Q- What other compost attributes are of greatest interest to compost users?

• **Weed seeds** were the biggest concern, according to a Cornell study. Compost is usually not tested for weed seeds, and no guideline programs exist that specify maximum weed seed content. The US Composting Council (USCC) Landscape guide calls for composts that are "weed free", but no numeric values are specified.

• **Pathogens** were also a user concern. Again, pathogens are not included in most guidelines, but there are federal regulations that address this issue, at *US EPA 503*.

Compost Specification Elements

Characteristic	Associated Value	Comments
1. Particle Size	< 1″; 2″; etc.	Porosity affects air and water infiltration. Smaller particles have more available nitrogen.
2. Salt Concentration	Mmhos/cm	High salt concentrations, > 4.0 mmhos/cm, can be harmful to seeds and plants.
3. Stability/Maturity	Stable or mature (i.e. when the organic material stops decomposing)	In mature compost, nitrogen is available to plants; and there is less potential for odor problems. The CIWMB is currently developing a maturity index through a contract with an industry association to help define what constitutes mature compost. This index should be available by summer 2000.
4. Feedstock Materials	Specify ingredients	The type of feedstock used can help you decide what product best suits your needs. Typical feedstock's include landscape/yard trimmings; grass clippings; food scraps; bio-solids; and agricultural crop residues.
5. Nutrient Content	N-P-K; Ca; Mg; S; Bo; & others	Compost provides slow-release nutrients, more efficient plant uptake; and much lower rates of fertilizer leaching
6. Trace Contaminants	Metals (Lead, Mercury, Etc.)	Product should meet US EPA, 40 CFR 503 regulations. Compost also binds up heavy metals.
7. pH	Acid/base	Helps balance the pH of your soil. Compost helps buffer soil toward neutral (pH=7).
8. Visible Contaminants	Specify inert: Glass Plastic Paper	Amount of glass, paper, plastic, etc., visible in the final product; ideally should be none visible. Cal Trans specification requires < 0.1 % by weight or volume.
9. Moisture Content	35-55% (40-50% preferred)	If you purchase by weight, wet compost means you're paying to haul excess water. Very wet compost can cause odor problems, while dry compost can be dusty and irritating to work with.
10. Organic Matter Content	30-70% by dry wt. (50-60% preferred)	Compost improves soil structure and water holding capacity.
11. Certifications	California Compost Quality Council (CCQC)	Requires that registered suppliers disclose feedstock and specified parameters. The supplier must also have a quality assurance/quality control program. Buyers *can* have greater confidence regarding the consistency and appropriateness of the compost product they buy for intended end uses.
12. User Guidelines	Application rates Vol/area	Ask suppliers to provide guidelines on how to apply their product. CIWMB is developing informational fact sheets for specific landscaping applications; these should be available by Spring 2000. Check the Board's web site at www.ciwmb.ca.gov/organics/.
13. Bulk Density	800 lbs./cubic yard	Depends on feedstock and moisture content, typically in range of 700 – 1200 lbs./cubic yard. Affects product handling, transportation and application.
14. Carbon/Nitrogen Ratio	C:N less than 20	C:N ratio is sometime used as a measure of stability. Ratio of less than 20:1 is likely to indicate that the compost is stable.
15. Other	Color, smell	Should have an "earthy" odor that is not unpleasant.

(California Integrated Waste Management Board)

• **Plant response**. The greatest concern to buyers is the plant's response. Germination tests and plant biomass tests are done by some buyers, but again these are not part of any guidelines.

Q- What kinds of end user guidelines should compost producers provide buyers?

The US Composting Council (USCC) publishes a "Field Guide to Compost Use" that provides instructions on compost use. Information on this publication can be found at *www.compostingcouncil.org.* USCC also has a "Seal of Testing Assurance" program, which provides standardized content labeling and use instructions for consumers.

The California Integrated Waste Management Board (CIWMB) has developed a series of fact sheets that provide application guidelines for compost buyers. These can be found at *www.ciwmb.ca.gov/Organics.*

Q- Are there intangibles about local compost that could be included on a local "quality" label?

Local attributes can also be promoted, such as quality of life. In Humboldt County, dairies promote products such as "grass-fed beef" based on the large, clean pasture that cows feed on, which adds value to local dairy products. The idea of promoting local compost products based on local quality features such as less pesticide use, more food waste from organic restaurants, and less water or air pollution, needs to be further examined by local economic developers.

Suggested Certification research:

California Quality Compost Council:
www.crra.com/ccqc
Soil Food Web Incorporated:
www.soilfoodweb.com
US Compost Council:
www.compostingcouncil.org
Organic Materials Review Institute:
www.omri.org
Biocycle:
www.jgpress.com/
CIWMB Organics:
www.ciwmb.ca.gov/organics

THE COMMERCIAL COMPOST FACILITY: SMALL, MEDIUM, AND LARGE

Large composting facilities to be operated either commercially or by municipalities, require extensive research, business plans, and investments. They are not covered in great detail in this toolkit. There is an existing body of technical and scientific literature focused on the large composting facility. However, some of the principles, equipment and approaches used in large-scale operations are useful to understand, for small and mid-sized facilities, whether commercial or municipal. These are summarized below, with the caution that greater research and thorough sets of instructions is needed beyond this text before implementing any facility plans.

A full-scale composting facility may take several acres, with outdoor windrows and indoor equipment, or with indoor or roofed composting piles, windrows, or in-vessel containers. The quantity processed at large facilities surveyed in 1990 varied from 2500 to 60,000 tons per year. The basic processes are shown in the box on this page.

Composting Processes

- **collection/drop-off of raw materials (grass, leaves, woody material, or other organic material)**
- **bag removal (if any)**
- **shredding, grinding, chipping the waste**
- **forming the piles or windrows (average 12′ wide by 8′ high, but varies)**
- **in-vessel containers (if any, may be instead of windrows)**
- **achieving the proper mix of C:N materials**
- **aerating the piles or windrows by turning**
- **achieving and maintaining the proper temperature**
- **maintaining moisture content**
- **time (6 weeks to 18 months)**
- **finishing the compost**
- **testing**
- **bagged or bulk sales**

Composting Equipment:

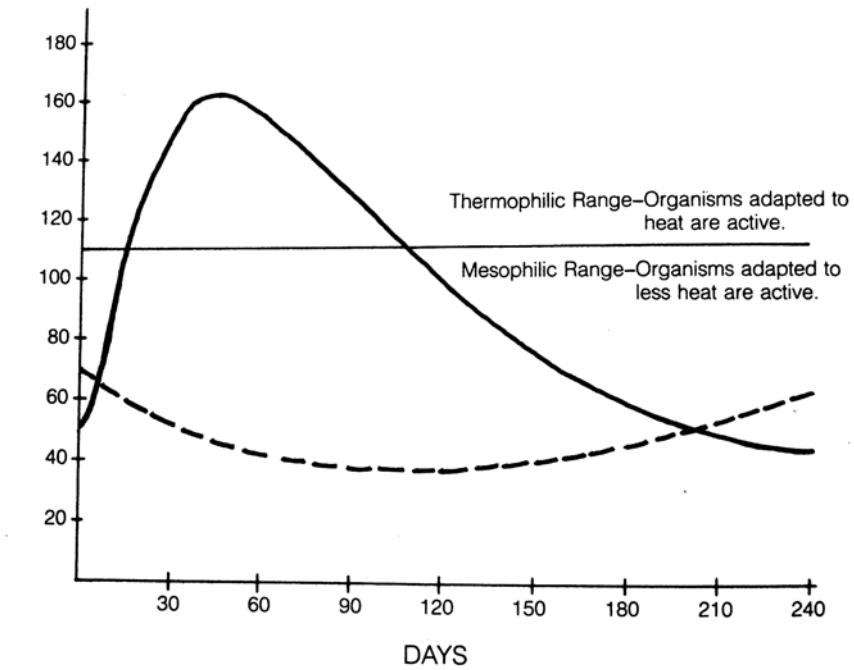
- **bag breaker or opening device (if bagged leaves are accepted at the site)**
- **sorter**
- **shredder/mixer**
- **grinder/chipper**
- **mixer/agitator/auger**
- **windrow turner**
- **tractor (for raking and towing)**
- **bins/ rotating bins**
- **probe thermometer**
- **digester/ mini-digester**
- **sifters/ screens/ gyrators/ filters**
- **in-vessel systems**
- **irrigation systems**
- **odor treatment solutions**
- **conveyer-mixer/ inversion conveyer**
- **bagger**

The land base may be level untreated acreage with soil base, or a base of concrete, asphalt or aggregate. The active composting area needed will be from one to forty acres. It takes one acre to process 7,000 cubic yards of leafy material, or twice the space with woody materials, which may also speed up the composting process and temperature. Many sites additionally require catchment ponds for leachate draining and treatment.

Equipment varies according to the design of the site, and some equipment may cost over $100,000 each if purchased new.

An In-vessel composting facility

Some of the most common problems that arise are permitting, labor, transportation and collection, pests and pathogens, odor, toxic contamination, leachate control and weed seeds. Most of these are treatable, and are in scientific and technical literature in greater detail through web research.

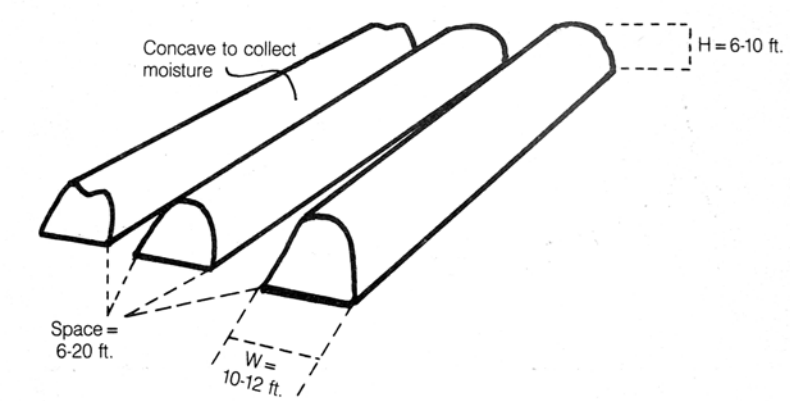


Typical Composting Temperatures

An adequate supply of air (oxygen) is required to maintain the elevated temperatures generated by composting. A brief drop in temperatures will occur each time a windrow is turned.

(from Composting: Making Good Use of Garbage, CIWMB)

It is clear from this list that the large, centralized composting facility is capital-intensive, yet it may be the only solution in some situations. The number of such facilities continues to grow across the country, and have been successful in Europe for over thirty years. However, where possible, small scale and mid-scale decentralized facilities may be successful with far less sophisticated equipment. An ideal solution may be for local governments, who at times own parcels of land, to dedicate a site to this purpose and find willing and skilled enterprises to contract with them for the composting operations. With rising concerns about transportation costs and environmental impacts, a well-tended site in or near town can provide for landscaping needs while meeting waste diversion needs.



Windrow Construction
Recommended dimensions are noted. The space required between windrows depends on the type of turning equipment used.
(from Composting: Making Good Use of Garbage, CIWMB)

A windrow being turned

In Chapter III we discuss in greater detail some small, decentralized commercial operations, including a worm farm, a small commercial composter, a transfer station, and a community supported agriculture farm. In each case, the equipment needs are far less than the list above.

VERMICOMPOSTING OR WORM FARMING: ALIVE AND GROWING VALUABLE PRODUCTS

One small-scale commercial operation that holds great promise is the worm farm. This can exist as a cottage industry, or as small-scale specialty agriculture. Live worms are the product, as well as worm castings. This can be viewed as "miniature livestock raising," as worms are fauna, not flora. The spatial needs are far smaller than composting, and there is a good body of literature on the web on the "how-to" aspects of vermi-composting facilities, worm-farms, and even of raising "pet worms!" A few of the key principles and approaches are highlighted here.

WORM COMPOSTING
(simplest version)
A wooden or plastic box with holes on sides and bottom

Ingredients:
--food waste (but not citrus!)
--newspaper, shredded
--red worms

Directions
--shred and moisten paper and layer 6″ deep in the box; adding more as needed
--add worms, and feed them stale bread for two or three weeks, until they feel at home
--add fresh food waste (no animal products) to the box, as generated in your kitchen

Result:
--Worm compost is ready in a couple of months.

With a simple backyard bin, the instructions can be simple, as in the example derived from a handout of the Alameda County Home Composting program (undated, from our archives). Before embarking on a more complex entrepreneurial approach, the enterprising individual would do well to try a small batch at home, farm, or garden to determine technique. A small amount of worms, less than a pound, provides enough for a test bin. Some test bins are available commercially from worm farmers as a kit from about $35 to $75, are about the size of an ice chest, and contain enough worms and bedding materials for a family to get started, with just a few instructions.

A pound of worms is a small investment, usually under $30, and contains about 1,000 adult red worms, or a combination of adults, juveniles, and spawn. Under the right conditions, the 1,000 adult red worms may produce one million red worms in a year, and if the right conditions continue, one billion by the end of the second year. Of course, the space needs do increase.

"Each worm is a tiny composting facility."
--ORB staff

"Vermicompost" is another name for worm castings, or to be more precise, worm manure. The nutrient value of the castings depends on the feedstock fed to the worms, and the bedding material, which is also feedstock to them. The worms' digestive system processes the feedstock into a form readily available to plants. As such, each worm is a tiny composting facility.

Feedstock is commonly nitrogen-rich food waste or manure, plus bedding material that is more carbon-rich, such as shredded cardboard or shredded paper. A tablespoon of sterile grit such as rock dust or oyster flour (ground-up shells), should be added periodically. It helps the worms' digestive process as they have no teeth. Worms eat paper, fruits and vegetables, coffee grounds, grains, yard waste (shredded) and manure. AVOID FEEDING THEM CITRUS WASTE, as it contains limonene, which is toxic to them. Pre-composted food is easier for them to digest than raw food waste or large pieces of food.

The Basics of Worm Farming

Bins	Plastic or wood. Buy or Build. How big depends on how much weekly food waste you generate. Figure one square foot of bin per one pound of weekly food waste. 8″–12″ deep.
Bedding	Shredded paper, shredded cardboard, animal manure (not chicken or pet manure), leaf mold, peat moss, old composted saw dust or wood shavings. Any of these can be used. Each has advantages and disadvantages. Shredded newspaper is most commonly used because of its availability. 4″–6″ deep.
Food	Food waste to us = food to worms. Worms will eat anything that decomposes. Feed in a pattern. Worms don't need to be fed every day. Avoiding overfeeding to avoid odors. Avoid citrus.
Moisture	Worms like their bedding moist but not soggy. For newspaper and other dry beddings, the water to bedding ratio is 3:1 by weight. Plastic bins accumulate moisture, wooden bins generally do not. Draining food wastes will help prevent excess moisture in the bin.
Air	Worms and micro-organisms need air for aerobic decomposition. Holes in the side, top and bottom of bin help it to stay aerobic and odor-free. Anaerobic decomposition is odiferous.
Temperature	Worms don't like to be too cold or too hot. Temperatures above 90F or below 32F may kill worms. 55-77F degrees is the optimum range.
Worms	Red Worms, Red Wigglers, not night crawlers, are the worms of choice. Worms will eat approximately one half their weight in food waste per day. One pound worms per box to get started.
Harvesting	To turn everything into vermicompost takes about 3-4 months, into all worm castings takes about 6 months. Worm casting or vermicompost can be used directly in house plant and in the garden. Use it wisely. What you have is "Gardener's Gold."

Size of bins varies considerably. A bin that holds 10 to 20 gallons is large enough for the food waste of one family. Low-mounded rows, also called "ricks" or worm beds, can be made for a larger worm farm. And in-vessel systems are also available commercially. Worm bin suppliers are listed at the California Integrated Waste Management Board's website, in their organics section.

Commercial opportunities are as varied as the entrepreneur. See chapter III for information about a local worm farmer's pilot project with area restaurants.

Marketing and sales of worms, worm colonies, worm castings, and worm-enhanced compost, other than to a few friends, of course requires a systematic approach of its own. The next section deals with some principles involved in successfully marketing a variety of products made from organic wastes.

OF MARKETING AND MEASURING. . .

There are at least 4 primary markets for compost and related products:

- Processors of soil products
- Governments, Institutional and Recreational users
- Retailers of garden and landscaping products
- Commercial Gardeners and Agriculturalists

In each case, there is room for market growth, by targeting the needs of the market, and increasing the knowledge about and need for compost for improved soil.

• Processors of compost themselves, whether large or small, are in the market for organic waste materials, and use these for raw materials or "feedstock" in their processing operations. Additionally, they may add products that have sale value themselves, such as manure or compost or soil or worms, to their windrows to achieve their finished product. Thus they should be viewed as both buyers and sellers of organic waste materials and compost. They are more knowledgeable than the other markets, but advisers and consultants often provide them with valuable technical assistance in problem solving. The "knowledge industry" is thus another commercial opportunity.

GET HAPPY GROW COMPOST!!!

(an advertising facsimile)

WHAT WILL IT DO?.....IT:

Adds nutrients
Absorbs moisture
Restores damaged soil
Prevents erosion
Increases yields.....and
It reduces the need for chemicals!

Try some today! It is safe and easy to use!

TRY HAPPY GROW!

• Governments, institutions, and recreational operators are also markets in both supply and demand for organic waste. Examples include schools, parks, golf courses, hospitals, and government offices. Food services often exist at these institutions, so these locations are potential suppliers of raw materials, often available for the price of hauling. Additionally, these categories often have parks, gardens, turf, and landscaping, and thus can become suppliers of plant waste as well as buyers of the various finished products, from mulch to bins to compost to worms and worm castings. Usually, a policy change in procurement practices and specifications is necessary to effect a change in this market. See procurement discussion in Chapter IV for some suggestions. But training the staff of operations and landscaping, and the food service staff, should yield results.

• Retailers of garden and landscaping products include not only nurseries, greenhouses and garden centers, but also supermarkets, department stores, hardware stores, and feed stores. With good advertising materials and a proven market demand, they may be willing to try new product lines.

• Commercial gardeners, farmers, and other agriculturalists represent the major market of end-users, whether they are supplied through retail stores or direct distribution. Knowledge of the need for compost products is increasing, but there are still many practitioners in the field who treat their soil with chemicals rather than returning structured compost products to the soil. Through marketing, advertising, testimonials, demonstration gardens, and local articles, the knowledge base of this market can improve, leading to greater demand.

Current Compost Bin Manufacturers

(from www.ciwmb.ca.gov/RCP/)

Bin Manufacturer	Recycled content	Post-consumer recycled content
All Fiberglass Products	100%	0%
Clivus Multrum Canada Ltd.	10%	0%
Coon Mfg. Inc.	100%	100%
Don Zwiers & Associates	100%	0%
Green Culture	100%	100%
GreenLine Products	0%	0%
Master Mark Products	100%	70%
Swing-N-Slide	100%	50%
Techstar Plastics	100%	100%
Smith and Hawken	90%	30%
Nature`s Backyard Inc.	100%	100%
Obex	80%	80%
Set Point	50%	50%
Moore Enviro Systems, Inc.	100%	100%
Inteq Corporation	80%	80%
Presto Products Company	10%	10%
Busch Systems International Inc.	10%	10%
Covered Bridge Organic	100%	100%
E.P.S. Corp.	50%	40%
Enviro Care of America	50%	50%
Environmental Building Products Inc.	100%	95%
GAIAM, Inc. d.b.a. HarmonySM Catalog	100%	100%
Plastikos	100%	50%
Scepter Corporation	100%	100%
Casemaker Incorporated	100%	0%
Enviro Care of America	50%	50%
Anex Distributors, Ltd.	75%	75%
Earth Safe, Inc.	60%	60%
Plastopan Industries, Inc.	100%	100%
Brave New Products Co.	100%	100%
Future Blue Recycling Systems	95%	50%
Norseman Plastics	50%	40%
Greener Sooner Inc.	99%	99%
TumbleBug	80%	20%
Bonar Plastics	100%	15%

Marketing the Local Product: Bagged or Bulk

There are several steps to identify and reach potential compost markets:

Step One - Analyze the local economy

Urban, suburban and rural areas all have different local economies that require different types of compost and related products.

Urban areas tend to have smaller yards and gardens, and fewer farms, where quality may be more of an issue than quantity. Also, in urban areas bulk markets such as compost for erosion control may not be as prevalent, except among large institutional landscapers such as parks. In this case, premium, bagged soil products may be in bigger demand than bulk compost. However, one bulk market for compost that may soon develop is bioremediation. New Brownfields programs that promote the redevelopment of abandoned urban industrial properties may create a new markets for compost that can be blended with contaminated soil to speed up the cleaning process.

Suburban areas tend to have larger gardens and yards, and more farms than urban areas. This creates outlets for both bagged and bulk compost products. Although suburban homeowners tend to buy bagged compost, mulch and soil products, suburban landscapers prefer bulk compost, mulch and topsoil. Erosion control is a big concern for new housing developments in suburban areas. New technology has been developed that uses long sleeves filled with mulch that are laced across hillsides with a blanket of compost on top to avoid erosion and treat water run-off. This is a major new market for mulch.

Rural areas, on the other hand, tend not to manicure their lawns as much as suburban areas, but have larger gardens and more farms. In this case, bulk compost is king. Rural residents prefer to pick up a yard of compost in the back of their pick-up truck, as opposed to buying many bags of more expensive bagged compost. In certain rural areas there are higher quality criteria, especially where organic produce is in demand, but generally rural compost buyers are concerned with the visual aspects of both the compost and plant response. Rural areas also have the need for compost and mulch for tree farming and reforestation, and erosion control.

For example, Humboldt County is a rural area with a relatively high number of organic farms. Some areas require both bulk quantity and high quality. Rural compost buyers tend to prefer bulk product. Even homeowners have shown a preference for buying compost by the yard instead of by the bag. Two years ago the only local compost producer to offer quality compost in bulk form found a strong market at nurseries,

where the compost was stored in a large bunker and customers could get 1 or 2 yards at a time loaded into their pickup trucks. Since then this compost producer has ceased operation, but the nurseries are still getting requests for their quality compost from customers. A regional compost facility has begun meet this demand.

Step Two - Survey End Users

Proper planning for compost sales should include surveying end users to determine what specifications are the most important. One good place to survey end users of compost is the local farmers market. Locally, staff did this by sharing a booth with a farmer and talking with organic growers and backyard farmers about what specifications they required in their compost purchases.

A survey of end-users done by Cornell University found that weed seeds, pathogens, and most importantly vegetative response were important specifications for compost buyers. Cornell found that different buyers required different specifications. For example, turf growers require a fine texture. However those who need potting mixes require mature compost with low conductivity. Erosion control contractors require a mulch product.

Sophisticated compost buyers may watch for this list of specifications:

- **Vegetative Response**
- **Lack of Weed Seeds**
- **Lack of Pathogens**
- **Texture**
- **Particle Size**
- **Salt Concentration**
- **Stability/Maturity/Conductivity**
- **Feedstock Materials**
- **Nutrient Content**
- **Trace Contaminants**
- **pH**
- **Visible Contaminants**
- **Moisture Content**
- **Organic Matter Content**
- **Bulk Density**

Step Three - Approach Nurseries and Wholesale Buyers

Nurseries often carry both bagged and bulk compost. They have a good "feel" for the local market demand, and can provide excellent advice to compost producers on form (bulk or bagged) and specifications likely to be in demand. Consulting early and often with local nurseries will greatly improve a compost producer's chances of developing good product markets. One benefit of selling wholesale instead of retail, whether in bags or in bulk, is the reduction in paperwork and traffic at the compost facility. In California, to sell retail, the producer must get a license from its state, charge sales tax, and pay the tax to the state. There may also be a lot of vehicle traffic to and from the site, which can cause problems for neighbors and trigger complaints.

Step Four - Assess the Competition

When visiting local nurseries, a compost producer should also study the competition to learn the going rate for compost products. When surveying local nurseries, we found that bulk compost was popular, especially with worm castings added to it. This may be a market niche. When studying the competition, producers need to find some competitive edge that will

help create their niche in the local or outside market. If there is already a glut of bagged compost and soil in a particular area, a producer could consider selling their compost in bulk. Or, if there is a glut of both bagged and bulk compost locally, a producer may have to look at outside markets. However, the transport of bulk compost to outside markets is often not cost effective, especially in remote areas. Therefore, when shipping compost to outside markets, a producer should consider selling bagged product.

Step Five – Labeling of Bagged Product

If a compost producer settles on bagging compost, there are certain weights and measures requirements to keep in mind, as well as some other information that should be included on a label for marketing purposes. These include:

Weights and Measures – Bagged compost is usually sold by 1 or 2 cubic feet volume. If volume measurement is on the label the producer must use a measurement device. This measurement device must go through a certification process. In California the weights and measures certification process is done by each County Sealer.

Other Label Requirements – Pursuant to the California Code of Regulations Title 4 Fair Packaging and Labeling Act, compost bags or labels should enable consumers to obtain accurate information as to the quantity of the contents and should facilitate value comparisons with other bagged composts. The **three basic requirements** are:

- Use a common name to identify products, in this case "compost"
- Include compost producer's name, address and zip code
- Declare the quantity of the compost in the lower 30% of the label

Step Six - Work with Buyers Cooperatives

If selling only bulk quantities, a compost producer may want to consider working with buyers' cooperatives. A buyers' cooperative allows several compost buyers to reduce trucking costs by sharing bulk loads. A web site can be created for the buyers cooperative so that buyers can each place their orders. When there are enough orders to fill a truckload, the bulk load can be sent.

In Humboldt County a buyers' cooperative was formed by a group of organic farmers with the help of the University of California Cooperative Extension, a local website consultant, a local compost producer and an organic dairy. Loads of organic manure are being shared by this cooperative, effectively reducing transportation costs. Once enough

orders come in from a particular area, a 10-yard dump truck is loaded with compost at the organic dairy and several drops are made to organic farmers in that area.

Step Seven - Approach Government Agencies

Government agencies such as parks and road crews are good customers for compost. Local government agencies may make purchase commitments to buy compost and should be contacted for this purpose. Policy changes are sometimes required.

Measuring the Products and the Diversion

A local objective of the ORB was to establish a data collection methodology for both organics collection and compost production. Each City and County in California, under AB939, must divert 50% of the overall waste stream from landfill. Organics constitute anywhere from 25% to 50% of the waste stream, and local municipalities are attempting to divert organics from landfill. But municipalities only report the tonnage of waste that goes to the landfill, as opposed to the tonnage that is being diverted. The success of a diversion project is measured by diversion of a significant amount of organic waste from landfill, so local data collection methodology becomes necessary. Yet, a 1992 study by Gainer and Associates found that composters and food scrap collectors surveyed had "poor to very poor" accuracy in their calculations and data.

Each city and county report their waste diversion. Their methods of collecting and reporting organic waste diversion data vary. The two main components are green waste and food waste. Following are a few examples from Humboldt County, developed by the ORB Project staff.

Green Waste (Arcata) – Most greenwaste (both household and commercial) goes to a mid-sized commercial composter. They keep track of the volume (cubic yards) of green waste that is dropped off at their site, and then they add it up and report it to the City of Arcata at the end of each month. As for commercial green waste, drop off can be made with an Arcata business license and water bill. The composter makes note on their receipt if the drop off is commercial, so total commercial green waste diversion volumes could be calculated separately.

Food Waste (Arcata) – The local mid-sized worm farm diverts approximately 200 tons per year. They are now picking up food scraps from several restaurants in Arcata, and charge for this pickup according to the number of 35-gallon totes that are filled by each restaurant each month. Therefore, they can quickly determine the total volume (gallons) of food scraps diverted in Arcata each month. In addition, City of Arcata staff created a formula for converting food waste from gallons to cubic yards, so they can report their diversion numbers to the State. Currently, restaurants in Arcata are charged a higher rate for their trash dumpsters, because of the heavy food scraps that they produce. However, City staff are now negotiating with the hauler to lower the trash rates for Arcata

DEFINITIONS

Weights and Measures - all weights and measures of every kind, instruments and devices for weighing and measuring, and any appliance and accessories associated with and instruments and devices. "Weight" used in connection with organics collection and compost sales means net weight.

Field Standard - the physical standards which are traceable to the reference standards through comparisons, using acceptable laboratory procedures, and used in the enforcement of weights and measures laws and rules;

Reference Standard - the physical standards of the State which serve as the legal reference from which all other standards and weights and measures are derived;

Package - any commodity put up or uniformly wrapped or sealed in advance of sale in units suitable for either wholesale or retail sale;

Sale from Bulk - the sale of commodities when the quantity is determined at the time of sale.

National Institute of Standards and Technology (NIST) - the subdivision of the US Department of Commerce responsible for maintaining the standard weights and measures of the United States.

National Conference on Weights and Measures Inc. (NCWM) - the national professional organization composed of regulatory officials, industry representatives, and individuals having an interest in weights and measures that develop consensus standards in areas of weighing and measuring device regulation, commodity regulation, and administration of regulatory weights and measures program;

Division of Measurement Standards (DMS) - the State of California agency responsible for the enforcement of California Weights and Measures laws and regulations. DMS responsibilities include ensuring the accuracy of commercial weighing and measuring devices, and verifying the quantity of both bulk and packaged commodities.

County Sealer - the County staff who, under the supervision and direction of the Secretary of Food and Agriculture, carry out the vast majority of weights and measures enforcement activities at the local level. Each county in California has an Office of Weights and Measures (also known as Department of Agriculture or Agricultural Commissioner - varies from county to county) that has jurisdiction over any commodity that is weighed, measured, or counted. These offices are also responsible for assuring the accuracy of weights and measures.

restaurants that are diverting their food scraps to the worm farm. Before they agree to lower these rates, they will do random weight checks on the restaurants that are diverting food scraps to confirm that the weight is in fact decreasing.

Green Waste (Eureka) – most green waste in Eureka goes to the Humboldt Waste Management Authority transfer station but 46% comes from surrounding communities as well. The Authority keeps track of the volume of green waste they have received by calculating the volume and weight after the green waste is loaded into trucks to be taken to a lumber company as boiler fuel. The transfer station diverted 1630 tons by this method in 2001. A compost facility is being planned for the Eureka area so that this green waste will be used for a "higher end use". This compost facility will again keep track of the volume and weight of the green waste received at the transfer station by taking the weight of the loaded trucks of green waste.

Food Waste (Eureka) – We met with the garbage franchise to discuss food waste diversion. They have an exclusive franchise agreement with the City, which means any food waste diverted from restaurants in Eureka will be done by the garbage company. As the Eureka-area compost facility comes into operation, the franchise and a local worm farm will approach restaurants in Eureka to estimate the volume and weight of food waste that will be diverted to the compost facility. Previously, the worm farm helped to divert food waste from Eureka restaurants to a worm farm in Fortuna. In that project restaurants were charged by the size of their separate food scrap dumpster (1, 2 or 3 yard). The level of each dumpster at each restaurant was monitored to determine if a larger dumpster was needed. Once each dumpster was dumped into the collection truck, the total weight of the truck was also measured before the food waste was dumped at the worm farm.

Statewide or regional baseline measures will be useful to jurisdictions, reporting agencies, and citizen groups monitoring progress, and could include

- the amount in tons of organics currently diverted from transfer stations and landfills; and also as a percentage of the amount diverted and the amount of materials received (with the caveat that to avoid double counting it is important to ascertain if the reported figure includes organics received directly at compost facilities and other grinding facilities, rather than only those delivered to transfer stations and redirected.)
- if available, the amount in tons of organics received by active compost facilities and other grinding facilities;
- the amount in cubic feet of compost produced at the above facilities for sale or for on-site uses.

Ascertaining local baseline measures is helpful for comparison to data obtained from large statewide surveys, such as the *Second Assessment of California's Compost and Mulch-Producing Infrastructure* table below.

Product Quantities By Type (Cubic Yards)

	2001 Survey	2003 Survey
Compost	4,232,000	3,011,182
Mulch	1,872,000	2,325,708
Boiler Fuel	3,446,000	3,872,983
ADC	2,795,000	8,482,372
Beneficial Reuse at Landfills	N/A	258,150
Other*	2,608,000	469,843
Total	14,953,000	18,420,238

* "Other" includes products such as fines, wood chips, steer manure, and bark products.
(Source, California Integrated Waste Management Board)

Local Measurements of Production and Sales

Locally, the ORB project found that organic collection and compost sales are required to notify the county Office of Weights and Measures if they are using commercial weighing or measuring equipment in their business. Upon notification, the scales or weights in their business will be inspected and certified.

Here are some examples where local compost operations and farms overlap:

--The local food bank produced such a high volume of food scraps that a vermicomposting facility could take only half of their food scraps, and the other half went to a hog farm.

--Breweries. They had a local rancher pick up most of their brewery grain, but wanted more consistent service, so the worm farm tried it. However, they discontinued collecting brewery grain, because the other food scraps broke down much quicker than the grain, an important factor in vermicomposting.

--The ORB project recognized the need for a conversion chart where volumes could be converted to weights for a variety of organic materials like green waste, food waste, commercial biosolids, etc., because small-scale organics recovery facilities only have the ability to measure by volume. They may not have industrial size scales to weigh trucks or bins.

--The ORB project staff collected several conversion methods currently used by local jurisdictions and agencies to report their waste diversions to

the State, and asked other composters for what they use to calculate their tonnage or volume of waste diverted, including conversion formulas.

Calculating compost production numbers, and more specifically sales of compost, follows a more strict path, especially for sales of bagged compost. Government rules drive the need for certified measurement of compost that goes into a bag and is labeled.

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CHAPTER III
THE ORGANICS RECYCLING BOARD (ORB) PROJECT IN A RURAL CALIFORNIA COUNTY: A CASE STUDY

(NOTE: Names of businesses are removed to protect their privacy and or proprietary information, and names of staff are also removed to protect their privacy.)

PROJECT GOALS AND OUTCOMES

What we wanted to do

The Organics Recycling Board staff hoped the project, by organizing an effective network and "think tank" of participants, would help to minimize the amount of organic "waste" generated, help to educate to maximize composting, and help to increase incentives for composting and use of compost products. The overall mission was to improve the "highest and best use" of organic waste materials, to improve the soil.

The overall objectives and projected outcomes of the ORB Project were to help ten new or improved collection sites; to generate 500 tons of increased recovery from landfill; to help increase by 100,000 pounds certified or quality product; to disseminate the toolkit to 50 groups; and to establish the ORB as a viable network. The overall goal of the ORB Project was to increase marketing of locally composted commercial organic materials as a replicable model by:

• Increasing the collection of discarded organic materials from landscapers and other generators through small-scale drop-off sites;

• Maximizing the quality and value of compost products by providing technical assistance to producers to help them satisfy various quality standards ;

• Increasing the demand for locally-produced compost;

• Creating the countywide Organics Recycling Board (ORB) composed of source material generators, producers, farmers, agency personnel, and others; and

• Developing a commercial compost toolkit and disseminating it.

What we succeeded in doing

Tons Recovered during the Project
The timing of this project was right. There is a need for generators, composters and end-users to come together and collectively address the organic waste problem locally and in other rural communities. Many rural communities, like Humboldt County, are faced with mandates to divert organic waste from landfill. The high cost of developing and operating large commercial compost operations meant that creative solutions were needed. Three of the solutions that the ORB staff assisted with were:

On-Site Composting
ORB staff brought together three local restaurants, a city, and a local small in-vessel compost system manufacturer called Sun Frost. The goal was to implement a pilot where three local restaurants demonstrated Sun Frost's in-vessel system for composting their food waste. It is estimated that 100 lbs. per week of food waste is now being recovered through this pilot. On an annual basis this would come to approximately 2 tons. This pilot shows the possibilities if the in-vessel system were widely marketed, and restaurants encouraged to participate.

ORB staff at a Vermi-Compost site

Small Scale Off-Site Composting
ORB staff assisted in bringing together ten local restaurants, the local Waste Management Authority and a local vermicomposter, for a pilot to demonstrate the cost effectiveness of diverting the food waste of ten restaurants. It is estimated that 1,000 lbs. per week of food waste is now being recovered, or about 24 tons per year.

Mid-Scale Regional Compost Facility
ORB staff has assisted in the development of a regional compost facility where green waste, food waste and other organic waste will be recovered. A temporary green waste compost facility has started where 2,000 tons per year of green waste will be composted.

At the same time, the local authority will site and permit the permanent facility, which will eventually compost 5,000-10,000 tons per year of organic waste.

Products Sold as a Result of the Project

There is a great need for compost products in rural regions. Thanks to the ORB project efforts, commercially-related compost production has increased as follows:

• A local forest products industry now produces quality screened sawdust, which is sold to local composters as a good carbon source to compost with food waste. It is estimated they will sell about 6 tons per year of this quality sawdust to composters in the region.

• Three local restaurants are now using Sun Frost in-vessel composters, and will sell about 1 ton per year of compost.

• The local city zoo is also now using a Sun Frost composter and will sell about 1 ton per year of compost.

• A local worm farming business is now selling about 6 tons per year of worm castings from food waste recovered from local restaurants.

• A temporary green waste compost facility will sell about 200 tons per year of compost, and when the permanent site is in operation in 2 years it will sell about 500 tons per year of compost.

A few Project Success Stories. . .

The local deli. . .

Many food waste generators, when approached with the option of recycling their food waste, ask: "Do we produce enough food waste to justify the extra time needed to separate it from other waste?" This question becomes even more of an issue when only pre-consumer food waste is collected. ORB staff approached the local deli to divert their food waste to a local worm farm. Included in Table A are the volumes of pre-

Table A

	The deli	Arcata average
Actual Food Waste Recycled - 6 months	5,040 gallons	1,260 gallons
Projected Food Waste Recycled - 1 year	10,080 gallons	2,520 gallons

consumer food waste recycled by them during a 6-month pilot, along with a projection of the volume they will recycle in 1 year. This deli recycles a large volume of food waste compared to other restaurants that are part of the same food waste collection route.

A five-fold difference in the volume of food waste recycled by this deli compared to the average for other restaurants in the area that recycle their food waste can be explained. It is a typical college restaurant catering to students who demand large portions, including large volumes of lettuce and other vegetables. The deli has a reputation for making high quality food, which again increases their throughput. Thus, kitchen preparation of vegetables is substantial. The owners are interested in food waste recycling for its environmental benefits, and will pay the slight extra cost of the collection service.

This analysis could help commercial composters identify the kinds of restaurants to work with as they develop their food waste collection routes.

A university food service. . .

A student-run center serves the large commercial food service at the university by providing a collection service for their food waste. The Campus Center for Appropriate Technology (CCAT) at Humboldt State University includes a vermicomposting demonstration project. CCAT provides a collection service to the food service vendor for student cafeterias. When the cafeterias are not operating in the summer, CCAT collects kitchen waste from local restaurants to keep their worm compost alive.

CCAT students were having a problem with their worm bed becoming anaerobic and ORB staff provided technical assistance. They learned to pre-compost their feedstock before feeding it to their worm bed, and their worms are proliferating. The table below lists increased volume and other factors that show the benefits of pre-composting, which could help other commercial composters deal with food waste difficulties.

Table B

	Before Pre-composting	After Pre-Composting
Worm Population	5 lbs.	20 lbs.
Commercial Food Waste Processed by CCAT	100 gallons/week	200 gallons/week
Vectors/Odor	Mites, larva, strong odor	No mites, larva or odor
Product Quality	low	high

A local specialty mill. . .

A small specialty mill generates wood shavings and sawdust as a by-product of their operations. These by-products were being burned prior to contact with ORB staff. Staff suggested the mill market their byproducts to a local worm farm as a bulking agent. The worm farm tried samples of these byproducts and found that the sawdust worked well as a bulking agent for pre-composting food waste before feeding it to worms, and began to buy the sawdust from the mill.

ORB efforts in this case increased the volume of organic waste recycled, both for the mill and the local worm farm. By identifying a good bulking agent for food waste, the worm farm was able to increase the volume of food waste that it processes from restaurants. Table C shows the increase in volumes of both sawdust and food waste now recycled, because of these efforts.

Table C

	Organics Recycled	
	Before Sawdust	After Sawdust
Mill	0 gal/mo	100 gal/mo
Worm Farm	525 gal/mo	1,050 gal/mo
Totals	525 gal/mo	1,150 gal/mo

Festival composting. . .

ORB staff was approached by county Environmental Health agency staff with an interest in diverting food waste from a yearly reggae festival to a local composter. The largest festival in the county, with over 10,000 attendees for three days, it grosses $1 million in sales, and produces a substantial amount of food waste that the County wanted to divert from landfill. The festival features many booths where food preparation occurs onsite. ORB staff identified a group interested in creating a commercial compost site close to this festival and began discussions with the County on diverting the food waste there. The food waste was eventually taken to another regional compost facility because of permitting issues. Several goals were accomplished, including substantial diversion from the landfill. Additionally, a new commercial compost producer became interested, and regulatory difficulties were identified.

ORGANIZING THE NETWORK

Introduction: Building a Foundation

Through the Center for Environmental Economic Development (CEED) staff, the ORB Project built a foundation for the recovery of commercial organic materials and production of quality compost. By monitoring and providing solutions to problems facing the local compost industry (generators, composters and markets), staff was effectively able to increase organics recovery and quality compost production. This step-by-step process included forming the project team, surveying the local compost industry, creating the Organics Recycling Board (ORB) network, holding ORB meetings, and providing technical assistance to the local compost industry. This is a blueprint that can be used by other communities.

Step 1: Forming the Project Team

The first step in this process was to form a diverse yet focused project team. The makeup of the ORB project team was key to our ability to effectively reach out to organic waste generators, composters, producers, and markets in our area. When the project director selected the team, it was important that the team members had experience, knowledge and connections to industry. For example, one team member had extensive composting experience. With 8 years of experience collecting food waste, green waste, wood waste, animal manure and other organics from local generators, it was a natural extension for him to work with the ORB project on expanding the recovery of organic materials. In addition, his knowledge provided good technical assistance to composters and markets. Another team member had different but complementary experience and skills, with vast experience in project development, surveying, regulation compliance, and project financing. As an RMDZ (Recycling Market Development Zone) consultant, she had developed other waste recovery projects, including their permitting and financing. She was able to enlist state officials in providing guidance to local composters in terms of compliance, grants and low interest loan financing.

Step 2: Conducting the Survey

The ORB staff also surveyed local generators, facilities, landscapers, restaurants, and producers. The protocols included targets, agency contacts, interested parties, survey questions, demographic questions, and logistics questions. The goals and strategies of the survey were:

• Identify the barriers and the opportunities for source separation of organics at the generator.
• Identify the barriers and opportunities for compost production at decentralized facilities.
• Determine equipment needs and other practical considerations, including cost associated with collection of organics.
• Characterize the compost product and assess the market.
• Prioritize by higher organics generation. Start with generators who express interest and who will build confidence in the program.
• Target pre-selected businesses based on criteria such as known interest, location, and type of business.

Step 3: Building the Organics Recycling Board (ORB) Network

The ORB staff analyzed and created a list of potential participants. They had several individual meetings to receive feedback before sending out the initial invitations. Staff made a strong effort to involve a wide variety of people from the compost industry including generators, composters, marketers, farmers and regulators. The focus of the initial meetings is discussed below:

First ORB Meeting: Organizing and Startup

In September 2003 the ORB staff held an organizing meeting. Invitees were pre-selected for their leadership skills, and included a wide variety of composters, agency people, and farmers. The main topics covered were:

Assessing the current local situation – Based on the surveys previously completed by staff, the group analyzed the trends, the main issues and obstacles facing them. This included defining organic material sources and end products, the new compost regulations, and how to properly label their end products. The group also recognized the need for common definitions.

Centralized vs. decentralized composting – An ongoing debate on the relative merits of decentralized small and mid-sized compost sites versus a centralized site. Some of the concerns raised were the new full compost permitting requirements; the costs of labor at small sites; and the costs of equipment for small and mid-sized sites. It was decided to have the Local Enforcement Agent make a presentation at the first general ORB meeting.

Organizing an effective "Think Tank" – An effective think tank would include representatives from all groups within the compost industry (generators, composters and markets) and from all geographical areas of the county. It was also decided that each meeting would have a theme and that special target groups would be invited to fit each theme.

Second ORB Meeting: Definitions and Regulations

The second meeting began by defining terms used in the compost industry so that all ORB participants were using similar definitions. Some of the terms defined were Compost; Mulch; Organic; Greenwaste; wood waste; food waste; pre-consumer; post-consumer; and others.

The second speaker, the local enforcement agent, addressed new compost regulations in California. She gave a general overview of the new regulations and then addressed new requirements for individual compost operations. The new regulations in California almost prohibit food waste composting at sites without a full compost permit. The prior tiered permit process that had different requirements for operations with different volumes of feedstock has now been changed to only one tier.

ORB TO-DO LIST
(early project brainstorm session):

Compost Quality
Research Quality Compost Certification (ie, USCC),
Organic Standards,
Premium Quality,
Soils issues

FORMS:
Survey protocol and forms,
Standardized weight form – laminated,
log for collection sites

REGIONAL COLLECTION SITE STRATEGIES:
Get Map of all sites countywide
Create subregions
South – Shively & south; Fortuna, Ferndale, Petrolia
North – Yurok to Weott; Klamath to Trinidad;
East – Hoopa, Willow Creek, Weichepec; McKinleyville – Blue Lake;
Humboldt Bay area strategy – Eureka, Arcata, Bayside, Manila;

ORB OUTREACH:
List of core group – key;
regional;
technical;
agencies;
tribes
Survey Priorities on generators – who to reach first?
Compost (finished) producer list

There was such a high level of interest in the new regulations from participants in this meeting that it was decided to create a policy sub-committee that would learn the regulations, analyze the concerns, seek further clarification, and communicate problems with the state. The highlight of the policy sub-committee meeting was a conference call with the state person in charge of drafting the new regulations. Each local composter was able to address their particular concern with the new regulations and get advice on how to comply, as well as suggest amendments.

Step 4: Technical Assistance: Aiding the Local Compost Industry

Since this project is focused on commercial composting, ORB staff provided technical assistance to not only the composters themselves, but to the organic material generators and the compost markets.

Technical Assistance to Restaurants – ORB staff helped implement two pilot programs:

a) On-site composting at several Arcata restaurants, using an in-vessel compost unit manufactured by Arcata-based SunFrost. During the pilot, ORB staff and local government helped the participating restaurants with issues such as how much food and brown material must be mixed to get good C:N (carbon: nitrogen) ratio. Participating restaurants had success with the pilot, so this is an on-going effort.

b) Off-site vermicomposting by a local worm farm – ORB staff helped document food scrap diversion during another restaurant food pilot, including collection and vermicomposting.

Technical Assistance to Compost Facilities – ORB staff visited local compost sites to provide technical assistance and invited these composters to attend ORB meetings to troubleshoot, "think tank," and give and receive technical assistance.

Technical Assistance to University Food Service - ORB staff assisted the local university food service with overcoming two problems: too much food during the school year, and not enough food in the summer. This project, administered by the student-run Campus Center for Appropriate Technology, operated a large collection service and worm bin/compost system for the university food service. During the school year, overfeeding the vermicompost system was leading to anaerobic conditions and odor problems. Staff technical assistance established pre-composting protocol for the students that maintain their system. By creating aerobic conditions, through pre-composting, the odor problem was solved. The problem of not enough food for the worms in the summer was solved when ORB staff found restaurants to divert pre-consumer food waste during the summer.

EMAIL INVITATION

Invitees for the initial organizing meeting included, (names omitted) 3 farmers, 1 tribal environmental officer, 1 person from UC Agricultural Extension, 1 county officer, 1 city agency rep, and 1 university recycling coordinator.

Dear invitee –

We are hosting an organizing meeting on Sept. 18 to initiate the formation of our Organics Recycling Board.

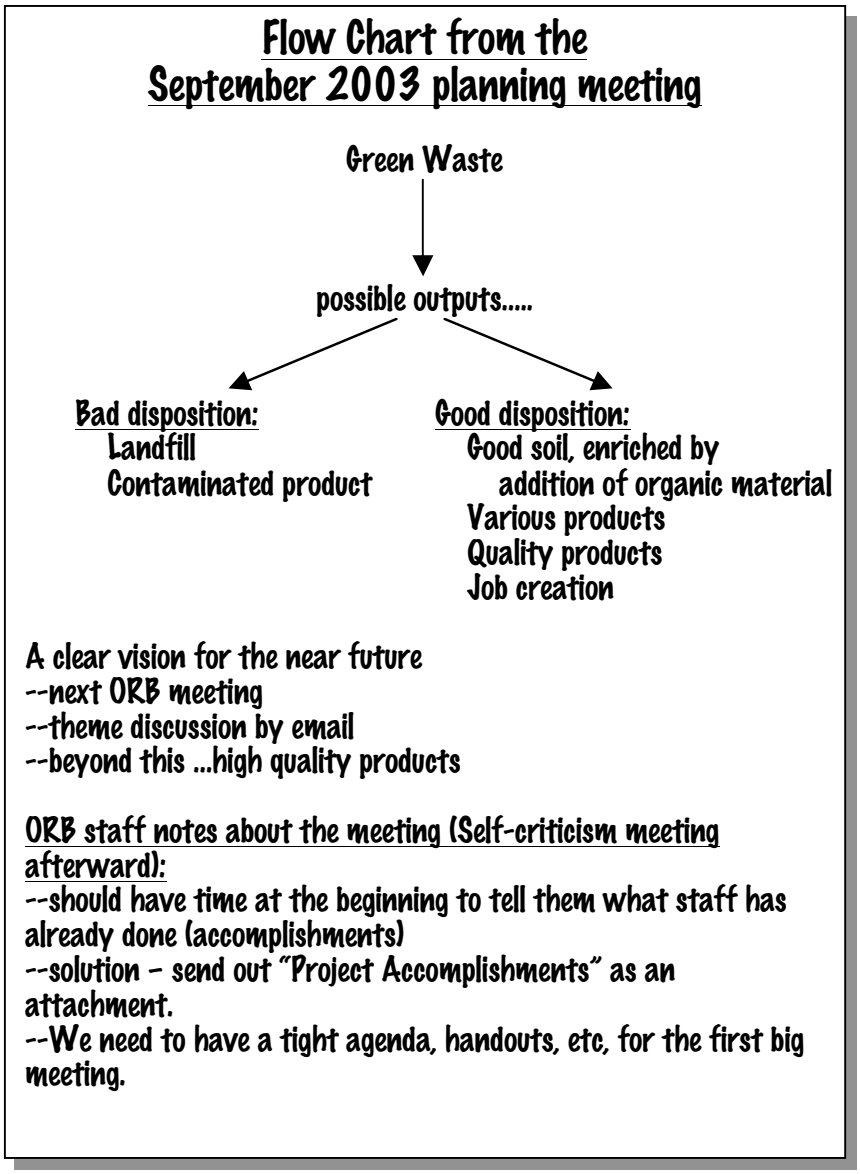
This meeting has been preceded by several months of CEED's preliminary interviews with dozens of key players in commercial organics recycling in Humboldt County. It is time to expand this discussion to a more systematic "think tank" approach to commercial organics here on the North Coast. The Organics Recycling Board itself will have a much larger initial meeting next month, with dozens of invitees, but we wanted to invite a few of you to join us in this preliminary organizing stage.

We hope you'll be able to attend this initial meeting and planning session. The agenda will include:
--Current state of the art of commercial organics locally
--How to organize ourselves into an effective think tank
--How often to meet, and best ways to network
--Identifying the major obstacles or issues of concern
--A clear vision for the near future of organics recycling

We will be meeting Thursday September 18 from 9:00 AM to 10:30 AM, at the CEED office, Arcata, just next door uphill from Wells Fargo. We're on the second floor. Phone if any questions. We look forward to seeing you there.

In cooperation and collaboration,
The ORB staff for
the Organics Recycling Board project

Technical Assistance to a Community Supported Agriculture Farm – Like many small composters the community supported agriculture (CSA) farm faced the problem of meeting new regulations. ORB staff facilitated their introduction to the relevant state official to clarify their regulations for them. And ORB staff provided a summary of the CSA project to the representative, so these problems could be addressed when the regulations go up for annual review.



Technical Assistance to a Forest Products Company – This specialty mill wanted to do something small-scale to recover their organic materials (sawdust and wood chips). Staff offered them advice on equipment that fits smaller scale operations, and the mill has since bought a screen that allows them to add value to their wood waste materials.

Step 5 – Researching the Markets

ORB staff learned from landscapers and nurseries that certain specifications are important when it comes to commercial compost. These include, among others, consistency, pH balance, weed-free, and regional availability. Staff explored new markets for compost such as:

Bioremediation – Compost can be used to augment the cleaning of contaminated soil. A soil remediation business had discussions with staff about using compost to amend this cleaned soil to clean further and add value by transforming it from an inert fill to a quality topsoil. As now planned, as the county airport is expanded over the next few years, cleaned soil will be blended with compost to produce quality topsoil for runway extension and landscaping. Two other local soil remediation projects in the county (Glendale and Eureka) will also utilize compost to speed up the cleaning process and add value to their soil.

Tree Nurseries – ORB staff discussed utilizing compost for seedlings with a local timber company. They agreed to test local compost against the soil and amendments they are now using for their tree seedlings for tree planting.

MINUTES OF AN ORB MEETING

The Minutes of ORB organizing and startup meeting Sept 18, 2003 follow, and speak clearly for themselves. Names have been omitted for privacy.

Agenda

__Current "state of the art" locally (a report from the surveys)
__Organizing into an effective "think tank"
__How often to meet; best ways to network
__Identifying major obstacles and concerns
__A clear vision for the near future

Structure of the ORB network and meetings: Organizing as an Effective "think tank":

• Who---Producers; Manufacturers; Marketers; Consumers; Regulators; geographic subgroups
• ORB as a hub – with contacts in these groups
• Be clear on purpose and expectations
• Then get together periodically (monthly? quarterly? bi-monthly?); time is an issue for attendees…not enough of it
• Email and listserve; one-to-one invitations too
• Look into funding
• Mini-conference or daylong workshop or retreat
• Leverage and political unity/local/state
• Work on ourselves first; self-education rather than recreate wheels
• Thematic meetings; subgroups as specialists on themes don't expect everyone to come to all meetings; invite separate target groups to different meetings; keep it small and invitational; growers – bring into one meeting, not regularly, too busy
• Small surveys; survey the groups on the issues
• Communication between groups
• Mini-conference or daylong workshop or retreat
• Leverage and political unity/local/state
• Work on ourselves first; self-education rather than recreate wheels

Identifying issues of concern; and obstacles:

• Regulations are more rigid. Very small or very large sites ok, but permits are prohibitive for mid-scale. 8 years ago permitters said go for it. But problems arose on some sites, so there are state regs now.
• Regulations as an obstacle; but regulations are needed. But see exemptions; Amend regs?
• Hold a meeting on this concern
• Labor at small sites can be prohibitive--why are compost figures down?
• Equipment for mid-size sites
• Centralize composting sites v. decentralized sites (or both);
• Decentralized as phase I, centralized as phase II?
• Definition and confusion in labeling (green v. food, pre v. post-consumer; animal feed; mulch, pathogens, organic, etc)
• Transportation and need for tipping fees
• Issues of marketing; nursery growers buying bags from Oregon; expensive and diverse products – how to push local buying; local products/ value added; How much? Quality?
• Local label? Local standards… must be organic for organic growers; but other levels for others; "real compost"; pasteurize….other benefits (less pesticides, etc);
• "Certified growers" not "certified compost" (the farm is certified, but this doesn't guarantee the quality or effectiveness of the compost)

Erosion Control – A market that has grown with local development and timber harvesting is erosion control. Recent technology advancements in erosion control systems have created a strong market for mulch and compost. New erosion control systems that use socks, sleeves, and blankets made with mulch and compost effectively reduce some forms of erosion and treat the water as it runs through the socks and sleeves. Locally, county planning provides guidelines to land developers on erosion control. Staff approached the agency to offer local compost and mulch as a material source for local developers, contractors and landscapers.

TECHNICAL ASSISTANCE

The ORB staff offered technical assistance over a two-year period. Here are a few examples, from staff emails:

A Sampling of Technical Assistance Reporting by ORB staff:

• E-mail to Manufacturer: I am still on the beat with getting your containers sited somewhere in town. I do need to talk to you. I met with city staff. Her big question is emptying and addressing how that would be done. I talked with __ at the zoo, and about 3 people roll it to dump it. Is there any new design element that you have added that would make it easier to empty?

• E-mail to the recycling transporter. Requesting tonnage numbers and to talk with him, and where he is taking compost. Plan to meet.

• Talked with tofu manufacturers and plan to do an on-site to see what they are doing.

• Talked briefly with __ at the Indian health village. They have additional capacity.

• Met with (4 individuals) to talk about a large regional compost facility and what are the possibilities.

EMAIL ANNOUNCEMENT

From: Organics Recycling Board
Subject: You are invited...Nov. 20 in the AM
Date: 10/19/03 5:19 PM

Dear invitee:

You are cordially invited to attend the first regular meeting of the Organics Recycling Board (ORB). As most of you know, since our team has been in contact with you, we are forming the ORB as an informal "think tank" of key players in commercial composting, for the purpose of finding solutions to some of the problems and obstacles identified by those in the field of commercial organic waste recycling.

We will meet Thursday, November 20, from 9:30 to 11 am, in the Arcata Library Conference Room, just behind City Hall at 7th and F Streets, Arcata. (The parking lot entrance is on the 7th Street side.) Please SAVE THIS DATE!!!

AGENDA
9:30 Welcome and introductions – Project Director
9:40 ORB staff - Defining the Terms in Composting (a presentation on properly defining terms such as "compost", "organic", "mulch", and "food waste")
9:50 Enforcement, County of Humboldt - The new state regs on Compost Sites - what you need to know
10:00 - 10:15 Questions and clarifications about the new state regs on composting
10:15 - 11:00 - How to make it work: a discussion of solutions to the problems and obstacles raised by the 2 above speakers

This should be an interesting, stimulating, and informative discussion for all who attend. Thanks for your interest, and see you the morning of Nov. 20!

ORB staff, for the Organics Recycling Board

BACKGROUND: WHAT THE ORB HAS DONE SO FAR:
We have held a preliminary planning session, attended by about 10 folks who were invited to help with the planning and organizing of the ORB. In a spirited hour-and-a-half session, we came to some ideas of how the ORB could function in an efficient and effective way to accomplish the above purpose.

We discussed the folks likely to be interested in attending, the formatting for meetings, the frequency, and we also took a preliminary look at what sort of problems and obstacles commercial generators and producers of compost face.

As a result, we have organized three thematic meetings, to take place during November, January, and February. You are invited to attend all three. The meetings will deal with the following themes: November: Compost: Definitions and Regulations (see above agenda for the November 20 meeting) January: Commercial Composting : Logistics (labor; equipment; transportation, and site management) February: Marketing of Compost: Labeling, Testing, Marketing problems and solutions.

• I talked to __ from the farmers market, she felt there was still a lot of vegetable matter being thrown out, suggested going around to the farmers. Staff at the city has started to work on this.

• She mentioned that she is looking for a solution for the organic waste produced from her goat cheese manufacturing. Just thought I'd do my networking bit and mention that to you, FYI.

• SunFrost has large 55-gallon drums, insulated so the temperature goes up. They are small commercial level in-vessel containers.

• I will let you know on the zoo doo, I think I remember them saying they were using it on site, they have that garden next store.

• I just met with Environmental Health, about the new compost regs, which do involve manure. I would want her to bring everyone up to date when we convene. They go into affect this month.

• I picked up some information on a system that could be outdoors (design cover of the mechanical process), it was module (additional lines could be added down the road), but a bit pricey.

• Also, if the mobile grinder is used in any way, and I know it is smaller, and less efficient than a tub grinder (nice to hear the new ones are less dangerous), he can order or make screens for different grind sizing. It is a way to reduce the volume of waste (wood waste, wall board), for shipment to the warehouse, also. It is also available locally, and may fulfill a niche (make it economical to ship some things further distances).

• When you refer people to RMDZ, it is best not to say they have access to grants. It creates an unrealistic expectation. What they do have is a low interest loan program that is a constant.

• The CSA could have taken some volume from the festival event, it just has to fall within the guidelines of the permit, so maybe not all of the scraps could be taken, but it should not have closed the door. It is unfortunate that it was read that way.

• I did a presentation to the Headwaters funds board on funding businesses and special projects. I have worked with ___ on idea development around that

• The mill - I have found a small used screen at a plant in Oakland that could be shared between the three sites. I am just waiting to see what the owner wants for it.

PROTOCOL FOR EPA SURVEYING DECENTRALIZED COMPOSTING FACILITIES

Contact City/County Recycling Coordinator(s). Ask for any surveys and waste audits that may have been done on restaurants, food manufacturers, and grocery stores. Get an update on activities they know about that have resulted in diversion. (This would include asking if there is any composting, animal feed collection, vermicomposting services available to these food generators)

Prioritize by higher organics generation. Start with generators who express interest and who will build confidence in the program.

Targeted survey of interested parties by geographic location
We are targeting pre-selected businesses based on criteria such as known interest, location, and type of business.

Questions to ask: (See survey for details)
Current garbage service, how often, size container, charges.
Organics in the businesses' waste stream, what is the quantity generated
Produce trimmings
Spoiled food
Soiled paper/ paper towels and napkins
Waxed corrugated.
Attitudes toward participation in a source separated program
Business demographics.
Location in connection to location of composting operations

Outcomes
Find sites that can take additional green waste near their location or where a collection program could be implemented.

Other issues raised
Transportation issue must be addressed.

Landscape Industry
Landscapers, gardeners

Collectors of Food Waste
recyclers
transporters
garbage companies
Present or possible collectors:
What are the barriers?
Needs? Containers?
What would need to happen to increase collection?
Do you have a special vehicle?

Compost Facility
List out known facilities:/locations/numbers
Do in-field survey of facility
Can they take an increase of food waste?
Green waste?
Can they use all they make on-site (if CSA/farm or land), or need a market?
Do you have staff on-site to do composting?

Organic Waste Generators
Food Processors
Wholesalers/Retailers
Food Services/ Restaurants

Compost Product Businesses
Local/regional businesses:
Can they use more.
Do they do their own compost?
Mixer? Bagger?
Willing to take local products.

Markets
On-site and beyond.
Testing issues if sold off site.
Local Products and Potential local products: bagged and bulk compost, peat-style pots

• The festival - I was informed by County Environmental Health that the CSA must have a permit to take food waste. This leads into the idea of having a simple list of regulations for potential composters, which could be another tool in our toolbox.

• The Park - This is a new item and is inserted here because it came out of my efforts to divert material from the festival to the CSA. Yesterday I met with ___ who leads the group that is creating the park, which will include the CSA. He is very supportive of starting composting at the park with the CSA and gave me the names of 3 people to talk to about developing a commercial compost operation there and we talked at length about the possibilities. It looks like this could be a good opportunity.

• They have teamed up and are putting together a project. There may be a possible vermiculture or compost project there with their wood waste that could combine with what ORB is doing and your expertise.

LOGISTICS AND OBSTACLES AT THE LOCAL SITES

The following describes types of local collection site problems and some solutions or improvements the ORB project was able to make. It represents questions coming from the collection sites, where staff technical assistance helped to increase recovery of organics by at least 500 tons. They are offered here in a frequently asked question (FAQ) format as part of the case study.

Compost equipment options?

Most compost equipment is designed for medium to large-scale operations. Grinders, turners, in-vessel systems and screens are generally made for bigger operations, thus not cost effective for small local operations. Cooperative ownership of equipment is a viable option, as may be local rental. ORB staff was successful in getting several of the local composters to agree to the cooperative option. Staff also introduced local composters to a state low interest financing program, and together these composters will apply for a loan to purchase a turner, an in-vessel system and a screen that will be shared.

Additionally, some local collection sites have already found small-scale systems that are economically feasible. For example, a local mill found a screen, so that sawdust and other material can be screened and sold as soil amendments. A shaker deck screen worked well for their low volume screening, in recent testing.

Rain, Excess Moisture, Leaching, and Runoff: How to deal with it?

The excess moisture question came up in the ORB meetings. Technically, if a compost pile gets overly saturated by rain, composting will slow down, or in some cases stop. Proper aeration is required to develop and maintain good compost temperatures. When a compost pile gets saturated by rain most of the pores in the pile become filled with water, eliminating the oxygen needed to compost. Covering the compost, building roofs, or in-vessel composting is needed to solve this excess moisture problem.

ORB staff showed the new collections sites that composting can be done inside a building or pole barn, or tarps can be used to cover outdoor piles. Or, an in-vessel system like an Ag-Bag EcoPOD or a NaturTech modified 20-55 yard container can be used. However, each of these systems has its limitations.

The problem with indoor composting is that compost gases can erode steel fitting and nails, which can destroy a building. Special aluminum or plastic buildings are now made for composting, but may not be cost effective for small operations. An open pole barn would not have the compost gas buildup.

As for covering compost piles, standard tarps can be used, but will get blown off frequently in windy areas. Very large tarps that can be staked down are expensive, so again may not be cost effective for small operations. There are also special tarps made by Gore-Tex and Compostex that allow compost piles to breath, but prohibit moisture from going through.

For in-vessel systems, the Ag-Bag EcoPod is the lowest cost system. However, anaerobic pockets can develop, since the

INVITATION AND AGENDA
ORGANICS RECYCLING BOARD (ORB)
June 24, 2004

Welcome to a meeting of the Organics Recycling Board (ORB). We formed the ORB as an informal "think tank" of key players in commercial composting, for the purpose of finding solutions to some of the problems and obstacles identified by those in the field of commercial organic waste recycling.

AGENDA for June 24, 2004 meeting:

10:00 Welcome and introductions

10:15 Project Director – a brief project update

10:20 "Logistical Problems of Commercial Composting and VermiComposting" : a guided open discussion ("think-tank" style) divided into 4 parts:

Controlling compost quality;
Facilities Management;
Equipment, costs, measures; and
Labor and Transportation.

The timing for the open discussion will be approximately:

10:30 – 10:45 "Compost Quality"
(weed seeds, pests, toxics, and temperature)

10:45 – 11:00 "Managing the Site"
(controlling odor, wind, rain, building and grounds)

11:00 – 11:15 " Equipment, Costs, and Measures"
(best equipment; weights, measures)

11:15 – 11:30 "Labor and Transportation Concerns"
(labor, trucking, concerns, costs)

The Organics Recycling Board is a project of the Center for Environmental Economic Development, with funding by the US-EPA.

material is not turned once it is filled. The NaturTech modified 20-55 yard containers however solve this problem by agitating or turning the material, but for medium sized facilities, several of these containers would be needed, which could be costly.

Because regulators consider leaching and run-off, new composters may need a paved or cement pad with retention ponds. More specifically, regulators are concerned with leaching or run-off of nitrogen, which turn into nitrates in surface water and kills fish and other aquatic life.

Vermi-Composting: What are the costs and revenues involved?

Scale and technique are very important, and entering into vermicomposting as a business must be considered as carefully as any other business. Although the ORB staff included knowledge of worm farming, the advice given was often cautionary. On the home level, of course, are backyard kits which often work well if tended, watered, and fed regularly. On the larger scale, ORB staff provided technical assistance to a local City and a family regarding vermicomposting.

The City was considering cooperating with a small business in their area, a Bed & Breakfast that does an extensive amount of gardening and was considering producing their own soil amendments. Staff arranged for the care takers of the B&B to visit a local worm farm to study the costs and revenues involved. This business decided that vermicomposting was too time and labor intensive for them, especially getting the necessary permits for food waste, and the recommended pre-composting process.

As for the family that also considered vermicomposting, they were attracted to what appeared to be a lucrative deal to start a worm farm. For a $10,000 investment, an out-of-state business would provide them with worms and instructions. In addition, this company would buy back all of the worms that were produced. Just when the family received this offer, an article appeared in the some national magazines describing “scams” that were being carried out by worm suppliers. ORB staff informed the family of this article, and they avoided the possible scam “investment.”

Locally, what permits and licenses are necessary to become a new commercial collection site?

Locally, a new collection site should get a solid waste permit, a land use permit, and a business license. The compost permit is usually done through the solid waste division of a municipality, such as the County Environmental Health Division, through the Local Enforcement Agent (LEA). The land use permit is obtained through the County or city

planning divisions. A business license must be obtained for commercial operations from the local municipality. The new compost regulations in California have eliminated the tiered permitting process that enforced different levels of permitting for different volumes of waste collected. Now even small off-site food waste compost operations, as well as very large waste companies, must get permits. There are still some exemptions for off-site composters however, including but not limited to:

Green Waste Compost Operations – If a facility is only composting green and wood waste (grass clippings, tree trimmings, leaves, branches, wood, etc.) and not taking food waste, animal manure, sludge or other putrifiable feedstock, then a full compost permit is not required. Instead a green waste composting operation receives what is called an Enforcement Agency (EA) Notification.

Research Compost Operations – If a compost operation is completing research on a specific technology, it can take food waste (but no sludge) for a limited period of time (2 years). Again the compost facility receives EA Notification, but first it must submit research protocol to the Local Enforcement Agent (LEA).

California Regulatory Obstacles

New California regulations prohibit the composting of off-site food waste without a full compost permit. This lengthy and costly process may not be cost effective for small sites in California's rural counties. Small collection sites that the ORB staff dealt with, which take food waste from off-site, will face a big challenge getting started and expanding without a significant financial investment, or without a change in the regulations. To divert a significant portion of food waste from the waste stream, staff found that either local composters must change or the regulations should change. This is an important problem not only for composters, but also for rural municipalities. In California, Assembly Bill 939 (now law) requires each city and county to divert 50% of the total volume of waste generated based on the total volume generated in 1990. However, rural cities and counties have their hands tied by the new compost regulations, as far as food waste is concerned. Through the ORB project meetings, staff helped to make local composters and agencies aware of the problem the new regulations are causing.

What are the collection advantages and disadvantages of food waste?

Food waste sources include residential curbside, restaurant and institution, and food processing plants. These sources can be further broken down into pre-consumer and post-consumer food waste. Pre-consumer is the preparation material from kitchens before it is put on a consumer's plate. Post consumer is what comes off the plate.

The advantages and disadvantages of taking food waste include:

Advantages
It represents a large volume of waste, and thus can help cities and counties to meet their waste diversion goals, thus diverting from landfill.
It makes good compost mix, with ground green waste and carbon sources.
It adds nitrogen and other nutrients to the compost product.
It is good for vermicomposting.

Disadvantages
• It increases permit requirements: because food waste can cause odor, vector and leaching problems
• It is treated differently by California regulators than is green waste. Water, soil, air quality regulators all become involved in the full permit process required by off-site food waste composters.
• It requires immediate and constant turning and aeration to avoid anaerobic conditions.
• Contamination levels in food waste can become high unless generators actively retrain staff on types of material to put in food waste bins.
• Plastic film can be a problem, and broken glass can destroy compost quality, because it is hard to screen out.
• It can cause odor and vector problems for neighbors.

Other off-site organic waste currently regulated in California includes manure and sludge:
New collections sites in California that take dairy manure, other animal manure and municipal sludge are also required to get a full compost permit. Potential pathogen and excess nitrogen issues seem to be the reason these materials are also heavily regulated. Locally, there is an organic dairy that diverts a portion of their manure each year to organic farmers and landscapers. They do not require a compost permit because their manure is produced on-site.

LOCAL REGULATORY PROBLEMS FOR DECENTRALIZED COMPOSTING SITES

The following summarizes the technical assistance that the ORB staff gave to decentralized organic waste collection sites. Our goal was to provide technical assistance not only to bigger collection sites that will service the local urban areas, but also to decentralized collection sites in the outlying areas of the county. Convenience is a key to convincing organic waste generators to divert their material from landfill.

A Local CSA Farm

This is a two-acre, student-run Community Supported Agricultural Farm. Located on the suburban outskirts of Arcata, CA, it is a place where college students and school children learn about small-scale, organic agriculture. In addition to composting their own crop residuals, they began collecting food scraps from local grocery stores, restaurants and from the homes of farm shareholders. However, new regulations put in place by the State of California last year require off-site composters of food scraps to have a full compost permit, which is a lengthy and expensive process that would not be economically feasible. ORB staff assisted them in discussions with the State regarding compliance with the new compost regulations. At an Organics Recycling Board (ORB) meeting the local enforcement agent made a presentation on her interpretation of the new regulations. A lively debate ensued including how the CSA was going to comply with the new regulations. The result of these discussions was the formation of an ORB policy subcommittee to assist local composters with understanding the new regulations.

A state agency representative was included in a conference call regarding specific local compost projects, that were being affected by the new regulations. During this conference call the CSA was able to determine where their operation fit within the new regulations. The State person asked them to write a summary of their operation and their problems with the new regulations.

A Local Worm Farm

This operation had been composting food scraps and other organic waste in Humboldt County for the many years. Until the new State compost regulations were put in place, they were exempt from permitting as a vermicompost operation. However, new regulations now require even small vermicomposters to get a full compost permit if they pre-compost food scraps from off-site generators before feeding to worms. Staff provided technical assistance to them in terms of sourcing additional feedstock and compost technology. They assisted them with a food scrap diversion pilot program with Arcata restaurants prior to the new

regulations coming into effect. And, through discussions at the ORB meetings, the worm farm was able to identify some new compost technology to use. Through a conference call with the State regulators arranged by the ORB staff, they were able to determine where they fit within the new regulatory framework. The State confirmed that any composting of food scraps collected from off-site, except for Research Compost Operations, would require a full compost permit.

A Regional Compost Facility

As pointed out above, the new regulations restrict off-site food scrap composting to fully permitted facilities and Research Compost Operations. ORB staff assisted in the creation of a new Research Compost Operation, and provided technical assistance. This facility contracted with the Humboldt Waste Management Authority to take 10 tons per day of green waste. To compost this material, they obtained EA Notification for a Research Compost Facility from Humboldt County Environmental Health. Research topics will include producing custom compost and mulch products for three different new market applications: Tree Farming (with a timber company), Bioremediation (with a bioremediation firm), and Erosion Control (with the county). With ORB staff assistance, the operator made a loan application to the State RMDZ low interest loan program, and assisted in identifying other financial options for application, such as the local Headwaters fund.

Composting Site Grand Opening Invitation

Dear All:

We are pleased to invite you to our Opening Ceremony on July 8 at 4:00 PM at our compost site

(Directions Omitted)...please follow to the right where you will see our compost windrows next to the old mill building.

Activities:

After we describe our process, demonstrate our compost turner and show you around the site, we will give you a "before and after look" at the green waste that comes from the Humboldt Waste Management Authority (HWMA) and Humboldt Sanitation. To do so, we will bring the group across the street to see where the green waste is ground. And finally, we will also show the group an active soil remediation site next door where some of our compost product will be utilized to speed up the soil cleaning process and improve the quality of this recycled soil.

We look forward to seeing you there.

Progress Report on decentralized Sites

The following paragraphs were part of the ORB reporting, and are offered here as samplings of our county-wide regional approach to techni9cal assistance.

NORTH REGION – PROGRESS REPORT #1
A Vermicomposter
Generators are restaurants and coffee shops, possibly also food service manufacturers. This vermi-composter has 8 years experience composting all types of commercial organics. This is an ideal decentralized collection site. They will begin serving nearby areas that have not previously been serviced. They plan to take food scraps from two new restaurants north and east, and may develop an additional collection site in the food business incubator to take additional organics as they reach capacity at the compost/vermiculture site. (By capacity, staff refers to the limit of 50 yards of material on-site at any one time.)

NORTH REGION – PROGRESS REPORT #2
Nursery Business
They are not interested in carrying worm castings, which have a big demand locally, staff is not sure why. However, when a local mill was grinding and composting, the nursery did carry their redwood soil conditioner, which is not a compost, but does have a good demand locally as weed suppressant. They are renting a portion of the site to a local grinder and recycler, who will be grinding drywall for gypsum (soil amendment), wood for mulch, and other things. Across the way, a mill is moving in and he is looking at having a compost or vermiculture set up. Staff did an e-mail introduction, and the grinder will be used to help things along.

NORTH REGION – PROGRESS REPORT #3
Small Town, Nearby Park Service
Generators could include the restaurants, park employees, and the new tourist lodge. Staff opinion is that if they develop a compost facility, it would be a relatively small one, because of the few generators. Country-style restaurants do not produce much vegetable scraps. However, if the park personnel got involved that could take it to another level. Also there is now an individual really interested in vermiculture. They could involve the Park, which is always looking for ways to work with the community. Also, there is the school up there. There is lots of cow manure up there since one of the businesses is raising beef.

EAST REGION - PROGRESS REPORT #1
Small Town and Nearby Tribes
Generators could include organic farms, tourist businesses, and school food service. Staff sees this as a good idea because of the good compost markets, and working with the tribes would be an asset, because of their proven ability to organize and carry out a sustainable project. Staff is checking with them to see if anyone might be interested in bringing back farmers market greenery or restaurant food scraps up in that area. More tribal contact names to be forwarded.

EAST REGION – PROGRESS REPORT #2
Rancheria Casino near Small Town
Generators could include casino restaurants, nearby restaurants and brewery, and local landscapers. This area could be serviced by the new research composting facility nearby.

SOUTH REGION – PROGRESS REPORT # 1
City Disposal Facility
Generators would include conference center, lodge, restaurants, hotels, and dairy. Would this also be possible for the cannery fish waste? Would the other dairy drop here? Staff believes this disposal site could be a good compost site because they are already permitted to grind green waste, and they have a tub grinder. They are already grinding green and wood waste and selling it as bedding to nearby dairies. Because many lumber mills have closed, that used to supply dairies with wood shavings for bedding, there is a need for bedding from green/wood waste grinding facilities. As for composting, not sure they would be interested, but will invite them to be part of the ORB so they can consider further.

SOUTH REGION – PROGRESS REPORT #2
City Yard
City staff showed interest in composting at the City Yard, so again we should invite them to ORB meetings so they can consider further. They already take tree-trimming material and do some limited composting of their sludge.

SOUTH REGION – PROGRESS REPORT #3
Dairy
A collector currently sells their organic manure to organic farmers. However, it is not composted, which takes too much time for a dairy.

SOUTH REGION – PROGRESS REPORT # 4
The Transfer Station
Generators could include restaurants and landscapers. There is also market potential to be researched. However, there may not have enough green waste to warrant a collection project, but it is worth a try.

SOUTH REGION – PROGRESS REPORT - #5
The CSA Farms
These are good for food scrap diversion. It seems to depend on staff time, and willingness of staff. They have done it in the past. New farmers there now, so it may take time to settle in before they take anything else on. Other site now has a tractor. I know she would be very careful about what she would take. May be a good place to take Farmers Market scraps. The CSA's both have a membership that equals nearly 100 between the two. This would make for an easy market for the compost product, for members' flowerbeds.

SOUTH REGION – PROGRESS REPORT #6
The Goat Ranch
Generators include nearby town restaurants. Again, good for food scrap diversion. Also good local markets, local gardeners, for compost and castings.

CENTRAL REGION – PROGRESS REPORT #1
The Zoo
The city zoo uses SunFrost in-vessel composters. A good test case. Generators are zoo animals and food, but could add coffee shops nearby. It is a site that does their own animal food scraps and manure. One of the zookeepers was going to check to see if they need more organic waste. The zoo would also be a good place to sell this product because the public is coming there already. It could be a small moneymaker for the zoo, "zoo doo compost". They also have a beautiful garden next store and could use compost internally to displace purchases.

CENTRAL REGION - PROGRESS REPORT - #2
The Urban Facility
Generators could include many restaurants, hotels, landscapers, and tree-trimmers. This facility is no longer called the "Central" Site, but simply the "Compost Facility". It will service mainly the city area, including green waste from landscapers and homes, and restaurant food waste.

CENTRAL REGION – PROGRESS REPORT - #3
A Health Village Farm
Part of United Indian Health Services, they are composting in windrows, growing vegetables on-site for health clients. Generators include local collector/transporter, and restaurants. Their farmer says they could take more restaurant scraps, but need to work out their staffing on that. They could use it on site, or distribute the compost to their client base.

CENTRAL REGION – PROGRESS REPORT - #4
A Commercial Compost Facility
They have been operating for over 10 years, so they do have the experience. However, they must improve the quality and availability of their mulch by screening and composting, if they are to reduce the volume of material that builds up next to the highway. They have a big pile of compost, of unclear quality. Wood chips are free to any city resident for their composting.

CENTRAL REGION – PROGRESS REPORT - #5
A Commercial Bulb Farm
They are only interested in composting their own material, but that could represent a large volume, because they are the biggest business in the area.

CENTRAL REGION - PROGRESS REPORT - #6
University Food Service Composting
Currently student-run Campus Center for Appropriate Technology (CCAT) collects food waste from the university food service vendor. Since ORB staff supplied CCAT with additional worms and some advice on pre-composting, their worm bin is doing better. However, they still have a problem with overfeeding their bin at times. There could be another option for restaurant food scraps during the summer, when school is out and their worms need food.

CENTRAL REGION - PROGRESS REPORT - #7
In-vessel Composter
SunFrost is now doing some in-vessel composting. The manufacturer is working with the city on trying to get the three restaurants composting with his commercial size composter. It takes 6 weeks to break down. One of the problems with his design is it does not have an easy way of emptying it. He said that he just scoops the compost out, instead of turning it over to dump it. He says it does not take that much time. That was one of the identified problems with his commercial level composter that the City mentioned.

CHAPTER IV
POLICY RECOMMENDATIONS FOR COMMERCIAL ORGANICS RECYCLING

A COLLABORATIVE AND SYSTEMATIC APPROACH

Highest and Best Use. Overall, policies for the flow of organic materials should go to the highest and best end use options, rather than for one-time uses such as fuel or landfill cover. One of the highest uses for food waste is diversion of edibles to donated food distribution programs, through gleaning and community kitchens. Another very high and best use for organic waste is the rebuilding of healthy soil, as discussed in previous chapters.

Waste Diversion and Energy Savings. Overall, transportation is one of the greatest concerns and costs in waste diversion. In an era of rising concern about fossil-fuel causes of climate change, it makes sense for the environment and the pocketbook to reduce mileage and transportation costs whenever possible. Therefore, policies that prefer decentralized facilities and short transport hauls should be favored over highly centralized facilities with greater hauling distances. This may also mean that processed compost returns to the soil closer to where it originated.

Zero Waste as an Overarching Principle. Many jurisdictions have combined their waste management programs into an overall "zero waste" approach. Examples are included in this chapter.

INCORPORATING COMMERCIAL COMPOSTING INTO EXISTING MUNICIPAL PROGRAMS

Municipal Programs will help the commercial sector to increase its diversion of organic waste, through tailoring a variety of existing community programs, as well as new programs at the local jurisdiction. For example:

The Master Composter Workshop programs are already in existence in many communities to train a new level of local expertise in composting, and can be tailored to a specific industrial sector. Workshops can be advertised and offered specifically for landscapers, restaurant operators, caterers, and others.

The Home Composting programs of many jurisdictions, which currently encourage local residences by providing them with backyard composting bins, could add an element that encourages Landscaping and Gardening service businesses to add an on-site bin maintenance service for those residents who prefer not to handle their own compost but may be enthusiastic about the environmental benefits as well as the rich garden loam in their own backyard. This will help these businesses to expand and may bring in new clients as well.

Grasscycling Education programs encourage the landowner or resident to leave grass on the lawn as mulch, and sometimes recommend the purchase of electric mulching mowers. This too may help commercial sales.

On-Site Composting programs, either with commercially sold bins or the larger commercial tub composters, can be encouraged by government for installation at industrial parks, institutions, and processing facilities to encourage onsite composting. If done with adequate training, these can be an effective method of increasing diversion of yard waste and food waste. The resulting compost is then valuable soil enrichment for the on-location landscape. Likewise, curbside collection programs can be modified to encourage increased business involvement, through larger containers and clear signage.

Similarly, the **Economic Development** division of local government may gear up its services to assist those local businesses involved in organic waste recycling, landscaping, or composting with technical assistance and workshops. These businesses will in turn help the local government to meet its diversion goals.

Waste Education programs provide additional opportunities for outreach about the commercial opportunities for organic recycling in landscaping, worm farming, compost facility operation, and product sales. A program such as the ORB Project in Chapter III, which organized a network and think tank of local organics recycling professionals over a two-year period, could be funded through education and outreach programs.

Soil Enhancement programs are another possible area for municipal or jurisdictional action. For example, Resource Conservation Districts, as part of agricultural demonstration, are encouraging commercial avocado and citrus growers to use mulch and compost to enrich their soil, control weeds, improve water infiltration, and reduce runoff and erosion.

These are just a few examples of a collaborative and systematic governmental approach to increasing commercial sector involvement in organic waste recycling. Since transportation fees and costs are often the

major impediment to program success, the combination of onsite compost processing and expedited permitting of small, decentralized commercial composting facilities nearby are encouraged.

Zero Waste Tools

Listed below are some of the governmental strategies and concepts featured in Zero Waste Plans:

Policy and enforcement tools
- Landfill bans
- Extended Producer Responsibility Programs (e.g. Deposit-refund systems, eco-fees)
- Open Burning Control Bylaws

Infrastructure
- Backyard Composting Programs
- Centralized Composting Programs
- Reuse Centres
- Eco-Industrial Parks
- Zero waste technologies for sewage treatment

Fiscal tools
- User Pay garbage collection programs
- Full Cost Disposal Charges (tipping fees)
- Variable business license fees
- Development Cost Charges
- Green Construction Permit charges
- User Pay water and sewage charges

Political and Community Action
- Lobbying senior levels of government
- Minimum Recycled Content Standards
- Design for the Environment Standards for Industry (business license requirement)
- Education/Public Awareness
- Purchasing Policies (See below)

The Zero Waste New Zealand Trust recommends the following strategies that can be implemented by community governments to move toward their zero waste to landfill target:
- Align all waste policies with the zero waste goal.
- Maintain community ownership (or at very least control) of the waste stream.
- Write contracts that favour recycling and waste minimization over landfilling.
- Keep the community informed – develop internal and external communication strategies.
- Involve and support existing recycling businesses and community groups.
- Tackle the easy projects first.
- Build in maximum resource recovery opportunities at every waste disposal facility, e.g. transfer stations.
- Raise tipping fees to realistic levels.
- Use full cost accounting for recycling and landfill processes.
- Where applicable use income from high value commodities to subsidize the low.
- Monitor and report on progress continually.
- Promote a community 'buy recycled' purchasing policy.

(Recycling Council of British Columbia's Zero Waste Working Group, 2002, based on New Zealand model)

See also the California Resource Recovery Association's Zero Waste Toolkit at www.crra.com.

RECOMMENDED POLICIES FOR MUNICIPAL PROCUREMENT

Aggressive municipal procurement policies that require municipal use of compost products, as part of a buy-recycled set of specifications, are helpful to build local demand for high-quality compost. If local governments only set targets of a recycled percentage of soil amendments purchased, the mandate in some cases may a drop in purchasing, as a percentage of zero purchases is zero. Thus, it is important that policies specify the importance of building soil through living, nutrient-rich humus (compost) as opposed to chemical fertilizers, which actually deplete the soil. Another approach is to eliminate the "new materials only" requirement that is sometimes seen on bid specification, or to go even further and replace this with "recycled products only." Public agencies should require increased compost use AND the purchase of at least 80% of its compost, mulch or soil amendments from locally produced compost facilities.

The California Compost Quality Council recommends that jurisdictions consider using compost for top dressing parks and athletic fields, for new plantings, for habitat enhancement and wetlands restoration, and for bioremediation of contaminated soil. They also recommend compost or mulch for roadway projects, erosion control, and stormwater runoff treatment. A listing of producers is found at www.crra.com/ccqc.

Model specifications for procurement are available. The California Integrated Waste Management Board has a publication for jurisdictions and purchasers, called "Guidelines for Writing Compost/Mulch Specifications." See www.ciwmb.ca.gov/organics.

The U.S. Environmental Protection Agency recommends for Landscaping Products, the use of Compost made from yard trimmings and/or food waste as follows:

> "Purchase or use compost made from yard trimmings, leaves, grass clippings and/or foodwastes for applications such as landscaping, seeding of grass or other plants, as nutritious mulch under trees and shrubs, and in erosion control and soil reclamation. EPA further recommends implementing a composting system for these materials when agencies have an adequate volume and sufficient space." (US EPA, 2000 *Buy-Recycled Series, Landscaping Products,* EPA530F-00-010).

This is a systematic approach, and could be a model for local government procurement. For example, the Washington State Department of Transportation uses thousands of cubic yards of compost in roadside revegetation and restoration, and also for wetlands mitigation. They give contractors the option of chipping trees and shrubs and leaving the material at the site, thus saving transportation costs.

The EPA also has a set of factsheets entitled "Innovative Uses of Compost," which procurement agents may find helpful. This series includes erosion control, disease control, bioremediation, and habitat revitalization, among others. (See EPA530F-97-047)

SOME THOUGHTS ON POLICIES FOR FACILITIES PERMITTING

Ideally, composting facilities should be small, numerous, and self-supporting or profit-making. This approach will reduce transportation costs and return enriched soil closer to its origins. The ideal facility would be permitted to take a good mix of nitrogen-rich materials (green or food) and carbon-rich materials (woody). If enough woody materials in a form such as sawdust are present at the site, there should not be a problem with odor. In reality, however, every community is different, in terms of its facilities, its available land, and its mix of feedstock. The permits for facilities operations should be flexible enough to encourage solutions to problems, while also encouraging additional decentralized sites.

In reality, the regulations for facilities permitting vary greatly also. At one extreme is the no-nuisance constituency, where any facility in any backyard is a problem. In the middle are real concerns about leaching nitrogen contaminants and real odor. At the other extreme may be a large, centralized waste industry that may want to shut out small time operators. As early as 1992, an article on facilities regulations in a Michigan newsletter said that proposed regulations from an industrial group were "so stringent and expensive that smaller operators would be unable to compete." (*Composting News*, June 1990). Yet decentralized facilities may be best for both the soil and for rising concerns about fuel usage.

Basic windrow-style facilities requirements should include, among others:

--protection of groundwater and surface water
--location outside of the floodplain
--surface water runoff control and diversion
--disposal of leachate, if any
--rapid addition of new materials to windrows
--frequency of windrow turning

--management to prevent offensive odors and noise
--immediate corrective action if nuisance

The overall goal must be to make the regulations work so that good organic waste can be converted into good rich humus. Scientists and soil technicians agree that a well-maintained facility should be free of odor and should produce a high quality humus – compost – or a useable, stable mulch. Philosophically, composting is farming and growing good soil. It is a non-toxic, natural process. Aside from concerns about leachates, which must be addressed at the front end, it should be simple to begin a small composting operation. Imagine if every backyard vegetable gardener were required to get a land-use permit, an impact report, air and water quality permits, and a business license! Yet some vegetable growers use commercial fertilizers and do not take care about runoff. For small facilities, the permits should exist to get these facilities up and running, not to stand in the way, or make the process so expensive that only the large, well-funded, centralized industry will be able to do it. Some sort of a permit that provides a basic license, and then requires the operator be subject to inspection and to meeting operations requirements, seems like an answer. This is the way drivers' licenses work, and composting is a lot safer than driving. These are general thoughts. In California, more specific concerns were communicated to the regulators.

Standard Special Provision for Compost Facilities

Compost shall be derived from green material consisting of chipped, shredded, or ground vegetation or clean, processed, recycled wood products or a Class A, exceptional quality biosolids composts, as required by the United States Environmental Protection Agency (EPA), 40 CFR, Part 503c regulations or a combination of green material and biosolids compost. The compost shall be processed or completed to reduce weed seeds, pathogens, and deleterious material, and shall not contain paint, petroleum products, herbicides, fungicides, or other chemical residues that would be harmful to plant or animal life. Other deleterious material, plastic, glass, metal, or rocks shall not exceed 0.1 percent by weight or volume.

A minimum internal temperature of 57°C shall be maintained for at least 15 continuous days during the composting process. The compost shall be thoroughly turned a minimum of 5 times during the composting process and shall go through a minimum 90-day curing period after the 15-day thermophilic compost process has been completed. Compost shall be screened through a maximum 9.5-mm screen.

The moisture content of the compost shall not exceed 35 percent. Compost products with a higher moisture content may be used provided the weight of the compost is increased to equal the compost with a moisture content of 35–40 percent. Moist samples of compost on an as-received basis shall be dried in an oven at a temperature between 105°C and 115°C until a constant dry weight of the sample is achieved. The percentage of moisture will be determined by dividing the dry weight of the sample by the moist weight of the sample and then multiplying by 100. Compost will be tested for maturity and stability with a Solvita test kit. The compost shall measure a minimum of 6 on the maturity and stability scale.

(California Integrated Waste Management Board)

Case study: AN EXAMPLE OF AN UNSOLVED REGULATORY PROBLEM OR A REGULATORY NIGHTMARE?

A Brief Description of the Composting Occurring at the Arcata Educational Farm and How it May Be Impeded by the New Composting Regulations

[Written by a participant at a local CSA effort, the following provides an example of how the new compost regulations are creating a burden. Editors notes added in brackets.]

The Arcata Educational Farm (AEF) is a two-acre, student-run Community Supported Agriculture Farm. Located on the suburban outskirts of Arcata, CA, it is a place where college students and school children learn about small scale, organic agriculture. [The produce is subscribed to and purchased by local farm shareholders.]

The AEF makes compost that is used on site to maintain soil fertility. The raw ingredients are primarily animal manures, weeds and crop residues, straw, and up to 20% food material. This food material is collected from local groceries, restaurants, and from the homes of farm shareholders. In addition to providing fertility for the farm, this composting diverts significant quantities of material from the waste stream (which locally, must be shipped away at a high cost)[to an out-of-state landfill].

The material is built in layers into windrows about 4 x 4 x 50 feet in dimension. The windrows are turned once or twice over the period of 6-10 months. By the end of this time, the material has finished composting, and is spread on the fields. Measures for controlling odor and flies are already in practice. Each time the piles are built or turned, they are capped with a thin layer of soil and/or wood ash. Lime is mixed in to ensure a sweet reaction. The piles are built with enough green or brown material to maintain aerobic conditions, and the piles are covered during the rainy season.

There are a couple of points in the new *Compostable Materials Handling Operations and Facilities Regulatory Requirements* that seem to suggest that the composting occurring at the AEF is not in accordance with the regulations. It seems that the current composting practices do not meet any of the listed exclusions, yet to become a Permitted Composting Facility is not even close to being economically feasible for an operation of this size.

The composting system here is very close to meeting the criteria for *Excluded Activity* #4 in Article 2, section 17855. The AEF operation falls below the 500 cubic yard threshold, but the food material used in composting is generated off-site, and piles are sometimes comprised of more than 10% food material by volume. The composting at the AEF is close to falling under the guidelines for Agricultural Material Composting Operations (section 17856), except for the use of food material as a feedstock.

The crux of the issue is that it would be an economic burden for the AEF to have to purchase extra fertilizer in place of the food material, and it is a burden to the generators of the food waste and to the environment to have this material hauled away. Because both supply and markets for compostable materials and composts are not concentrated in our region, a large permitted facility is not likely to be viable here. This example is one of a few very similar operations in our area. We are seeking a means to continue the decentralized composting that supports waste diversion in our area.

From http://www.ciwmb.ca.gov/Regulations/Title14/ch31.htm

California Integrated Waste Management Board
COMPOSTABLE MATERIALS HANDLING OPERATIONS AND FACILITIES REGULATORY REQUIREMENTS

Section 17855. Excluded Activities.
(a) The activities listed in this Section do not constitute compostable material handling operations or facilities for the purposes of this Chapter and are not required to meet the requirements set forth herein. Nothing in this Section precludes the EA or the board from inspecting an excluded activity to verify that the activity is being conducted in a manner that qualifies as an excluded activity or from taking any appropriate enforcement action.

(1) An activity is excluded if it handles agricultural material derived from a agricultural site, and returns a similar amount of the material produced to that same agricultural site, or an agricultural site owned or leased by the owner, parent, or subsidiary of the composting activity. No more than an incidental amount of up to 1,000 cubic yards of compost product may be given away or sold annually.

(2) Vermicomposting is an excluded activity. The handling of compostable material prior to and after use as a growth medium is not an excluded activity and is subject to the requirements of this chapter. Handling of agricultural material on the site of a vermicomposting activity, for use as a growth medium on that same site, is an excluded activity if it complies with section 17855(a)(1).

(3) Mushroom farming is an excluded activity. The handling of compostable material prior to and after use as a growth medium is not an excluded activity and is subject to the requirements of this chapter. Handling of agricultural material on the site of a mushroom farm, for use as mushroom bedding on that same site, is an excluded activity if it complies with section 17855(a)(1).

(4) Handling of green material, feedstock, additives, amendments, compost, or chipped and ground material is an excluded activity if 500 cubic yards or less is on-site at any one time, the compostable materials are generated on-site and if no more than 1,000 cubic yards of materials are either sold or given away annually. The compostable material may also include up to 10% food material by volume.

(5) The handling of compostable materials is an excluded activity if:

(A) the activity is located at a facility (i.e., landfill or transfer/processing facility) that has a tiered or full permit as defined in Section 18101,
1. has a Report of Facility Information which is completed and submitted to the EA that identifies and describes the activity and meets the requirements of Titles 14 or 27; and,
2. will only use the material on the facility site, or

(B) the activity is solely for the temporary storage of biosolids sludge at a Publicly Operated Treatment Works (POTW) or
(C) the activity is located at the site of biomass conversion and is for use in biomass conversion as defined in Public Resources Code section 40106; or
(D) the activity is part of a silvicultural operation or a wood, paper, or wood product manufacturing operation; or
(E) the activity is part of an agricultural operation and is used to temporarily store or process agricultural material not used in the production of compost or mulch; or
(F) the activity is part of an operation used to chip and grind materials derived from and applied to lands owned or leased by the owner, parent, or subsidiary of the operation; or
(G) the activity is part of an agricultural operation used to chip and grind agricultural material produced on lands owned or leased by the owner, parent, or subsidiary of the agricultural operation, for use in biomass conversion; or
(H) the activity is part of an animal food manufacturing or rendering operation.
(I) the activity is the storage of yard trimmings at a publicly designated site for the collection of lot clearing necessary for fire protection provided that the public agency designating the site has notified the fire protection agency; or
(J) the materials are handled in such a way to preclude their reaching temperatures at or above 122 degrees Fahrenheit as determined by the EA.

(6) Non-commercial composting with less than one cubic yard of food material is excluded provided that all compostable material is generated and used on-site.

(7) Storage of bagged products from compostable material is an excluded activity provided that such bags are no greater than 5 cubic yards.

(8) Within-vessel composting process activities with less than 50 cubic yard capacity are excluded.

(9) Beneficial use of compostable materials is an excluded activity. Beneficial use includes, but is not limited to slope stabilization, weed suppression, alternative daily cover, and similar uses, as determined by the EA; land application in accordance with California Department of Food and Agriculture requirements for a beneficial use as authorized by Food and Agricultural Code section 14501 et seq.; and reclamation projects in accordance with the requirements of the Office of Mine Reclamation of the Department of Conservation as authorized by Public Resources Code section 2770 et seq.

POLICIES FOR FINANCING AND ECONOMIC DEVELOPMENT

Financing. Federal, state, and local jurisdictions, through their economic development programs, can "invest" in building a strong organic waste industry. They can offer business technical assistance on available loans and eligibility requirements, SBA and RMDZ loan structuring and packaging, agreeable loan fees, and attractive development infrastructure packages. Block grants for renovation, compliance, infrastructure and permitting assistance will be especially helpful for the mid-to-large scale facilities, but may also be useful for larger landscapers and food operations. They may also assist in locating sources of venture capital.

Incentives and Education. For business, low-interest loans for operations, fast-track permitting, training, and procurement contracts will be strong incentives at the startup phase. Siting assistance, minimizing permit confusion, targeted collection and delivery programs, technical assistance, trainings and workshops would be additionally useful incentives. Also, help with marketing problems, through product studies, process studies, technical assistance on quality requirements of buyers, pilots and prototypes, and vendor shows would help to build the industry. A collaborative approach with local university departments such as engineering and environmental sciences, or soils sciences, would be helpful on research, and also for innovative technology transfer.

AN INVITATION ON TRAINING FOR THE NEW STATE REGULATIONS:

This e-mail was sent in 2003 on behalf of the LEA Support Services Branch of the California Integrated Waste Management Board.

Compostable Materials Regulation Training: Operations and Odor Management
April 29, 2003 in Santa Ana and April 30, 2003 in Oakland

Operators of Compostable Material Handling Sites, LEAs, Other Local Officials, and Board staff are invited to attend these workshops concerning operations and the compostable materials regulations.

--What does an operator need to know to keep their compostable materials handling site in operation
--How have others met the challenge of odor generation at composting and chipping/grinding sites
--How do participants "build" an odor impact management strategy for an "odor-challenged" site
--What new California regulations are in place regarding odor management
--Questions (and some answers) from participants on options for site improvements to address neighbors' concerns and regulatory requirements

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CHAPTER V
RESOURCES, PUBLICATIONS, AND GLOSSARY

SUGGESTED BOOKS, PAMPHLETS, ARTICLES AND PUBLICATIONS

(Note: some of these were used as sources for the toolkit, and some of them are recommended but not reviewed.)

Books:

Alameda County Home Composting Education Program, 1991, Alameda County Waste Management Authority

The Australian Compost and Worm Book: A Practical Guide for Homes, Schools & Businesses, by Peter W. Rutherford and Mary Lou Lamonda, Apollo Books, 1996

Backyard Composting: Your Complete Guide to Recycling Yard Clippings, by John Roulac, Harmonious Technologies, 1995

Basic Composting, by Eric Ebeling, editor, Stackpole Books, 2003

Beneficial Co-Utilization of Agricultural, Municipal and Industrial By-Products, by Sally Brown, editor, Kluwer Academic Publishing, 1998

BioCycle Guide to Composting Municipal Wastes, by J. G Press, 1989

Biological Reclamation of Solid Wastes, by Clarence G. Golueke, Rodale Press, 1977

Co-Composting of Domestic Solid and Human Wastes, by Letitia A. Obeng and Frederick W. Wright, World Bank, 1987

College Guide to Campus-Wide Composting, for Educational and Functional College Composting Programs, (.pdf file is available through an internet search.)

Compost, by Sterling Publishing, August 2005

Compost Critters, by Bianca Lavies, Penguin USA, 1993

Compost Engineering: Principles and Practice, by Roger Tim Haug, CRC PR I, LLC, 1980

Compost, Fertilizer, and Biogas Production from Human and Farm Wastes in the People's Republic of China, by Michael McGary and Jill Stainforth, International Development Research Centre, 1978

Compost Gardening, by W. E. Shewell-Cooper, David and Charles, 1972

Compost! Growing Gardens from Your Garbage, by Linda Glaser and Anca Hariton, Millbrook Press, 1996

The Compost Heap, by Harlow Rockwell, Doubleday, 1974

Compost: Production, Quality, and Use, by M. DeBertoldi, editor, Elsevier Applied Science, 1987

Compost This Book!; The Art of Composting for Your Yard, Your Community, and the Planet, by Tom Christopher and Marty Asher, University of California Press, 1994

Composting in the Classroom: Scientific Inquiry for High School Students, Kendall Hunt Publishing, 1997

Composting Municipal Sludge: A Technology Evaluation, by Arthur H. Benedict, Eliot Epstein, and Joel Alpert, William Andrew Inc, 1988

Composting of Agricultural and Other Wastes: Proceedings of a Seminar Organised by the Commission of the European Communities, Directorate General Science, Research and Development, Commission of the European Communities, Elsevier Applied Science Publishers, 1985

Composting Manure for Value-Added Products, JG Press, 2001

Composting: A Study of the Process and its Principles, by Clarence G. Golueke, Rodale Press, 1973

Composting and Mulching: A Guide to Managing Organic Yard Wastes, by Carl J. Rosen, Nancy Schumacher, et al, University of Minnesota Extension Service,1988

Composting and Solid Waste Handling Facilities, SciCorp Biologic

Composting Equipment Handbook, including Site Management Guidelines, SCAT Engineering, 1991

Composting for Agriculture: Municipal Waste Composting Information (Booklet)

Composting in Restaurants and Schools: a Municipal Tool-kit, May 2003

Composting, the Cheap and Natural Way to Make Your Garden Grow, by Dick Kitto, Harper Collins, 1982

Composting: The Organic Natural Way, by Dick Kitto, Harper Collins, 1988

Composting, by Liz Ball and Jim Anderson, Workman Publishing, 1998, Smith & Hawken

Composting Fish By-Products: A Feasibility Study, by William F. Brinton and Milton Seekings, Time and Tide RCD, 1988

Composting: A Local Waste Management Solution, by Ludia D. Bjornlund, International City/County Management Association, ICMA, 1998

Don't Throw Away that Food: Strategies for Record-Setting Waste Reduction, U.S. Environmental Protection Agency, 1998, EPA-530F-98-023

Don't Waste Your Wastes, Compost 'Em: The Homeowners' Guide to Recycling Yard Wastes, by Bert Whitehead, National Book Network, 1992

Down to Earth Composting of Municipal Green Wastes, by the Institute of Wastes Management, Great Britain, 1994

Easy Composters You Can Build, by Nick Noyes, Workman Publishing, 1995

Easy Composting, by Vic Sussman, St. Martins Press, 1982

Easy Composting, by James Ball, Robert Kourik, and Roberta Spieckerman, Meredith Books, 1992

Encouraging Backyard Composting: An Environmental Guide for Local Government, Global Cities Project

Everyone's Guide to Home Composting, by Robyn Bem, Van Nostrand Reinhold, 1978

Home Composting in Alameda County: Progress Report and Recommendations, 1997

The Humanure Handbook, by Joseph Jenkins, Chelsea Green Publishing, 2005

The Incredible Heap: A Guide to Compost Gardening, by Chris Catton, and James Gray, St. Martin's Press, 1984

Large Scale Composting, by .J. Satriana, Noyes Data Corporation, 1974

Let it Rot: The Gardeners' Guide to Composting, by Stu Campbell, 1998, Storey's Down-to-Earth Guides, by Stu Campbell

Metro's Home Composting Demonstration Program, Portland Metro Service District, 1992

Microbiology of Composting, by Herbert Insam et al, editor, Springer, 2002

Multi-Jurisdictional Recycling and Composting System Materials Recovery Facility: Options Study, Unincorporated County of Santa Cruz, City of Watsonville, 1993

Municipal Composting Handbook: Park, Yard and Landscaping Plant Wastes, California Waste Management Board, 1983

Municipal Yard Waste Composting; A Handbook for Wisconsin Communities, by Wendy McCown, Dane County Compost Recycling Network, 1988

No Garbage: Composting and Recycling, by Allen Gilbert, Lothian, 1993

Organic Waste Diversion Study, Portland Metro Regional Government, 1998

Practical Considerations in Designing Yard Waste Composting Programs: Lessons from Case Studies, by Richard Kashmanian and Alison C. Taylor, 1989

The Practical Handbook of Compost Engineering, by Roger T. Haug, CRC Pr I LLC, 1993

Practical Strategies for a Home Composting Program, Resource Conservation Manitoba

Raising Earthworms for Profit, by Earl Shields

Recycle with Earthworms, the Red Wiggler Connection, by Shelley Grossman and Toby Weitzel, Shields Publications, 1997

Recycling: A Local Solution to the Solid Waste Crisis: Composting Yard Waste, 1990, Local Government Commission

Regional Yard Debris Recycling Plan, Metro Portland, 1991

The Rodale Book of Composting: Easy Methods for Every Gardener, by Deborah L. Martin et al, editors, St. Martins Press, 1992

Rodale Guide to Composting, by Jerry Minnich and Marjorie Hunt, St. Martin's Press, 1979

SCAT Composting Equipment Handbook, SCAT Engineering, 1992

The Science of Composting, by Eliot Epstein, CRC Pr I, LLC, 1996

The Secret Life of Compost: A "How-To" and "Why" Guide to Composting Lawn, Garden, Feedlot or Farm, by Malcolm Beck, Acres USA, 1997

Soil and Composting: The Complete Guide to Building Healthy, Fertile Soil, by Nancy J. Ondra and Barbara Ellis, Houghton Mifflin, 1998

Soil Management: Compost Production and Use in Tropical and Subtropical Environments, by H.E. Dalzell, Bernan Associates, 1987

Squirmy Wormy Composters, by Bobbie Kalman, Crabtree Publishing, 1992

Starting a Yard Waste Collection Program, Global Cities Project, 1992

Success Stories on Composting and Separate Collection, by the European Commission, Office for Official Publications of the European Communities, 2000)

Sustainable Composting Options in the Province of Alberta: Final Report, Alberta Environmental Protection, 1993

The Urban/ Suburban Composter: The Complete Guide to Backyard, Balcony, and Apartment Composting, by Mark Cullen, Lorraine Johnson, and Andrew Leyerle, St. Martins Press, 1994

Waste Composting for Urban and Peri-Urban Agriculture: Closing the Rural-Urban Nutrient Cycle in Sub-Saharan Africa, by Pay Drechsel and Dagmar Kunze, editors, CABI Publishing, 2001

Wastewater Biosolids to Compost, by Frank R. Spellman, CRC Pr I LLC, 1996

The Worm Book: The Complete Guide to Worms in Your Garden, by Loren Nancarrow and Janet Hogan, Ten Speed Press, 1998

Worm Composting, by Joshua D. Nelson, Workman Publishing, 1998

Worms Eat my Garbage: How to set up and Maintain a Worm Composting System, by Mary Appelhof, Flowerfield Press, 1997

Worms, Worms, and even more Worms: A Vermicomposting Guide for Teachers, Integrated Waste Management Board, 1998

Pamphlets, Articles, and Publications:

"Guidelines for Writing Compost or Mulch Procurement Specifications," 4 pp., CIWMB, www.ciwmb.ca.gov/

"Buy-recycled Series: Landscaping Products," U.S. EPA, June 2000, EPA530-F-00-010

"The Value of Recovered Organic Materials," 6pp., U.S. EPA, May 2000, EPA909-B-00-001

Organic Materials Management Strategies, 54 pp., U.S. EPA, July 1999, EPA530-R-99-016

Organics Processing in Alameda County, October 2000, Alameda County Waste Management Authority, www.stopwaste.org

A National Strategy to Promote Source Separated Composting: Proceedings of the National Source Separated Compost Symposium, National Recycling Coalition, 1993

Waste to Soil Products Feasibility Study for the City of Arcata, Gainer and Associates, 1993

"Mulch/ Compost and the Marketplace," pp.44-45, *BioCycle*, September 2001

"Moving Municipal Organics to Agricultural Markets," pp.49-50, *BioCycle*, December 1998

"Creating markets for solid waste compost," pp.20-21, 56-57, *Resource Recycling*, May-June 1988.

"Compostable Materials Handling Operations and Facilities Regulatory Requirements," California Code of Regulations, CCR, Title 14, Chapter 3.1, Section 17850- 17863

Eicher, Annie L., and Giraud, Deborah D. *"Organic Agriculture in Humboldt County,"* May 2002, 8 pp., University of California Cooperative Extension, Agriculture and Natural Resources, Humboldt County

Yard Waste Composting: A Study of Eight Programs, 47 pp., April 1989, EPA530-SW-89-038

"A prescription to reduce yard debris," pp. 90-94, *Resource Recycling*, July 1990.

"Managing Yard Trimmings: Yes... In my backyard," pp.44-47, *BioCycle*, September1993

"A Landscaper's Guide to Grasscycling: Save Time, Save Money and Create Beautiful Lawns," 8 pp., Alameda County Waste Management Authority, www.stopwaste.org

"What's Behind a Compost Label or Seal?," pp.28-30, *BioCycle*, September 2003

"Versatile Blends Succeed in the Market," pp. 63-65, *BioCycle*, July 1999

"Got compost? A dairy farm spins 'waste' into garden gold," pp.15-20, *The Oregonian, Homes and Gardens*, April 7, 2005

Christmas Tree Recycling, 1992, 23 pp., California Integrated Waste Management Board, 304-92-001

"Wood Waste: How to keep wood waste out of landfills," 4 pp., CIWMB fact sheet

"An Analysis of Composting as an Environmental Remediation Technology", U.S. Environmental Protection Agency, April 1998, EPA530-R-98-008

"Temperature Dynamics, Oxygen Consumption and Nitrogen Utilization in Static Pile Composting", Redwood National Park, Technical Report 14, June 1985

"An Annotated Bibliography of Periodical Literature on Composting," June 20, 1989, Prepared by Gary Van Dorst, Waste Reduction Coordinator, City of Sacramento, Department of Public Works, Solid Waste Division, 1989

"Odor Control: Completing the Composting Process," International Process Systems.

"Environmental Fact Sheet: Recycling Grass Clippings," U.S. EPA, 1992, EPA-530-F-92-012

"Environmental Fact Sheet: Yard Waste Composting," U.S. EPA, 1991, EPA-530-SW-91-009

"Compost and Regeneration", by William F. Brinton, in *Orion*, Spring, 1992

"Yard Waste Composting, Cornell Waste Management Institute, 1986

"Massachusetts Supermarket Recycling Organics Initiative", www.wastecap.org

"Greenscapes: Environmentally Beneficial Landscaping," U.S. EPA, July 2003, www.epa.gove/cgi-bin/epaprintonly.cgi

Texas Natural Resource Conservation, Erosion Control Best Management Practices, 2003

"Farming out Food Wastes," by John Majercak, in *Resource Recycling*, December, 1998, 12-15

"Composting Liquid Food residuals," in *BioCycle*, June, 1999, 58-60

"Home Composting Programs, in *BioCycle*, January, 1993, 34-36

"Source Reduction through Home Composting," in *BioCycle*, April 1992

"Food waste composting: Institutions get a taste," in *Resource Recycling*, November, 1990, 45-47

"Food residuals recovery in California," in *BioCycle*, September 1999, 28-30

"Status of composting in the United States,' by Luis F. Diaz, and Clarence G. Golueke, in *Resource Recycling*, February, 1990, 40-42,70-74

"Worm treatment Produces 'Class A' Biosolids," in *BioCycle*, October,1996, 67-68

"Compost and Storm Water Management – tapping the Potential," in *BioCycle*, August, 2002, 33-38

"trends in Yard Waste Composting, in *BioCycle*, July 1988

"Organic Waste Recycling Facility Launches," in *BioCycle*, December 1989

"Solid waste composting gears up in Minnesota," in *Resource Recycling*, September, 1991, 81-88

"Odor control progress at composting sites," in *BioCycle*, February 1994, 64-67

"Description of State backyard Composting Bin Markets," 1993, Gainer and Associates

"King County Washington's Master Recycler Composter Program, in *Resource Recycling*, December, 1990, 22-25

"Understanding the Basics of Composting," in *BioCycle*, April 1990, 56-59

WEBSITES, AGENCIES AND ORGANIZATIONS

The Composting site of the U.S. Environmental Protection Agency, includes numerous .pdf files you can download.
www.epa.gov/epaoswer/non-hw/composting/pubs.htm

Yard waste site, U.S. EPA,
www.epa.gov/epaoswer/non-hw/muncpl/yard.htm

Organic Materials Management, California Integrated Waste Management Board ("CIWMB"), www.ciwmb.ca.gov/organics

Food Waste Management, CIWMB, www.ciwmb.ca.gov/FoodWaste

Vermicomposting, CIWMB, www.ciwmb.ca.gov/Organics/Worms

Compost Marketing, CIWMB, www.ciwmb.ca.gov, for marketing reports

Wood Waste, CIWMB, www.ciwmb.ca.gov/ConDemo

Recycled Materials Purchasing, CAL-MAX, www.ciwmb.ca.gov/CalMAX

Alameda County Waste Management Authority, www.stopwaste.org See also their publications

Recycling Market Development Zone, for loan assistance and packaging www.ciwmb.ca.gov/rmdz

www.cityfarmer.org/

www.mastercomposter.com

www.wormdigest.org/gettingstarted.html

www.ciwmb.ca.gov/Vermi

The U.S. Composting Council, www.compostingcouncil.org

GLOSSARY

"Aerobic" – In the presence of free oxygen, or requiring oxygen. This refers to compost systems that need air. Air can be added by turning the pile, or other methods of aeration.

"Anaerobic" – In the absence of free oxygen. Some "no-turn" systems of composting operate without air, and decompose more slowly.

"Carbon/Nitrogen ratio" – The proper balance of carbon and nitrogen is essential for successful composting. Approximately 25 C to 1 N is considered by some to be ideal, but the range may vary according to conditions.

"Chipped Wood" – Generally from tree-trimming or gardening. Can be composted or used as a mulch.

"Clean Wood Waste" – Wood only, without trash or debris.

"Composting" – to turn organic waste into fertile, structured humus. [The recycling of vegetative or animal materials through decomposition of valuable nitrogen-rich organic materials mixed with carbon-rich woody materials at a proper ratio, held at certain temperatures, properly aerated, to result in the formation of humus.] [The CIWMB definition is "the product resulting from the controlled biological decomposition of organic wastes that are source separated from the municipal solid waste stream."]

"Construction and Demolition Wood Waste" – If properly separated, construction wood is generally "clean", but demolition wood may be contaminated.

"County Sealer" – Means the County staff who, under the supervision and direction of the Secretary of Food and Agriculture, carry out the vast majority of weights and measures enforcement activities at the local level. Each county in California has an Office of Weights and Measures (also known as Department of Agriculture or Agricultural Commissioner - varies from county to county) that has jurisdiction over any commodity that is weighed, measured, or counted. These offices are also responsible for assuring the accuracy of weights and measures.

"Division of Measurement Standards (DMS)" – Means the State of California agency responsible for the enforcement of California Weights and Measures laws and regulations. DMS responsibilities include ensuring the accuracy of commercial weighing and measuring devices, and verifying the quantity of both bulk and packaged commodities.

"Field Standard" – Means the physical standards which are traceable to the reference standards through comparisons, using acceptable laboratory procedures, and used in the enforcement of weights and measures laws and rules;

"Food Waste" – Means food material resulting from the processing, storage, preparation, cooking, handling, or consumption of food, and comes from industrial, commercial and residential sources. It tends to be nitrogen-rich. It includes both pre-consumer (kitchen trimmings) and post-consumer (off the plate).

"Green Waste" or "Yard Waste" – Generally, landscape or plant trimmings, leaves, and grass. This is usually nitrogen-rich, unless it contains a preponderance of brush and twigs, which are more carbon-rich. Food waste, often defined separately from yard waste, is "green" in the sense of being high in nitrogen.

"Humus" – A blend of decomposed plant matter, beneficial micro-organisms, and soil.

"In-vessel Composting" – Reactor systems process compost in chambers that provide adequate aeration, moisture and mixing.

"Micro-organisms" – Tiny bacteria, fungi, and animals that digest and decompose organic materials.

"Mulch" – A soil covering used to control weeds or erosion; to retain moisture in the soil; or to insulate soil from cold weather.

"National Conference on Weights and Measures Inc. (NCWM)" – Means the national professional organization composed of regulatory officials, industry representatives, and individuals having an interest in weights and measures that develop consensus standards in areas of weighing and measuring device regulation, commodity regulation, and administration of regulatory weights and measures program;

"National Institute of Standards and Technology (NIST)" – Means the subdivision of the US Department of Commerce responsible for maintaining the standard weights and measures of the United States.

"Nutrients" – Substances which provide nourishment for living organisms

"Organic Agriculture" – A subset of agriculture, covered by National Organic Standards Board standards. NOSB definition is "an ecological

production management system that promotes and enhances biodiversity, biological cycles and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain and enhance ecological harmony."

"Organic Labeling" – Denotes food products produced under the authority of the Organic Foods Production Act guidelines.

"Organic Materials" – The complex living products of living systems.

"Organic Waste" – Unwanted products or byproducts of plants and animals

"Porosity" – The ability to absorb water or air, based on the percentage of space in the solid material

"Sale from Bulk" - Means the sale of commodities when the quantity is determined at the time of sale.

"Sawdust" – May be added to compost or soil amendments, or used as a mulch.

"Tree Trimmings" – Woody twigs, limbs, branches. Generally needs to be chipped or ground before using in compost or as mulch

"Weights and Measures" – Means all weights and measures of every kind, instruments and devices for weighing and measuring, and any appliance and accessories associated with and instruments and devices. "Weight" used in connection with and organics collection and compost sales means net weight.

"Windrow Composting" – Large elongated piles to process compost. The windrows are mixed or turned to provide proper aeration.

"Wood Waste" – Includes woody debris, branches, twigs, stumps, and sawdust. These are carbon-rich. May also include construction and demolition waste, although demolition waste is more likely to be contaminated.