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Environmental Protection
Agency

Solid Waste
and Emergency Response
(5306W)

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www.epa.gov

EPA REGION 9

The Value of Recovered Organic Materials

For everyone-from government agencies to entreprenurs to homeowners

Organic materials make up the bulk of America's discarded municipal solid waste (MSW) and includes paper and paperboard, yard trimmings, food scraps, and wood (see pie chart on page 2). Organic materials also make up a large portion of waste not usually included in MSW, such as construction and demolition debris, agricultural waste and food manufacturing/processing debris.

This factsheet presents organic material market development opportunities to business people who have potential markets for these material, and federal, state and local decisionmakers whose responsibilities include managing organic materials. *Organic materials are valuable resources!* EPA recommends they be reused and recycled to create other products such as furniture, compost and mulch, or used to generate energy before being sent to a landfill. A significant portion of the national organic waste stream (e.g., paperboard which includes newspaper, office paper, and corrugated cardboard) is already being recovered for reuse and recycling. This factsheet focuses on the other organic wastestreams with high growth potential for recovery—yard trimmings, food and wood scraps.

Some benefits of diverting organic materials from landfills

- Potential savings on collection, disposal, and landfill costs.
- Revenue from selling new products.
- Extends landfill life by reducing amount of waste disposed.
- Fights global warming by reducing methane gas generation and contributes to carbon sinks. Methane is a powerful greenhouse gas and landfills are the single largest source of methane in the U.S. Methane can be controlled by reducing the anerobic decomposition of organic materials. *For more information on carbon sinks see www.epa.gov/epaoswer/nonhw/muncpl/ghg/greengas.pdf.*
- Meets waste reduction/diversion goals.

INSIDE:

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Food scraps - prevention first, recovery second

Food scraps accounted for nearly 22 million tons of solid waste generation in 1997. The United States Department of Agriculture (USDA) found that more than one quarter of all food produced for human consumption in America is currently discarded. Businesses and institutions throughout the country—from supermarkets and hospitals to government offices and schools—are designing programs to help redirect food discards from the national waste stream. Those with record-setting food diversion programs are recovering 50 to 100% of their food discards and reducing their overall solid waste by 33 to 85%. Businesses can practice food waste prevention, reuse and recycling by improving portion control, recipe specifications, handling, storage and serving procedures.

Benefits of Food Recovery

Food recovery programs not only benefit the environment by reducing the waste stream, but they also offer social and economic benefits:

- Reducing trash collection and disposal fees.
- Providing food to the needy.
- Recovering the nutrient value of the food as compost or animal food.
- Helping communities meet local and state waste reduction goals.
- Sustaining local industries and jobs.
- Creating a better image for businesses and soliciting community participation.

Potential savings

- Donors save through avoided disposal costs and tax-deductible donations to food banks.
- Food service agencies buy less and save money.
- Farmers save on feed costs.
- Industries gain revenue from animal feed, food rendering or compost operations.

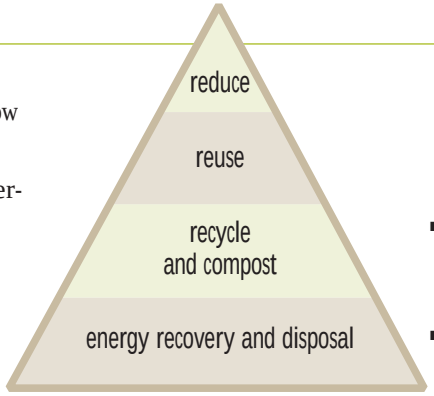
For example, the San Francisco Food Bank collects over 37 tons of edible food a month from wholesalers and distributes it to local service agencies. With tipping fees at $33/ton, this equals close to $15,000/year in avoided disposal costs.

For more information on food recovery and how to volunteer or donate food call USDA's 1-800-GLEANIT hotline managed by the World Hunger Year.

USDA / EPA food scraps hierarchy

With remaining food scraps, businesses can follow the new USDA/EPA's food scraps hierarchy.

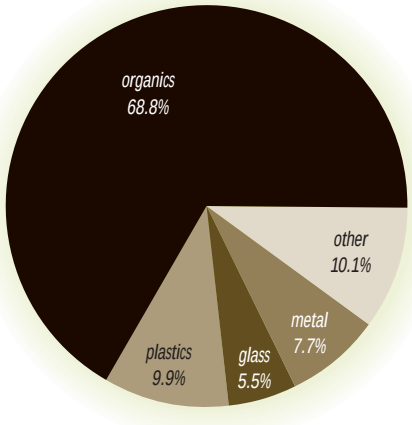
- Feed people–nonperishable and unspoiled perishable food can be donated to food banks, soup kitchens, shelters, and other charitable organizations,
- Feed animals–some types of food discards, such as inedible produce, can be used as animal feed or can be converted into a high-quality, pelletized pet food,
- Render the food–process meat products into animal food, cosmetics, soap, and other products, or
- Compost using worms.



Let the NATIONAL EPA WASTE MANAGEMENT HIERARCHY guide you in making decisions about managing organic materials in your community.

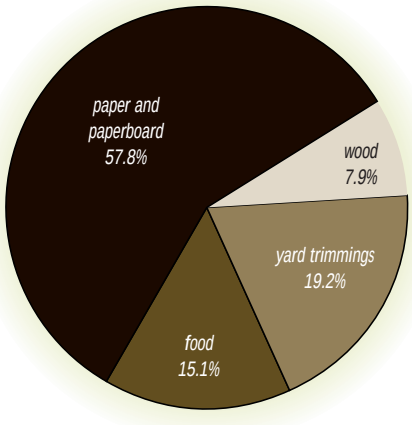
Organics as a Percentage of the Total Wastestream

Taken from "*Characterization of Municipal Solid Waste in The United States: 1998 Update*"



Types of Organic Materials in the Wastestream

Taken from "*Characterization of Municipal Solid Waste in The United States: 1998 Update*" (percentages based on total organic wastestream)



The value of composting

Composting is the controlled biological decomposition of organic matter, such as food, wood products, and yard wastes, into a rich organic soil like material.

Composting helps keep high volumes of organic materials out of landfills and turns them into useful products. Yard trimmings and food residuals together constitute nearly 23% of the U.S. waste stream. An estimated 41% of yard trimmings were recovered for composting or grasscycled (see box below) in 1997, a dramatic increase from the 12% recovery rate in 1990. Accompanying this surge in yard waste recovery is a composting industry that has grown from less than 1,000 facilities in 1988 to nearly 3,300 in 1997. Once dominated by public sector operations, the composting industry is increasingly entrepreneurial and private-sector driven, led by firms that add value to compost products through processing and marketing. Compost prices have been as high as $26 per ton for landscape mulch to more than $100 per ton for high grade compost which is bagged and sold at the retail level.

The benefits of compost

Erosion control, turf remediation, and landscaping. Compost has been viewed as a valuable soil amendment for centuries. And it is an effective way to improve plant growth. Compost-enriched soil can also reduce erosion and nutrient runoff, allevate soil compaction and help soil retain water. Suggested markets include: agriculture, forest management, sod production, residential retail, nurseries, delivered topsoil, landscapers, landfill cover and surface mine reclamation.

Reforestation, wetlands restoration, and habitat revitalization. Original wetland plants can be restored with the use of compost during planting. Compost adds the missing infrastructure, humus, and nutrients that plants need to re-establish themselves in eroded areas and provides invigorated tree seedlings for survival and growth. Compost, with its high organic content, can absorb up to four times its weight in water and can replace essential organic materials in wetlands. Suggested markets include: agriculture, forest management, landscaping and surface mine reclamation.

Save money, reduce use of pesticides, and conserve natural resources. Professional growers are discovering that compost-enriched soil can help suppress diseases and ward off pests. It can also help growers save money, cut their use of pesticides, and conserve natural resources. Compost has been shown to enhance plant survival and growth and stabilize soil for revegetation. In the poultry industry, composting has also become a cost-effective method of mortality management. The process of composting destroys diseased organisms and creates a nutrient-rich compost. Suggested markets include: agriculture, forest management, sod production, residential retail, nurseries, delivered topsoil and landscapers.

Bioremediation and pollution prevention. Compost bioremediation is currently being used to restore contaminated soils, manage stormwater, control odors, and degrade volatile organic compounds (VOCs). It has proven effective in degrading or altering many types of contaminants, such as chlorinated and nonchlorinated hydrocardbons, wood preserving chemicals, solvents, heavy metals, pesticides, petroleum products, and explosives. Compost used in bioremediation is referred to as "tailored" or "designed" compost in that it is specially made to treat specific contaminants at specific sites. Suggested markets include: surface mine reclamation, oil and fuel spills, roadside landscaping, and phytoremediation projects (the use of plants to remediate contaminated soils).

Potential savings

Depending upon the type of waste and method of composting selected, average national savings over conventional disposal vary from $9 to $37 per cubic yard (see the Organic Material Management Strategy for more information about costs/savings).

- Avoided disposal costs
- Revenue from selling compost, mulch, and soil blends.

For more information about composting, see EPA's composting website at www.epa.gov/msw/compost.htm

Scrap wood and plant trimmings reuse

Scrap wood comes from a variety of sources including trim, shorts, and rejects from manufacturers; scrap from construction sites; wood recovered through building deconstruction or demolition; general MSW wood waste; pallets and crating; and tree removals. You can reuse items as they are- or remanufacture items to a "like new" condition, or make into:

- Furniture and furnishings (i.e., tables, dressers, chairs, stools, boxes, shelves, spice racks)
- Flooring
- Lumber
- Compost bins
- Garden planter boxes
- Firewood
- Bird houses
- Wooden toys
- Animal bedding and litter
- Pallets
- Road stabilization material
- Mulch in the form of grasscycling—the process of leaving grass clippings on the lawn, which acts as a fertilizer
- Packaging filler
- Art projects

Wood scraps - reuse and recycle

In 1997 scrap wood and plant trimmings accounted for 27% of the organic wastestream. Almost 70% was not recovered. Instead of sending them to landfill, these materials can be reused , recycled, or composted generating a host of environmental, financial, and social benefits.

Reuse means that the material is used over and over again in its current form - without breaking it down into a raw material. Reuse also includes remanufacturing—which refers to restoring used durable products to a "like new" condition. Scrap wood and plant trimmings can be reused in a number of products—reused in its original form, such as a pallet, or made into something new without processing. Reuse, when possible, is preferable to recycling because it saves processing costs. Therefore, there are potential energy savings if material is reused.

Recycling includes collecting recyclable materials that would otherwise be considered waste, sorting and processing recyclables into raw materials such as fibers, plastics, metals, and glass and forming them into new products.

Benefits of reuse and recycling

- Saves energy
- Conserves natural resources
- Prevents emissions of many greenhouse gases and water pollutants
- Supplies valuable raw materials to industry
- Recycling protects and expands U.S. manufacturing jobs and increases U.S. competitiveness
- Stimulates the development of cleaner technologies
- Reduces the need for new landfills and incinerators
- Helps sustain the environment for future generations

Potential Savings

- avoided disposal costs
- revenue from selling products made with reused and recycled organic materials.

Organic materials can be recycled into a number of products:

- Compost
- Hydromulch
- Pulp/paper
- Aggregate blocks
- Concrete and wood mix
- Charcoal
- Landfill cover
- Animal bedding/litter
- Mulch
- Potting soil
- Pressed fuel products (pellets and fire logs)
- Particleboard
- Playground cover material
- Wood composites such as hardboard, fiberboard, and cement/fiber, gypsum/fiber, and plastic/fiber
- Loose fiber products (cellulose insulation and molded pulp)

Get Involved! Here are some resources to get you started.

Organic Material Market Development Resources

- EPAs Jobs Through Recycling program. www.epa.gov/jtr.
- Materials for the Future Foundation, a non-profit market development organization. Call (415) 561-6530 or visit www.materials4future.org.
- Clean Washington Center, a non-profit organization helping develop markets for recycled materials through recycling technology and market development expertise and services. Call (206) 464-7040 or visit www.cwc.org.

Food Recovery Resources

- USDAs toll-free hotline managed by the World Hunger Year. Call 1-800-GLEANIT for more information.
- Foodchain, a non-profit organization that provides listings of local organizations that accept donations and distribute to those in need. Call for listings in your area at 1-800-345-3008.

Wood Reuse / Recycling Resources

- USDAs Forest Products Laboratory conducts wood product research. www.fpl.fs.fed.us.
- USDA Agricultural Research Program. In particular see C.T. Donovan Associates, Inc. A Sourcebook on Wood Waste Recovery and Recycling In the Southeast. Southeastern Regional Biomass Program. June 1994. www.ars.usda.gov.

Composting Resources

- The U.S. Composting Council is a non-profit organization involved in research, public education, composting, compost standards, and market development. Call 1-440-989-2748 or visit www.compostingcouncil.org.
- BioCycle Magazine is a monthly journal of composting and recycling. Call 1-610-967-4135 or visit www.jgpress.com.

Climate Change / Greenhouse Gas Resources

- EPA's Climate Change, Methane and Other Greenhouse Gas website. www.epa.gov/ghginfo
- See EPA Office of Solid Waste publication, Greenhouse Gas Emissions From Management of Selected Materials in Municipal Solid Waste at www.epa.gov/epaoswer/non-hw/muncpl/ghg/greengas.pdf.

Carbon Sequestration and Composting

- Get EPA Office of Solid Waste publication, Greenhouse Gas Emissions From Management of Selected Materials in Municipal Solid Waste at www.epa.gov/epaoswer/non-hw/muncpl/ghg/greengas.pdf.
- The U.S. Composting Councils editorial on carbon sequestration. www.compostingcouncil.org/directory/contributions.

Biobased Products and Bioenergy

- Executive Order 13134, Developing and Promoting Biobased Products and Bioenergy. www.bioproducts-bioenergy.gov.
- Executive Order 13101 Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition, which includes biobased products. www.ofee.gov.
- The Alternative Agricultural Research and Commercialization Corporation. www.usda.gov/aarc.
- USDA's Biofuels Research Program located in the Agricultural Research Center. www.nal.usda.gov/ttic/biofuels.htm.
- Department of Energy's Regional Biomass Energy Program. http://rredc.nrel.gov/biomass/doe/rbep.
- Department of Energy's Bioenergy website: www.eren.doe.gov/bioenergy_initiative.

Landfill Bioreactors

- EPAs Office of Solid Waste and Emergency Response website provides information on landfill bioreactors and ongoing projects with EPA. They're at www.epa.gov/ooaujeag/projectxl/yolo/page6.htm.

What is in our future?

Organic material, or biomass, has the potential to be made into many other products. These products, known as biobased products, offer environmentally friendly and organic-based alternatives to petroleum and mineral-derived industrial products currently in the marketplace. Some examples include chemicals, fibers, construction materials and energy sources. Development and commercialization of these biobased products provide new and expanded markets while fostering rural/sustainable development. Many biobased products can be composted at the end of their useful life!

When organic materials from the MSW wastestream cannot be reused or recycled or composted, they may be burned with some fossil fuels to produce energy. This process is known as co-firing. Substituting a small percentage of biomass for fossil fuel can help reduce greenhouse gasses.

Additionally, EPA is conducting research on new ways to capture methane gas from landfills. One method is to make landfills large bioreactor cells. Unlike conventional landfill practices that try to keep waste dry, bioreactors focus on creating an optimal environment for the microbes that break down organic material. Increasing the rate and extent of waste decomposition may extend the life of a landfill cell.

It can also improve the quality of leachate by reducing the concentration of organics and metals and enhance the rate of methane generation. This may make waste energy gas recovery at existing landfills more economical.

Biofuels

Methanol, syngas, and ethanol are some of the fuels derived from biomass materials. According to estimates by the U.S. Department of Energy, biofuels could replace substantial amounts of fossil fuels currently used to produce electricity, thermal energy, or transportation fuel. Biomass has the potential to be used as feedstock for methanol, syngas, and ethanol production. Wood waste is a major feedstock in both short– and long–term forecasts of biofuels. Note that pollution and emissions associated with these fuels need additional research. For more information on biofuels visit www.nal.usda.gov/ttic/biofuels/usdabio.htm.

Biobased products

A biobased product is commercial or industrial product, other than food or feed, that uses biological products or renewable domestic agriculture (plant, animal and marine) or forestry materials

- Absorbents/adsorbents
- Adhesives/inks/coatings
- Alternative fuels and fuel additives such as biodiesel, ethanol, and methane
- Construction materials/composites such as structural biopolymers and packaging materials
- Lubricants/functional fluids
- Renewable alternative fiber papers/packaging
- Solvents/cleaners/surfactants
- Plant-based plastics/degradable polymers/films
- Landscaping products
- Bioremediation products
- New fibers/filler/yarn/insulation
- Enzymes/intermediate chemicals such as ethylene, fatty acids, acetic acid, leuvulenic acid, and rubber

For more information on biobased products visit www.bioproducts-bioenergy.gov/index.htm.

Examples of revenue from enterprises using recycled wood and organics

Reclaimed lumber competes directly with virgin lumber in many cases, so prices will track virgin lumber prices closly. Reclaimed lumber is often of better quality than lumber on the market, and can command higher prices—between 5–15%

Product	Approximate market value
Compost	$10 – $35 per ton
Soil Blends	$23 – $35 per ton
5Ó thick, 24 x 24maple laminated wood blocks,	$300 (depending on the quality and finishing)
1Ó thick, 9 x 12maple cutting board	$10
Hardwood tables	in the hundreds
Hardwood jewelry holders *with three to four racks*	$16 – $29
Oak spice racks, two levels, and 12Ó long	$29 (depending on the length)
Cup or coat racks	$20–$40
Step stools	$15–$40
Wood flooring (4–6widths)	$1.50–$4.00 per ft.
Planter boxes	$10–$50

Note: Quotes are estimates. Retail may be higher.
From "Manufacturing with Reused and Recycled Materials: Fifty Small Business Opportunities", a Materials For The Future Foundation publication.

Available EPA publications

Below is a sample of EPA organic material management publications available free of charge. These and other publications may also be available by calling the RCRA Hotline at 1-800-424-9346 (please have the publication number ready) or many can be downloaded from the EPA website at www.epa.gov/compost or www.epa.gov/msw/compost.

An Analysis of Composting as an Environmental Remediation Technology, Pub.# EPA530-R-98-008
Biosolids Generation, Use and Disposal, Pub #EPA530-R-99-009
Composting, Yard Trimmings, and Municipal Solid Waste, Pub.# EPA530-R-94-003
Doing What it Takes to Be WasteWi$e, call 1-800-EPA-WISE
Don't Throw Away That Food: Strategies for Record-Setting Waste Reduction, Pub.# EPA530-F-98-023
Environmental Fact Sheet: Recycling Grass Clippings. Pub # EPA530-F-92-012
Environmental Fact Sheet: Yard Waste Composting, Pub.# EPA530-SW-91-009
Innovative Uses of Compost: Disease Control for Plants and Animals, Pub.# EPA530-F-97-044
Innovative Uses of Compost: Reforestation, Wetlands Restoration, and Habitat Revitalization, Pub.# EPA530-F-97-046
Innovative Uses of Compost: Composting of Soils Contaminated by Explosives, Pub.# EPA530-F-97-045
Innovative Uses of Compost: Bioremediation and Pollution Prevention, Pub.# EPA530-F-97-042
Innovative Uses of Compost: Erosion Control, Turf Remediation, and Landscaping, Pub.# EPA530-F-97-043
Markets for Compost, Pub.# EPA530-SW-90-073
Organic Materials Management Strategies, Pub.# EPA530-R-99-016
Source Reduction Program Potential Manual: A Planning Tool, Pub.# EPA530-R-97-002
The Effects of Composted Organic Materials on the Growth Factors for Hardwood and Softwood Tree Seedlings, see www.epa.gov/msw/compost
Waste Prevention, Recycling, and Composting: Lessons from 30 Communities, Pub.# EPA530-R-92-015
Waste Not, Want Not: Feeding the Hungry and Reducing Solid Waste Through Food Recovery, Pub.# EPA530-R-99-040
WasteWi$e Tip Sheet: Donating Surplus Food to the Needy, Pub.# EPA530-F-96-038
WasteWi$e Tip Sheet: Managing Food Scraps as Animal Feed, Pub.# EPA530-F-96-037
WasteWi$e Update: Recovering Organic Wastes Ð Giving Back to Mother Nature, Pub.# EPA530-N-99-007
WasteWi$e Update: Remanufactured Products: Good as New, Pub.# EPA530-N-97-002

Resources for YOU

The following are groups of publications that compliment each other relative to specific industries. Feel free to order as many as you like. Please refer to the publication numbers above when ordering.

Federal Government	Analysis of Composting As an Environmental Remediation Technology ¥ Innovative Uses of Compost series ¥ The Effects of Composted Organic Materials on the Growth Factors for Hardwood and Softwood Tree Seedlings ¥ Waste Not, Want Not; Feeding the Hungry and Reducing Solid Waste Through Food Recovery ¥ WasteWi$e Updates and Tip Sheets.
State Government	An Analysis of Composting As an Environmental Remediation Technology ¥ Composting, Yard Trimmings and Municipal Solid Waste ¥ Don't Throw Away That Food ¥ Innovative Uses of Compost series ¥ Markets for Compost ¥ Organic Materials Management Strategies ¥ Source Reduction Program Potential Manual ¥ Waste Prevention, Recycling and Composting: Lessons from 30 Communities ¥ Waste Not, Want Not.
Local Government	Composting, Yard Trimmings and Municipal Solid Waste ¥ Don't Throw Away That Food, Environmental Fact Sheets ¥ Organic Material Management Strategies ¥ Source Reduction Program Potential Manual ¥ Waste Prevention, Recycling, and Compostings: Lessons from 30 Communities
Business	Don't Throw Away that Food ¥ Markets for Compost ¥ Organic Material Management Strategies ¥ Waste Not, Want Not ¥ WasteWi$e Updates and Tip sheets ¥ Doing what it Takes to be WasteWi$e; Food Manuracturing/Processing Industry.
Gardener/Landscaper	Environmental Fact Sheets ¥ Innovative Uses of Compost: Disease Control for Plants and Animals, Innovative Uses of Compost Erosion Control, Turf Remediation, and landscaping ¥ The Effects of Composted Organic Materials on the Growth Factors for Hardwood and Softwood Tree Seedlings.
Homeowner	Environmental Fact Sheets

For Further Information contact your Regional EPA Organics office:

US EPA Region 1
Solid Waste Reduction and Global Climate Change Program
One Congress Street (SPP), Suite 1100
Boston, MA 02114-2023
(617) 918-1790

US EPA Region 2
Solid Waste Program
290 Broadway
New York, NY 10007-1866
(212) 237-4183

US EPA Region 3
Solid Waste Program
1650 Arch Street, (3WC21)
Philadelphia, PA 19103-2029
(215) 814-5000

US EPA Region 4
Solid Waste Program
Sam Nunn AFC, 10th Floor
61 Forsyth Street, S.W.
Atlanta, GA 30303-8960
(414)562-84557

US EPA Region 5
Pollution Prevention and Program Initiative
77 West Jackson Blvd.
Chicago, IL 60604-3507
(312) 866-3584

US EPA Region 6
UST/Solid Waste Program
1445 Ross Avenue
Dallas, TX 75202-2733
(214) 655-6760

US EPA Region 7
Solid Waste and Pollution Prevention Program
901 North Fifth Street
Kansas City, KS 66101-2798
(913) 551-7496

US EPA Region 8
Pollution Prevention and Waste Program
999 18th Street Suite 500
Denver, CO 80202-2405
(303) 312-6312

US EPA Region 9
Solid Waste Program
75 Hawthorne Street
San Francisco, CA 94105
(415) 744-2134

US EPA Region 10
Office of Waste and Chemicals Management
1200 6th Avenue
Seattle, WA 98101-3123
(206) 553-1200

EPA Headquarters
Municipal Solid Waste Program
1200 Pennsylvania Avenue
Washington, DC 20406
(703) 308-8254

EPA Region 9 thanks the organic material management workgroup for their comments on this factsheet.