

FOOD AND BIOBASED CAFETERIAWARE COMPOSTING FOR FEDERAL FACILITIES IN WDC

A Perspectives Roundtable Discussion

**USDA, ARS, Henry A. Wallace Research Center
10300 Baltimore Ave.,
Building 005, Conference Room 21
Beltsville, MD.20705**

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Edited by

**Richard Reynnells, USDA/CSREES/PAS
Pat Millner, USDA/ARS
Carmela Bailey, USDA/CSREES/PAS**

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Preface

Richard Reynnells
National Program Leader, Animal Production Systems
USDA/CSREES/PAS
(Speaker Contact Information is Included in Appendix C)

These post workshop proceedings are provided to encourage and facilitate additional discussion and implementation of plans to further the use of biobased cafeteriaware as part of a food residuals composting program. These proceedings supplement the on-site proceedings. We expect these efforts to stimulate additional workshops or symposia that support government procurement decisions and enhanced utilization of food wastes and biobased cafeteriaware, and food processing residuals.

Some authors chose to provide, in addition to their abstract used for the on-site proceedings, their powerpoint slides and/or a full paper on their topic. These extra efforts are greatly appreciated. As possible, powerpoint slides were converted to a black and white format which allows a higher quality proceedings. Contact the author to ask for a copy of the original colored slides.

Additional copies of these proceedings are available from the Co-coordinators and from the US Department of Agriculture Agricultural Research Service or the Cooperative State Research, Education and Extension Service websites.

Welcome and Organizational Comments

Richard Reynnells
National Program Leader, Animal Production Systems
USDA/CSREES/PAS

(Speaker Contact Information is Included in Appendix C)

On behalf of the organizing committee and sponsors, I am honored to welcome you to this ground breaking workshop, the "Food and Biobased Cafeteriaware Composting for Federal Facilities in Washington, DC". Speakers will provide full written papers shortly after this meeting. It is important you realize that all are welcome to provide a position paper on any topic covered by these discussions, for inclusion in the post-meeting proceedings. You may provide your paper in electronic format to me or the other Co-Coordinator, by December 16.

The overall goal of the presentations today is to clarify what inhibitors currently limit progress in the biobased cafeteriaware industry in the United States, as well as in the food composting industry. The synergistic relationship between the biobased product industry and the composting of food wastes from our many facilities that serve food, will also become more apparent. Specific purposes are outlined in Appendix B.

Recycling is essential to the long term sustainability of our planet, and this meeting is one component in moving toward a goal of more responsible environmental stewardship. Land-filling economically compostable material such as food waste and compostable cafeteriaware does not appear to be a viable alternative to solving our resource management problems.

We have a full agenda, with time set aside for discussion of these topics. Rather than statements of opinion, these discussion periods are meant to be more brain-storming, dialogue about strategies that have been successful, and suggestions for piloting new strategies on institutional, municipal, and regional scales. We value everyone's suggestions and ideas on these topics, so directness and succinct comments will allow us to hear from all who wish to contribute. Comments will be recorded and transcribed for inclusion in the proceedings.

Likewise, we request speakers pay attention to the moderator so that you will know when your allotted time is over, and try to end on time. In order have enough time for the discussions, we need to honor the admittedly brief times available for each presentation.

Your full proceedings will be mailed to you, so it is essential that your contact information be complete and readable. We may have a follow-up conference in 2006, and we will want to be able to provide that information to you. Again, we thank you for your commitment to participate in these important discussions

Charge to the Roundtable Participants

Patricia D. Millner, Research Microbiologist
USDA/ARS/BARC/SASL and EMSL

Developments on several fronts are moving forward in parallel. These fronts are independent yet interconnected. The fronts are:

1. Biobased Product Research, Development, and Marketing;
2. Greening of Government and Institutional Operations; and,
3. Compost Quality Certification and Use.

Two federal level mandates currently direct federal agency action on these fronts. The 2002 Farm Bill which deals with Biobased Products, and Executive Order 13148 "Greening the Government Through Leadership in Environmental Management." You will hear more details about both of these during this roundtable.

Here at the Beltsville Agricultural Research Center we have conducted two pilot projects with federal agency cafeterias in downtown Washington, D.C. Based on the positive results from these pilot projects and on the programs and successes occurring along these lines in other areas of the USA, we see an opportunity for federal facilities in the Washington, D.C. metropolitan area to model the use of biobased food serviceware, food composting, and organics recycling in the context of federal-state-and local public/private partnerships. A Federal level program based on sound science, product quality criteria, and economic and life-cycle analysis for sustainability would serve as a model for other institutional and city endeavors. It could also help reduce the apprehension of dealing with post-consumer foodservice materials that some jurisdictions continue to express relative to potential adverse factors such as odors and pathogens.

The charge to this group is to assess what specific approaches are needed to move forward on these fronts in concert. You have been invited to participate in these discussions because of your particular experience and knowledge on one or more of these topic areas. Through open and direct discussions and the sharing of your perspectives, we expect that you will suggest some strategies and options, perhaps involving synergistic interactions, that collectively will help develop a federal 'Green' Cafeteria, and 'Sustainable' Landscapes program, both based on quality, renewable, biobased products.

The basic concepts of recycling and renewable resource use that are involved here are widely accepted. It is how to put this into practice as a unified program on a large scale that is the current challenge. The Washington area comprises three localities: The District of Columbia, Maryland, and Virginia. Each has their own existing regulations, permit requirements, and zoning rules regarding solid waste and composting. Transportation and siting, as always, are challenging issues that need to be addressed directly. Product quality standards, whether for biobased food serviceware, or compost, are critical to success. Input from appropriate industry

and government agencies is essential to establish realistic criteria, tests, and performance standards that build on existing knowledge and science.

Provisions Of The Federal Biobased Products Preferred Procurement Program And Progress In Implementation

Marvin Duncan, Senior Agricultural Economist
USDA/Office of Energy Policy and New Uses

The power point slides are in Appendix D and the abstract is in Appendix E.

State of US Food Composting – Institutional and Municipal Scales

Nora Goldstein
BioCycle, The JG Press, Inc.

The power point slides are in Appendix D and the abstract is in Appendix E.

USDA Cafeteria Pilot With Biobased Products

James M. Green
Program Manager, Biobased Procurement
USDA/DA/OPPM

Patricia D. Millner, Research Microbiologist
US Department of Agriculture, Agricultural Research Service,
Beltsville Agricultural Research Center

Rosalie E. Green, Senior Recycling Specialist
SEE Associate with USEPA, Office of Solid Waste

Randy Townsend,
US Department of Agriculture, Agricultural Research Service,
Beltsville Agricultural Research Center

The power point slides are in Appendix D and the abstract is in Appendix E.

This presentation covers USDA's overall concept and expectations for the pilot, operational strategies, costs, outcomes and lessons learned in the Fall 2005 Biobased Cafeteriaware Project.

This Interagency Pilot Project addressed two recent environmental Executive Orders as well as two legislatively authorized activities under the auspices of the United States Department of Agriculture (USDA) and the U.S. Environmental Protection Agency (EPA). The Pilot Project accomplished its original goals and identified strategic opportunities for advancing the federal biobased procurement program and overcoming the certain challenges for federal facility cafeteria acquisition and use of biobased foodservice-ware and food composting.

The Department of Agriculture's Departmental Administration (DA) was charged by the 2002 Farm Bill to develop an affirmative biobased procurement preference program model. The model must consist of (1) a biobased product preference program; (2) a biobased product procurement promotion program; and (3) an annual review and monitoring of program effectiveness. In addition, the EPA was charged by the Resource Conservation Recovery Act of 1979 with promoting the use of recycled content products including food residuals compost. The two Executive Orders addressed are E.O. 13101, Greening the Government through Waste Prevention, Recycling, and Federal Acquisition; and E.O. 13134, Developing and Promoting Biobased Products and Bioenergy.

On January 10, 2006, USDA completed its Affirmative Procurement Program (APP) and posted it on its biobased website at <http://www.usda.gov/biobased>. The APP formally establishes USDA's Biobased Procurement Program for USDA-designated biobased items and provides agency-wide guidance for implementing an effective program. USDA's Biobased APP ensures

items composed of biobased material will be purchased to the maximum extent practicable and will serve as the government-wide model to achieve the Section 9002 goals.

USDA-DA's overall plan to fulfill the requirements of the 2002 Farm Bill is to promote the use and procurement of biobased products. An initial step taken by the Department was to conduct this Biobased Pilot Project designed to test biobased/biodegradable food-service products such as cups, plates, cutlery, etc. in the small cafeteria in the Jamie L. Whitten building which serves approximately 2000 patrons per week. The overall goals of the Pilot Project were to demonstrate a full-cycle process for biobased cafeteria-ware by selecting and using it in a cafeteria and then composting the pre-and post-consumer food residuals. The compost byproduct would then be used in the USDA Whitten Building gardens. Specific objectives of the project included the following:

- * Select and use biobased food service-ware in the Whitten Building employee cafeteria;
- * Evaluate customer acceptance and satisfaction with the biobased food service-ware;
- * Educate staff and customers about the program and evaluate compliance with source separation;
- * Evaluate compostability of the food service-ware;
- * Characterize and use the compost produced in the Whitten building gardens in 2006;
- * Assess the feasibility of expanding the program to the main cafeteria; and,
- * Assess the feasibility and identify resources needed to include other federal agencies in the program.

The full-cycle approach of the Pilot Project included: (1) a 100 percent replacement of current Styrofoam and plastic food service items with biobased products wherever possible; (2) data collection from cafeteria patrons' comments on a daily basis; (3) partnering with the Agricultural Research Service's (ARS) Beltsville Agricultural Research Center (BARC) and the Environmental Protection Agency (EPA) to provide training to patrons on how to dispose of waste to prevent contamination with noncompostables and to compost the cafeteria residuals; (4) collecting biobased product and food residuals on a daily basis, and in collaboration with ARS/BARC transporting and composting it at the USDA/ARS BARC composting facility in Beltsville, Maryland, and evaluating its compostability; (5) use of the finished compost in the Whitten Building gardens; and (6) diverting cafeteria-derived organic recyclables from landfill disposal to a beneficial horticultural use.

This three month Pilot Project provided the project team with a reasonable scale operation that allowed for quick identification of problems and ability to correct them. It also served as a live demonstration project that permitted the DA to test the effectiveness of the products and to determine patron acceptability of biobased, biodegradable food service products such as cups, plates, and cutlery and compliance with a source-separation disposal program, as well as final compostability.

To educate staff and patrons about the reasons and benefits of the Pilot Project and make them aware of the biobased procurement program, DA collaborated with BARC and EPA to provide training to patrons on which receptacles to use for which items to prevent contamination from entering the compostable stream. The training became an integral part of the pilot and was conspicuously located just outside of the Whitten Cafeteria for the duration of the Pilot. It included (1) a PowerPoint presentation about the biodegradability of the biobased materials and

on the separation of items for later composting; (2) an information visual display that compared the lifecycle of Styrofoam and plastic to that of the biobased materials was placed outside the cafeteria; and (3) brochures on biobased awareness and composting, along with sample materials, were provided to patrons.

During the Pilot, 33,426 patrons were served. In general, patrons initially accepted the change from the typical Styrofoam and plastic ware to products manufactured from biobased feedstock with little apprehension. Acceptability of the products increased the longer the Pilot was sustained. However, as expected there were those patrons that did not like or appreciate the change. Out of over 33,000 patrons served fewer than 150 negative comments were received. They ran the gamut from disliking the products because they were so different from what was normally expected, to cups that were used for hot liquids becoming too hot to hold and cornstarch straws breaking. As a rule, the comments were minor in nature and did not indicate any serious issues that would call for the discontinuance of the use of biobased products.

Throughout the Pilot, cafeteria operations and services were not adversely impacted by the change to biobased products. Kitchen staff compliance with source separation was excellent.

Biobased products for the Pilot cost \$14,367.42 with total freight charges of \$952.83. USDA's part of the overall cost was 66% or \$9482.50 and the cafeteria contractor's portion was 33% or \$4884.92. This represents an appreciable increase over the normal cost of doing business with the typical Styrofoam and plastic cafeteria-ware. However, such an increase in cost is typical, when an industry is in its infancy because the small number of manufacturers available will reduce the potential for competition. As the Pilot continued, an increase in the availability of biobased service-ware was noticed. An increased number of companies began to call the project manager for information on how to become involved with the existing or future pilots that USDA would conduct using biobased cafeteria-ware. As the number of manufacturers of these items increases, so too will competition; thereby, the cost of doing business will decrease.

The pilot included a wide variety of biobased products (Table 1). These included biodegradable bowls, plates, cups, food containers, knives, forks, spoons, straws, and some lids. Only a few lids and a water cup are not currently available as biobased or biodegradable products. These products, along with the food preparation scraps and trimmings, as well as the source-separated post-consumer residuals from the cafeteria, were composted at the BARC Composting Research Facility. The total composting effort included:

- * 11,370 pounds of compostable cafeteria materials, (10, 945 pounds of kitchen trimmings and 435 pounds of biobased products); and,
- * 168 cubic yards of leaves and grass.

A significant fact concerning the composting activity deals with the trace amount of plastic contaminants recovered from the compostables in the post-consumer collection bins. Out of the total amount of materials used for composting only 20 pounds or 0.18 % of non-compostable plastics were recovered. For a diminutive amount of contaminants of this nature to be found in such an activity as composting is very unique. So unique in fact that it can only be attributed to the quality and level of education and guidance provided to cafeteria patrons by BARC, EPA, and the cafeteria staff.

The experiment yielded 44 cubic yards of compost that would cost the Department \$20 per cubic yard to purchase. The compost will be used at USDA's Whitten Building Demonstration Gardens in the Spring of 2006 at a savings to the Government of \$880. In addition to the monetary savings that will be realized, the use of composted biobased products will introduce considerable intrinsic value into the environment.

Lesson's learned by USDA are many. However, the most significant include the following:

1. Biobased products are difficult to find but this will be overcome, based on feedback that we have received from the industry;
2. Biobased cafeteria-ware currently cost more than conventional cafeteria-ware; however, as more producers and dealers are found, competition will increase and overall costs will be reduced;
3. Good planning, quality awareness training, constant communications, superior teamwork and management backing are essential to a successful program; and,
4. Composting of the full range of pre-and post-consumer cafeteria residuals not only reduces the amount of material sent to landfill, and the costs associated with that, but also provides a product for landscaping of federal building that would otherwise have to be purchased.

During the 3-month Pilot, the Whitten cafeteria did not contribute any Styrofoam or plastic cafeteria waste to landfills, which takes hundreds of years to decompose. If this effort were replicated throughout the government, or even just within the Washington Metropolitan area, it would considerably reduce the total amount of material being landfilled by the Federal government.

Interagency collaboration was key to accomplishing Project objectives. The DA, through its Office of Procurement and Property Management, and Office of Operations, identified sources and obtained the biobased service-ware, identified a suitable size cafeteria space for the project, coordinated with the foodservice contractor to make necessary changes during the contract period, and provide daily oversight to the Project. The ARS-Beltsville Composting Research Facility and EPA, Office of Solid Waste, SEA representative Dr. Rosalie Green provided expertise on composting the residuals, as well as education and training of staff and customers, and initial oversight of source separation by staff and customers. ARS and the Cooperative State Research Education, and Extension Service (CSREES) co-organized a one-day Roundtable Discussion "Food and Biobased Cafeteria-ware Composting for Federal Facilities in Washington, DC" in which public, private, non-profit affiliates, biopolymer, compost, and other experts discussed strategies for overcoming various limitations to moving the Pilot Project model to the next level of implementation. A written proceedings of the Roundtable will be posted on the web and made available in limited hardcopy.

USDA and EPA consider the Pilot a complete success and that the use of Biobased products is the future. As the biobased program grows, the reduction in waste generation becomes more significant; the use of foreign petrochemicals becomes less necessary; and the need for greater quantities of agricultural feedstocks will increase as a result of increase production and demand for biobased products.

The knowledge and experience gained from the pilot provided the necessary base from which to recommend that management consider the full integration of biobased food service products into all of USDA's cafeterias and at Forest Service feeding sites during fire season. Additionally, DA has submitted a Sources Sought request for biobased cafeteria service-ware to FedBizOps to identify greater numbers of companies that can provide quality biobased service-ware, thus reducing overall costs through greater competition. These companies, along with others that may come online, will be included in USDA's overall strategy for the re-competition for cafeteria services in FY 2007.

Table 1. Items Used in the 2005 USDA Whitten Cafeteria Biobased Product Pilot Project

Item Description	Agricultural or other feedstock composition/compost claim
7" Sturdy Bagasse Plates	Sugarcane, composts in 45 days
9" Sturdy Bagasse Plates	Sugarcane, composts in 45 days
12 oz Cold Cup	Corn, composts in 45 days
20 oz Cold Cup	Corn, composts in 45 days
24 oz Cold Cup	Corn, composts in 45 days
Flat Lid with Straw Slot for 12/20 oz - Made from Corn	Corn, composts in 45 days
Flat Lid with Straw Slot for 24 oz - Made from Corn	Corn, composts in 45 days
9" x 12" Tray - 99.9% Recycled Content - Biodegradable	Recycled paper, com posts in 60 days
2-Cup Carrier - Recycled - Biodegradable	Recycled paper, com posts in 60 days
12 oz Bagasse Bowl	Sugarcane, composts in 45 days
32 oz Clear Cylinder Food Container - No Hot Foods	Corn, composts in 45 days
16 oz Hot Food Container - 99.9% Recycled Content	Recycled paper
12 oz Hot Food Container - 99.9% Recycled Content	Recycled paper
8 oz Hot Food Container - 99.9% Recycled Content	Recycled paper
16 oz Clear Cylinder Food Container - No Hot Foods	Corn, composts in 45 days
8 oz Clear Cylinder Food Container - No Hot Foods	Corn, composts in 45 days
Lid for Clear Cylinder Food Container	Corn, composts in 45 days
12 oz Bio-Coated Hot Cup - Biodegradable	Recycled paper, vegetable-based coating, composts in 60 days
16 oz Bio-Coated Hot Cup - Biodegradable	Recycled paper, vegetable-based coating, composts in 60 days
Hot Cup Jacket - Recycled - Biodegradable	Recycled paper, com posts in 60 days
12 oz Recyclable Plastic Water Cup	Plastic, not compostable (see 12 oz corn cup)
8" Thin Straw	Corn, composts in 45 days
Corn Fork - Not for Hot Food	Corn, composts in 45 days
Fork - Heat-stable	Plant cellulose and limestone, com posts in 120 days
Corn Spoon - Not for Hot Food	Corn, composts in 45 days
Spoon - Heat-stable	Plant cellulose and limestone, com posts in 120 days
Corn Knife - Not for Hot Food	Corn, composts in 45 days
Knife - Heat-Stable	Plant cellulose and limestone, com posts in 120 days
Plastic Lid for 16 oz Hot Food Container	Plastic, not compostable
Plastic Lid for 8/12 oz Hot Food Container	Plastic, not compostable

Black Plastic Lid for 16 oz Bio-Coated Hot Cup

Plastic, not compostable

Case Studies: Keys to Successful Large Institutional and Municipal-Scale Food Composting

Keys to Success of San Francisco Food Composting & Compostable Product Ware Use

Jack Macy
Commercial Recycling Coordinator, SF Environment
City and County of San Francisco

The power point slides are in Appendix D and the abstract is in Appendix E.

Case Studies: Keys to Successful Large Institutional and Municipal-Scale Food Composting

In-Vessel Composting: The Wright Way

Bob Kerlinger, President
Mid-Atlantic Composting Association

The abstract is in Appendix E.

In-Vessel Systems, City of Hutchinson, MN, & Schools

Jim McNelly, President
Renewable Carbon Management

The power point slides are in Appendix D and the abstract is in Appendix E.

An Economic Analysis of Composting

Nadine H. Davitt
Organic Materials Processing and Education Center
The Pennsylvania State University

The power point slides are in Appendix D and the abstract is in Appendix E.

New York State Correctional Facilities Composting Operations

James I. Marion
Resource Management Director
NYS DOCS

The abstract is in Appendix E.

Rationale and Scope

The New York State Department of Correctional Services is the third largest State correctional system in the nation with 70 correctional facilities housing approximately 63,000 inmates supervised by 29,000 civilian and security staff. Correctional facilities range from 200 bed minimum security work camps and shock incarceration units to large 1930's era maximum security walled facilities such as Sing Sing and Attica with up to 3300 inmates. The majority of inmates, 39,000, are housed in medium and minimum security dormitory style units with up to 1500 beds.

Feeding systems range from traditional mess halls with cafeteria style service to small group satellite feeding units. Nearly 6,000 inmates are fed three meals daily in their cells, medical units or 23 hour per day isolation cells.

With the passage of the Solid Waste Management Act of 1988 all State divisions were required to initiate solid waste management and recycling policies to be in place by January 1991. The Department of Correctional Services responded by creating the Resource Management Division in 1990 to reduce the waste stream and provide avoided disposal costs to cover the cost of operations.

Today the Department maintains recycling programs in all 70 facilities with 12 regional processing centers marketing over twenty recycled commodities in commercial load lots.

Early waste audits revealed the largest fraction of the waste stream by weight was food preparation waste and leftovers. Food waste generated weighed 1800 pounds per cubic yard with an average of 1 pound per day generated per inmate. This number is representative of audits conducted in 16 other States and compares with over two pounds per bed in hospitals and up to 3 pounds per bed in nursing homes. It was determined that less than .25 pound per day was coming from returned serving plates with the balance coming from food prep areas, over-date bakery and wet materials such as pasta, rice, coffee grounds and soups.

In 1990 two pilot compost sites were developed to refine collection protocol and compost process control as well as determine economic feasibility for expanded operations. These early sites were open windrows on impervious pads utilizing large wood chips as a bulking agent and carbon source.

Based on results of pilot sites from operational and avoided cost perspectives the program has expanded to 32 compost facilities processing organic waste from 56 correctional facilities. During Fiscal Year 2005-06 approximately 14,000 tons of food waste and waste wood will be composted. Using \$130 per ton as an average waste disposal cost (tipping and hauling fees) the avoided cost will be \$2.2 million. This number includes avoided disposal costs for composting of approximately 100 dairy cattle and calf mortalities and abattoir waste from 500 beef animals processed in the Department's Agri-Business program.

Operational Protocol

Although a number of composting technologies are in place in the New York system a set of standard separation, collection and process protocols have become implemented at all composting facilities.

Food waste is collected in unlined, covered, plastic barrels (35 gallon) from pre and post consumer areas of facilities. All paper and plastics are rigidly source separated

Generally inmates are served in Lexan sectioned trays using durable drinking vessels and metal cutlery. Inmates housed in remote areas or segregated cells are served in covered Lexan trays and portion controlled foil sealed polystyrene containers. In emergency situations and facility lock downs inmates may be fed in their cells in Styrofoam containers with disposable cutlery.

Collected food waste barrels are moved daily to compost facilities or in some facilities stored in dedicated coolers for thrice weekly collection. No size reduction or grinding is utilized at any facility.

On site mixing of food waste with bulking agent is accomplished by skid steer or front loaders in one half of windrow sites or in scaled agricultural feed mixers. Aerated bay and in-vessel sites all utilize scaled mixers. Bulking agent is exclusively tub ground scrap wood generated at correctional facilities from routine maintenance, pallets, clean construction debris, lawn and tree waste. In-vessel systems require double ground mulch material also generated on site by private vendors semi- annually. At several sites lawn and tree waste is accepted from local municipalities as well as utility generated chipped material. Starting recipes are generally 2:1 by volume bulking to food. Mixing tables by weight are used in mechanical mixing sites.

Composting temperatures are maintained at 55 – 70 °C. for approximately 30 days. Daily temperature readings determine turning and aeration activities. Initial moisture content is routinely 60 % for windrows and 65-70 % for mechanically aerated systems. Experience shows that visible food waste is gone in 2-3 weeks, with material ready for screening and curing in 4-5 weeks. Material is removed from active aeration and turning based on return to near-ambient temperature, moisture content and physical appearance.

Routine maturity testing is done semi-annually with complete physical and chemical analysis done only when a significant change in feedstock is experienced. Base recipes and time protocols were developed based on 2 years of quarterly analysis conducted for each technology.

All compost is routinely screened through 3/8" trommel or orbital screens. Overs are returned to the compost cycle after contaminants are hand removed. Fines are cured with minimal management for at least 90 days with 120 days being the average.

Mature compost is utilized within the correctional system for landscaping, vocational horticulture programs, community service projects and in some cases land applied for turf maintenance or agricultural land amendment. Increasingly finished compost is bartered to State and local transportation departments and municipalities for in-kind services. Limited bulk sales to private vendors are completed when surpluses develop at selected sites.

Technology

Site constraints include available space, visual buffers, quantity of generation, leachate treatment options and available labor. These constraints are used to determine the level of technology utilized in developing compost facilities. Economic payback analysis also plays a major role in system implementation. Facilities are generally constructed that will provide an avoided disposal cost amortization in less than 5 years. The exception to this rule is when an in-vessel system is indicated where payback is less than 10 years.

Four levels of technology are employed at correctional sites. At present 17 open windrow, 6 structure covered windrow, 5 aerated bay and 4 in-vessel systems are in use. An additional 3 aerated bay facilities are funded or in development. The operating policy calls for implementing the lowest effective technology.

Leachate treatment at sites is accomplished through capture of site runoff in surface drains and underground settling tanks that are pumped for landfill disposal as needed. The liquid fraction of runoff is diverted to stone filled recharge structures and grass filter strips designed by USDA-NRCS.

Each level of technology offers advantages and challenges.

Open windrows

Traditional open windows on an impervious pad, usually concrete, is the most economical system to construct and operate. These facilities are capable of handling large quantities of material with great flexibility for active processing, bulk storage and curing. Process control is limited by precipitation, temperature and other environmental influences. Mixing is less precise unless an ancillary mixer is used. Maintaining appropriate moisture has been problematic in some instances. This method is used for very large sites with a variety of feedstocks such as manures, food and mortalities with discrete windrows on the same site. This method is also used for very small operations where capital costs for benefit derived are marginal. Leachate collection and treatment must be sized to accommodate rain and snow drainage from pad areas.

Open windrows are used for curing at most sites even with enclosed active composting areas.

A 2002 study using prevailing civilian wages and current construction costs indicated open windrows operated with costs in the \$6.00 per ton range.

Covered windrow

Windrow operations covered by pole structures with open or partial side walls are used where visual considerations are a consideration. The structures also provide increased process control in high precipitation and severe winter sites. Containment of compost materials to the pad area is also improved with partial concrete sidewalls. Large pole structures can also provide elemental protection for equipment such as mixers and screens. Pole structures are normally 60' wide by up to 200' long.

Operational challenges with a covered windrow system include adequate ventilation for water vapor, building maintenance from equipment damage and interior odor issues.

In the New York experience based on 2002 information costs per ton of material composted was in the \$12 - \$15 per ton range.

Aerated Bay

Aerated static bay systems offer several process control advantages such as absolute temperature and moisture control with forced aeration. Aerated bay facilities are relatively labor efficient since regular turning of windrows is not required and they are very space efficient for material processed. Because of the improved process control, thermophilic stages can be reduced to the minimum time frame.

Aerated bay systems however require additional equipment in mixers, scales, screens and aeration fans and controls with inherent maintenance costs. As with any enclosed composting space, ventilation is critical to the success of the program. Aerated bay systems also lose flexibility in recipes and variation in feedstock although not as restrictive as in-vessel systems.

It is the New York State experience that most new composting facilities will be of the aerated bay type based on cost efficiency, space, aesthetic parameters and process control.

Aerated bay systems are in the \$20.00-25.00 cost per ton range when amortized over 10 years.

In-Vessel

While the most costly on a per ton processed basis in-vessel composting systems still provide reasonable returns in specific site locations. The New York State DOCS operates 4 Wright Environmental units of 750, 1500, 2000 and 3000 pounds per day capacity. These units are employed where space is at a premium such as inside facility security perimeters and adjacent to other inhabited buildings. In-vessel units provide ultimate process control and protection from the elements. Aeration, moisture, mixing and leachate control are integrated in the vessel. With a 20' by 60' footprint the 3000 pound per day unit is very space efficient. On board leachate recycling and a bio-filter make these units neighbor friendly.

Management considerations are increased for in-vessel systems. Integrated computers and electronics require extensive operator training and increased maintenance costs when mechanical failures occur. Enclosed space regulations may make routine maintenance difficult. In-vessel systems are recipe specific and require specialized bulking material with little flexibility in feedstock. With an enclosed tunnel design adjustments to material in the 14 day cycle are difficult.

In-vessel systems have been very successful in the NYS system and over a 15 year amortization capital and operational costs average \$45.00 per ton

All the above described composting technologies are capable of producing commercially acceptable compost products and significant waste disposal cost avoidance when compared to an average \$130.00 per ton hauling and landfill fee structure.

Biobased Product Experience

Since 1995 the New York State DOCS has piloted 3 brands of biobased food service ware and bags. All of these products were vegetable starch based with bag products including a polyethylene matrix. In each case a number of economic and physical characteristics precluded the Department from regular use of the products.

The NYS DOCS potential use of disposable/compostable service ware is limited to emergency and security issue cell based feeding situations.

The most evident limiting factor in each of the product lines tested was cost per service. The minimum cost was more than double the cost of alternative materials such as foam or paper materials.

Waste Bags

In the case of compostable bag products to be used as food waste can liners no product exhibited abrasion resistance suitable for institutional use. No product tested provided thermal tolerance above 100⁰ F without failure. All but one product tested also lost integrity in the presence of high moisture materials when stored for more than a few minutes.

When introduced in windrow composting biobased bags disintegrated into large fragments that posed a severe airborne problem across the landscape. When used in mixing equipment bag sections became entangled in shafts and elevators causing system failures. Un-degraded bag fragments also coated the interior of screening equipment causing poor sizing of materials.

As with all tested biobased products the per unit cost of bio-degradable waste bags was approximately double that of traditional film bags.

Service Ware

Product testing for biobased service ware included cups, bowls, plates and cutlery. All products tested were of vegetable starch compounds.

In each case of products submitted for field testing, both physical and economic limitations prohibited inclusion of these products in regular use for correctional facilities.

In all cases, cups, bowls and plates did not sustain physical shape or integrity when exposed to normal serving temperature foods or liquids. When stored in unventilated areas ambient heat of summer caused disfiguring and self adherence.

Forks and spoons did not maintain rigidity when introduced to hot liquids and became misshapen when stored in summer temperatures. When utensils stored for over 60 days were used they became brittle and broke into small pieces especially knives.

When biobased cutlery was introduced to the compost process handle areas showed an uncanny resistance to degradation and after several months became a contaminant of increasing proportions in recovered bulking agent. It was noted that a significant portion of biobased cutlery was still evident in compost after 4 cycles of active composting. The biobased materials were tested in all four compost systems in use.

As with biobased film products, the cost of cutlery was at least double of durable and disposable plastic and metal alternatives.

Although initial experiences with biobased service ware were unsatisfactory the NYS DOCS system would continue to field test new products as the utility and environmental advantages of biobased products could fill a need in selected instances.

**Biobased Product Development, Supply, and Procurement:
Meeting Quality Standards and Product Demand**

Panel: Industry Perspectives: Ways to Move Forward

Biobased Products: Opportunities and Issues for Growth

Steven A. Mojo, Executive Director
Biodegradable Products Institute

The power point slides are in Appendix D and the abstract is in Appendix E.

Earthshell

John Nevling
Earthshell Corporation

and

Cindy Eikenberg
Marketing Communications Manager
Earthshell Corporation

The power point slides are in Appendix D and the abstract is in Appendix E.

Biodegradable Products and Solid Organic Waste Management

Li Nie, Sukh Bassi
MGP Ingredients, Inc.

The abstract is in Appendix E.

Summary

MGP ingredients has developed filled composite resins for disposable products for cost reduction, enhanced properties, and enhanced biodegradation. Product applications include films, thermoformed packaging shells and food service trays, and molded articles. We will discuss the benefits of a starch filled system, formulation, properties, composting results and BEES analysis.

Discussion topics are: the market drivers for biodegradable, compostable, bio-based products; solid organic waste management as it relates to biodegradable and compostable plastics; and, the role government plays on waste management and job creation.

The future of biodegradable plastics lies in the direction of solid organic waste management.

Composite resins

MGP Ingredients has developed proprietary technology to make composite starch-polyester compound resins for various products made by injection molding, thermoforming, and film extrusion.

Combining starch with biodegradable polyesters offers following advantages:

1. cost reduction;
2. increased flex modulus;
3. improved heat deflection temperature;
4. enhanced biodegradation;
5. reduced shrinkage and warping;
6. improved molding for better cycle time and release.

For example, at 65% starch in the formulation and assuming a cost of \$2.00/lbs of the polyester, the compounded resin cost can be cut in half to \$1.0/lb. Table 1 shows the cost analysis for resin at high starch content.

Tensile modulus, in case of Bionolle 1020 (polybutylene succinate), can be doubled as compared to the polyester itself (see Figure 1).

Table 1 Cost Reduction at 65% starch

Poly-ester	starch	Formulation	compounding	Total cost
\$2.0/lb	\$0.15	\$0.82/lb	\$0.20/lb	\$1.02/lb
\$1.0/lb	\$0.15	\$0.46/lb	\$0.20/lb	\$0.66/lb
\$0.5/lb	\$0.15/lb	\$0.30/lb	\$0.20/lb	\$0.5/lb

Figure 1 Improvement on Tensile modulus at 65% starch

Starch in the compound resin can be readily digested in a composting environment, leaving behind a matrix with a cell structure for enhanced rate of biodegradation. Enhanced rate of biodegradation is made possible due to a vastly increased surface area. Cutlery products made of the composite resins are compostable according to ASTM D6400.

Products made of such composite resins also have favorable environmental and human health benefits according to the BEES analysis.

Market drivers for biodegradable, compostable, and biobased products

Biodegradability is a material property for many natural and a few synthetic products. A market driver for biodegradable plastics is functional applications requiring biodegradability as a functional property. Good application examples are golf tees, and lawn netting. The market for biodegradable products, however, is very small if not tied to solid organic waste management.

Compostability is a defined property of biodegradable materials under the composting environment and an additional requirement for land applications of the resulting composting humus. A market driver for compostable plastics is in solid organic waste management. A good application example is lawn waste composting bags. It will be easier for consumers to mix disposable and compostable plastic products with organic waste without the need to sort them out separately. Solid organic waste recycling can not afford contamination by non-compostable plastic products. Business potential is huge when solid organic waste is separated and recycled either by aerobic composting or anaerobic digestion, or a combination of the two.

Biobased products are defined as products containing or derived partially or in full from renewable resources. Market drivers for such products are sustainability for economic viability and a high oil price. As long as the oil price stays high and likely to go higher due to limited availability in the long run, renewable and sustainable resources are attractive for business considerations. Good application examples are ethanol, biodiesel, and plastics such as polylactide (PLA). Such products have to compete with petroleum based products for cost and performance. Even though biodegradability is an intrinsic property of many such products, many products do not necessarily compete with petroleum based products on this property.

Biodegradable, compostable, and biobased products are often closely related to each other. There are connections and disconnections. Many biobased products are biodegradable and compostable. Compostable is biodegradable. However, biodegradable is not always compostable. Biodegradable is not necessarily biobased. Biobased is not necessarily biodegradable. From a business angle, the market driver for each product category is very different.

Solid organic waste recycling

Biodegradable and compostable plastic products are often promoted as a solution to solid waste disposal problems due to concerns of ground contamination, limited availability of space, and cost of landfilling. In reality, there is no need for biodegradable and compostable plastics when there is no solid organic waste management in that regard. Recycling solid organic waste back to the land is a responsible and beneficial practice. It provides the land with needed nutrients and organic humus. Even with solid organic waste recycling, plastics do not have to be biodegradable and compostable if they can be sorted out of the organic waste stream. However, if the mixed plastic products in solid organic waste are biodegradable and compostable, it will provide benefits for ease of handling, sorting and no contamination. Solid

organic waste management does not want to see contamination of non-compostable plastic waste. As a result of that, there will be a market demand for such products.

Biodegradable plastic products are often seen for their environmental benefits. However, the consumers are not willing to pay more than 10-15% extra cost. Demand for biodegradable products from solid organic waste recycling will change the perceived benefits into functional requirement. Solid organic waste recycling has the potential to open a huge market for such products.

Aerobic composting and anaerobic digestion

Aerobic composting and anaerobic digestion provide the means to prepare the solid organic waste for recycling back to the land. Composting can result in a good, stable organic humus. Anaerobic digestion can produce methane for energy recovery. By recycling the solid organic waste, a significant portion of the municipal solid waste can be diverted. It reduces the space requirement for landfill and addresses the long term concern about leaching from organic waste fermentation in the mixed waste.

Government's role

With the development and commercial availability of biodegradable and compostable plastics for packaging and disposable products, and the development of composting technology, it is conceivable that solid organic waste can be readily separated from other waste without causing major distress for consumers and institutions. The government will have the goal of mandating consumers, institutions, and industries sort out solid organic waste as part of the recycling program. Burying organic waste with other waste is simply not a sound approach, and will have to be abandoned in the future.

Programs from California on sorting and solid organic waste management such as composting can provide a model for national rollout. Purchasing programs and test programs from government and government cafeterias will also provide incentives for industries, and give insight to move things toward solid organic waste management. Many jobs will be created in an effort to better manage the waste. Industries involved in making biodegradable and compostable plastics, and waste management such as composting will get a boost.

Panel: Customer Perspectives on Biobased Packaging and Cafeteriaware Needs and Opportunities

Army and Navy Environmental Research Programs for the Reduction of Solid Waste

Jo Ann Ratto, Materials Research Engineer
U.S. Army Natick Soldier Center
Nanomaterials Science Team

The abstract is in Appendix E.

Biodegradable/Compostable Plastics

Ramani Narayan
www.msu.edu/~narayan; narayan@msu.edu
Department of Chemical Engineering & Materials Science
Michigan State University

The abstract is in Appendix E.

Biobased and biodegradable plastics can form the basis for an environmentally preferable, sustainable alternative to current materials based exclusively on petroleum feedstocks. These biobased materials offer value in the sustainability/life-cycle equation by being part of the biological carbon cycle, especially as it relates to carbon-based polymeric materials such as plastics, water soluble polymers and other carbon-based products like lubricants, biodiesel, and detergents. This global carbon cycle vis-à-vis managing carbon efficiently and in an environmentally responsible manner is reviewed by us in earlier papers (1, 2). Identification and quantification of biobased content uses the radioactive C-14 signature.

Biobased polymers are synthesized by many types of living matter - plants, animals and bacteria - and are an integral part of ecosystem function. Because they are synthesized by living matter, biopolymers are generally capable of being utilized by living matter (biodegraded), and so can be disposed in safe and ecologically sound ways through disposal processes (waste management) like composting, soil application, and biological wastewater treatment. Therefore, for single use, short-life, disposable, materials applications like packaging, consumer articles, and food and plasticware, biobased materials can and should be engineered to retain its biodegradability functionality. For durable, long life articles biobased materials needs to be engineered for long-life and performance, and biodegradability may not be an essential criteria.

In this paper we focus on biodegradable/compostable plastics, and review the principles underlying the biodegradability of such plastics under composting conditions (1, 2)

Biodegradable Plastics

Currently, most plastics are designed with limited consideration to its ecological footprint especially as it relates to its ultimate disposability. Of particular concern are plastics used in

single-use, disposable packaging and consumer goods. Designing these materials to be biodegradable and ensuring that they end up in an appropriate disposal system is environmentally and ecologically sound. For example, by composting our biodegradable plastic and paper waste along with other "organic" compostable materials like yard, food, and agricultural wastes, we can generate much-needed carbon-rich compost (humic material). Compost amended soil has beneficial effects by increasing soil organic carbon, increasing water and nutrient retention, reducing chemical inputs, and suppressing plant disease. Composting is increasingly a critical element for maintaining the sustainability of our agricultural system. The food wastes along with other biowastes are separately collected and composted to generate a good, valuable soil amendment that goes back on the farmland to re-initiate the carbon cycle (3, 4).

Polymer materials have been designed in the past to resist degradation. The challenge is to design polymers that have the necessary functionality during use, but destruct under the stimulus of an environmental trigger after use. The trigger could be microbial, hydrolytic or oxidatively susceptible linkage built into the backbone of the polymer, or additives that catalyze a breakdown of the polymer chains in specific environments. More importantly, the breakdown products should not be toxic or persist in the environment, and should be completely assimilated (as food) by soil microorganisms in a defined time frame. In order to ensure market acceptance of biodegradable products, the ultimate biodegradability of these materials in the appropriate waste management infrastructures (more correctly the assimilation/utilization of these materials by the microbial populations present in the disposal infrastructures) in short time frames (one or two growing seasons) needs to be demonstrated beyond doubt.

Polyethylene (PE) or PE-wax coated paper products are problematic in composting because the paper will fully biodegrade under composting conditions, but the PE or wax coating does not biodegrade and builds up in the compost. Paper products coated with fully biodegradable film can provide comparable water resistance, and tear strength like the PE coating. However, it is completely biodegradable and non-interfering in recycling operations (unlike current polyethylene or PE-wax coated paper). These new packaging products along with other biowastes, including food wastes can be collected and composted to generate a good, valuable soil amendment that goes back on the farmland to re-initiate the carbon cycle.

Integration with Disposal Infrastructure

Making or calling a product biodegradable or recyclable has no meaning whatsoever if the product after use by the customer does not end up in a disposal infrastructure that utilizes the biodegradability or recyclability features. Recycling makes sense if the recyclable product can be easily collected and sent to a recycling facility to be transformed into the same or new product. Biodegradable products would make sense if the product after use ends up in a disposal infrastructure that utilizes biodegradation. Composting, waste water/sewage treatment facilities, and managed, biologically active landfills (methane/landfill gas for energy) are established biodegradation infrastructures. Therefore, producing biodegradable plastics using annually renewable biomass feedstocks that generally end up in biodegradation infrastructures like composting is ecologically sound and promotes sustainability. Materials that cannot be recycled or biodegraded can be incinerated with recovery of energy (waste to energy). Landfills are a poor choice as a repository of plastic and organic waste. Today's sanitary landfills are plastic-lined tombs that retard biodegradation because of little or no moisture and negligible

microbial activity. Organic waste such as lawn and yard waste, paper, food, biodegradable plastics, and other inert materials should not be entombed in such landfills. Figure 1 illustrates the integration of biodegradable plastics with disposal infrastructures that utilize the biodegradable function of the plastic product.

Amongst disposal options, composting is an environmentally sound approach to transfer biodegradable waste, including the new biodegradable plastics, into useful soil amendment products. Composting is the accelerated degradation of heterogeneous organic matter by a mixed microbial population in a moist, warm, aerobic environment under controlled conditions. Biodegradation of such natural materials will produce valuable compost as the major product, along with water and carbon dioxide. The CO₂ produced does not contribute to an increase in greenhouse gases because it is already part of the biological carbon cycle. Composting our biowastes not only provides ecologically sound waste disposal but also provides much needed compost to maintain the productivity of our soil and sustainable agriculture. Figure 1 shows disposal infrastructures that can receive biodegradable plastics.

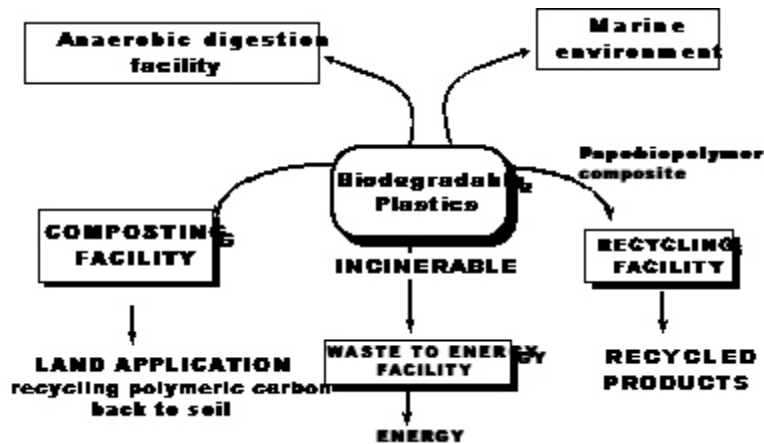


Figure 1. Integration of biodegradable plastics with disposal infrastructures.

As discussed earlier, composting is an important disposal infrastructure because greater than 50% of the municipal solid waste (MSW) stream is biowastes like yard trimmings, food, non-recyclable paper products (see Figure 2)



Figure 2. Typical MSW distribution by weight

Degradable vs Biodegradable – An Issue

Designing products to be degradable or partially biodegradable causes irreparable harm to the environment. Degraded products may be invisible to the naked eye. However, out of sight does not make the problem go away. One must ensure complete biodegradability in a short defined time frame (determined by the disposal infrastructure). Typical time frames would be up to one growing season or one year. As discussed earlier the disposal environments are composting, anaerobic digestion, marine/ocean, and soil.

Unfortunately, there are products in the market place that are designed to be degradable, i.e they fragment into smaller pieces and may even degrade to residues invisible to the naked eye. However, there is no data presented to document complete biodegradability within the one growing season/one year time period. It is assumed that the breakdown products will eventually biodegrade. In the meanwhile, these degraded, hydrophobic, high surface area plastic residues migrate into the water table and other compartments of the ecosystem causing irreparable harm to the environment. In a recent Science article (5) researchers report that plastic debris around the globe can erode (degrade) away and end up as microscopic granular or fiber-like fragments, and that these fragments have been steadily accumulating in the oceans. Their experiments show that marine animals consume microscopic bits of plastic, as seen in the digestive tract of an amphipod. The Algalita Marine Research Foundation (6) report that degraded plastic residues can attract and hold hydrophobic elements like PCB and DDT up to one million times background levels. The PCB's and DDT's are at background levels in soil, and diluted out so as to not pose significant risk. However, degradable plastic residues with high surface areas concentrate these highly toxic chemicals, resulting in a toxic time bomb, a poison pill floating in the environment posing serious risks.

Recently, Japanese researchers (7) confirmed these findings. They reported that PCBs, DDE, and nonylphenols (NP) were detected in high concentrations in degraded polypropylene (PP) resin pellets collected from four Japanese coasts. The paper documents that plastic residues function as a transport medium for toxic chemicals in the marine environment.

Therefore, designing hydrophobic polyolefin plastics, like polyethylene (PE) to be degradable, without ensuring that the degraded fragments are completely assimilated by the microbial populations in the disposal infrastructure in a very short time period poses more harm to the environment than if it was not made degradable. These concepts are illustrated in Figure 3. The Figure shows that heat, moisture, sunlight and/or enzymes shorten & weaken polymer chains, resulting in fragmentation of the plastic and some cross-linking creating more intractable persistent residues. It is possible to accelerate the breakdown of the plastics in a controlled fashion to generate these fragments, some of which could be microscopic and invisible to the naked eye, and some elegant chemistry has been done to make this happen.

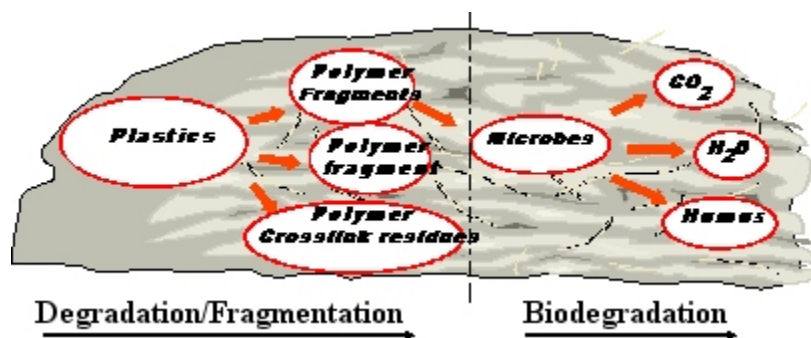
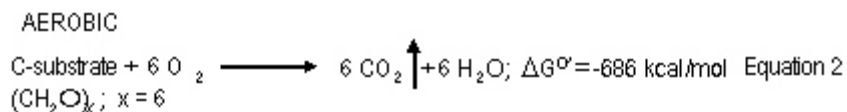


Figure 3. Degradation vs biodegradation

However, this constitutes only degradation/fragmentation, and not biodegradation. As discussed earlier, hydrophobic polymer fragments pose risk to the environment unless the degraded fragments are completely assimilated as food and energy source by the microbial populations present in the disposal system in a very short period (one year). Microorganisms use the carbon substrates to extract chemical energy for driving their life processes by aerobic oxidation of glucose and other readily utilizable C-substrates as shown by the following equation.



Thus, a measure of the rate and amount of CO₂ evolved in the process is a direct measure of the amount and rate of microbial utilization (biodegradation) of the C-polymer. This forms the basis for ASTM and International Standards for measuring biodegradability or microbial utilization of the test polymer/plastics. Thus, one can measure the rate and extent of biodegradation or microbial utilization of the test plastic material by using it as the sole carbon source in a test system containing a microbially rich matrix like compost in the presence of air and under optimal temperature conditions (preferably at 58° C – representing the thermophilic phase). Figure 4 shows a typical graphical output that would be obtained if one were to plot the percent carbon converted to CO₂ as a function of time in days. First, a lag phase during which the microbial population adapts to the available test C-substrate. Then, the biodegradation phase during which the adapted microbial population begins to utilize the carbon substrate for its cellular life processes, as measured by the conversion of the carbon in the test material to CO₂. Finally, the output reaches a plateau when all of the substrate is completely utilized.

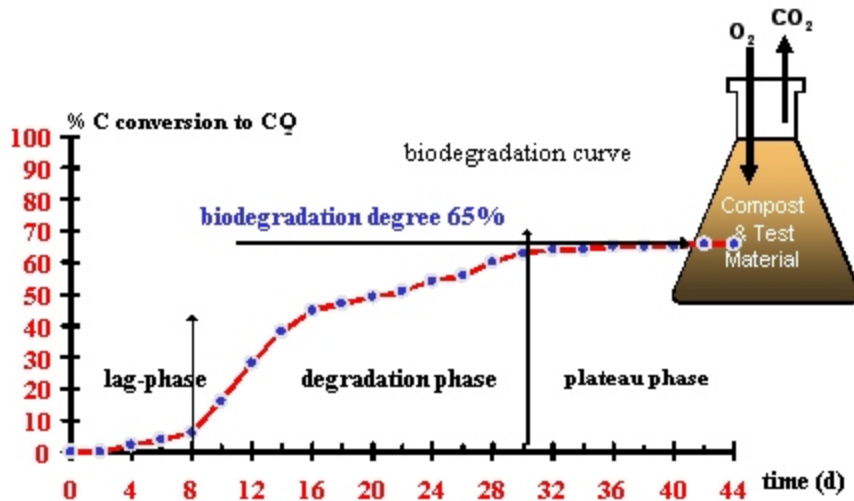


Figure 4. Test method to measure the rate and extent of microbial utilization (biodegradation) of biodegradable plastics

Based on the above concepts, ASTM committee D20.96 (8) has developed a Specification Standard for products claiming to be biodegradable under composting conditions or compostable plastic. The specification standard ASTM D6400 identifies 3 criteria.

Complete biodegradation (using ASTM D5338 test method):

1. Conversion to CO₂, water & biomass via microbial assimilation of the test polymer material in powder, film, or granule form.
2. 60% carbon conversion of the test polymer to CO₂ for homopolymer & 90% carbon conversion to CO₂ for copolymers, polymer blends, and addition of low MW additives or plasticizers.
3. Same rate of biodegradation as natural materials -- leaves, paper, grass & food scraps
4. Time -- 180 days or less; if radiolabeled polymer is used 365 days or less.

Disintegration

<10% of test material on 2mm sieve using the test polymer material in the shape and thickness identical to the product's final intended use – see ISO 16929 (9) and ISO 20200 (10).

Safety

The resultant compost should have no impacts on plants, using OECD Guide 208, Terrestrial Plants, Growth Test.

Regulated (heavy) metals content in the polymer material should be less than 50% of the EPA (USA, Canada) prescribed threshold.

The above specification standard is in harmony with standards in Europe, Japan, Korea, China, and Taiwan, for example EN13432 titled “Requirements for Packaging Recoverable through Composting and Biodegradation—Test Scheme and Evaluation Criteria for the Final Acceptance of Packaging” is the European standard (norm) and similar to D6400. At the International level, the International Standards Organization (ISO) is developing ISO 17088, “Specification for Compostable Plastics” which is in harmony with ASTM D 6400, and the European norms. Figure 5 summarizes the current standards for the different disposal systems.

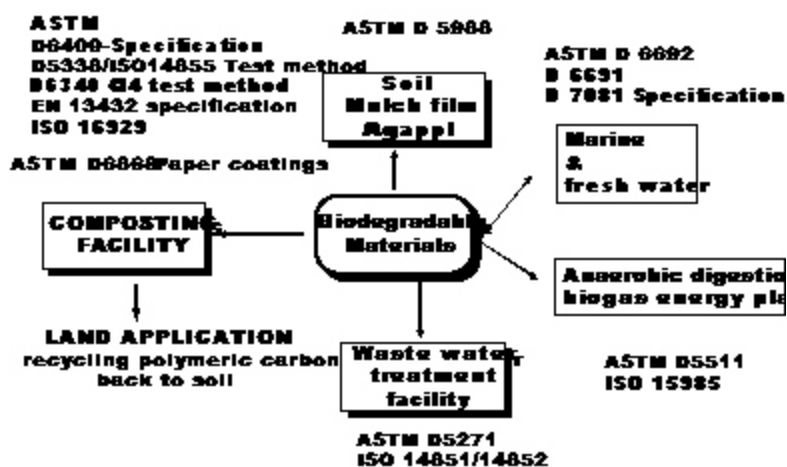


Figure 5. ASTM and European (EN) Standards for biodegradable plastics in different disposal systems.

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Customer Perspectives on Biobased Packaging and Cafeteriaware Needs and Opportunities

Ken Letherer
Whole Foods Market

The power point slides are in Appendix D and the abstract is in Appendix E.

On December 8th, 2005, I had the pleasure of participating in a round table discussion on this topic. This meeting took place at the USDA facility in Beltsville MD. The following is a recap of the discussion.

Our company's goal is to create a full circle waste diversion composting program. We currently have a program in place but would like to divert more landfill products to compost. We currently have our compost bagged and for sale in our retail facilities.

Our company promotes Environmental Stewardship. We see the necessity of active environmental stewardship so that the earth continues to flourish for generations to come. We seek to balance our needs with the needs of the rest of the planet through the following actions:

1. Supporting sustainable agriculture. We are committed to greater production of organically and bio-dynamically grown foods in order to reduce pesticide use and promote soil conservation.
2. Reducing waste and consumption of non-renewable resources. We promote and participate in recycling programs in our communities. We are committed to re-usable packaging, reduced packaging, and water and energy conservation.
3. Encouraging environmentally sound cleaning and store maintenance programs

Company wide we produce and sell a lot of tonnage of prepared foods. We also sell a lot of product in pre-packed plastic containers:

1. We currently have **180 stores** worldwide.
2. Our goal is to have **300 by the year 2010**.
3. **\$10 billion in sales** annually by 2010.
4. Worldwide cost of packaging by 2010 will be **\$60,000,000**.

Concerns and Challenges:

1. We must be able to leverage our buying power.
2. We have a commitment to not support GMO's into our waste stream or our products.
3. Crop source and true cost matters.
4. Willing to look at reusability that is also compostable.
5. Expense is a huge concern. We must balance all of our stake holder groups being a publicly traded company. This means no premium pricing!

Compostable vs. Biodegradable

1. Most of our stores are on a composting program.
2. Continued challenges in finding haulers and composting facilities in close proximity to all locations.
3. Urban locations are more challenged than suburban.
4. "Biodegradable" claim is like "Natural" claim. It doesn't mean much even if it is true.
5. Some compostable plastics are co-polymers that are blended with hydrocarbons and still get certified compostable.
6. Third party certifiers have symbols that do have some recognition, yet the word compost or compostable probably make the most sense.
7. Using the # 7 triangle symbol for compostable plastic is next to useless. It confuses as much as it clarifies. The number 7 means not the first 6 which are specific hydrocarbon molecules.

How about using the number 0 for compostable plastics that want to use a number. A "0" would imply zero waste.

More Retailing Opportunities

1. In the USA we throw away enough plates and cups to have a picnic for the entire world 6 times a year.

2. Whole Foods Market sells cafeteriaware to our customers every day. We are willing to look into a private brand label for these goods.

3. Other retailers like Wal-Mart, Costco, Harris Teeter etc., are increasingly getting into selling natural and organic products.

In summary, there is a great opportunity to market this program to our customers and the rest of the world if we can procure the product we are looking for. The PLA or plant based material must be made from 100% plant material which would make it fully biodegradable. It must come from a sustainable plant source that is not grown using pesticides or herbicides. It must also not contain any genetically engineered organisms.

Panel: Compost Product Users, Stakeholder Education and Information

What the Horticulture Industry Needs in Regards to Composted Products

Marc Teffeu

Director of Research and Regulatory Affairs

American Nursery and Landscape Association & the Horticultural Research Institute

The abstract is in Appendix E.

**Department of Interior's Demonstration Project and Potential Use of
Compost by the National Park Service**

Heather Davies
Office of Environmental Policy and Compliance
U.S. Department of the Interior

The power point slides are in Appendix D.

**Education and Information: Greenscapes, Roof Gardens, Rain
Gardens, Compost Berms, Stormwater Management**

Rosalie Green
Office of Solid Waste
US Environmental Protection Agency

The abstract is in Appendix E.

Discussion: What will help to increase supply of products and facilitate standards/certification establishment

Summary of Roundtable Discussion Session

Patricia D. Millner, Research Microbiologist
USDA/ARS/BARC/SASL and EMSL

The following is a synthesis of comments and discussion from the open forum that followed the formal presentation session of this Roundtable. The discussion comments have been organized into topics rather than a verbatim record of the statements made.

I. Acquisition of Biobased Food Serviceware

a. Role of the Biobased Product Council USDA-DOE

i. Priorities for performance standards were discussed and members of the Biobased Product Council indicated that they would advocate for promoting adoption of food serviceware standards in the short-term.

ii. It was noted that a number of existing science-based performance tests and approaches have been published and documented. There was consensus among the Roundtable discussion participants, which included members of the Biobased Product Council, that where high quality performance standard tests exist and are already being used by academics and industry these should be considered for use 'as is' or with minor modification.

iii. Performance standards need to build on current practices and standards. There is a significant amount of published and grey literature available documenting current performance testing objectives and protocols. This should be used to the fullest extent possible to accelerate the standards development process. Such testing protocols have been used for biobased serviceware as well as compost.

b. Role of the Office of the Federal Environmental Executive (OFEE)

i. It was explained that among the functions the OFEE can provide are some coordination and liaison efforts relative to a variety of activities and programs underway among different federal agencies. However, procurement is handled by each agency individually. There may be some opportunities to discuss how agencies needs could be better

met by promoting economies of scale so that costs/unit item for biobased products can be brought into a more competitive range relative to petroleum-based items during the transitioning phase.

c. Role of Industry

i. Industry representatives in attendance indicated their willingness and desire to work with the federal agencies to provide biobased products. This effort could also include coordinating with the product manufacturers, not just the resin manufacturers, to produce certain items to meet customer specifications. It would also include working with the Biobased Products Council to ensure that products can ultimately meet the Federal Product Procurement Standards whenever they are established for specific product lines or categories. Industry is also willing to coordinate with Biobased product Council members and federal procurement agents to fill product gaps (e.g., hot drink cup lids).

II. Collection and Transport of Food and Post-Consumer Cafeteria Residuals from Federal Facilities in the Washington, D.C. area

The federal building cafeteria systems typically operate through contractors and serve employees primarily; and in the case of Smithsonian Institution museums and National Zoo, the visitors. Residuals from these operations have yet to be inventoried and none are routinely using biobased serviceware. Residuals inventories, although not yet conducted for all agencies in the WDC area, can be expected to approximate those that have been performed in other urban institutional locations such as Oregon and California.

Estimates of food residuals generation can be calculated as:

$$(\# \text{ of containers generated}) \times (\text{size of containers}) \times (\# \text{ of collections/unit of time})$$

In areas that have conducted residuals inventories, data show that the following categories are the largest generators of food residuals:

Food supermarkets and distribution warehouses, restaurants, schools, hospitals, and hotels.

As biobased serviceware becomes more widely available and used in cafeterias and as post-consumer collection increases, the proportional contribution of polylactone and cellulosic serviceware content in the residuals stream will increase incrementally. Food residuals can be efficiently collected in biobased, compostable bags in commercial kitchens or at the recycle bin area of cafeterias. When full, bags are tied and loaded into large-wheeled covered totes.

A collection and haul service can either exchange the wheeled totes for cleaned fresh ones and maintain a return cycle, weekly, or can empty the tote into the truck. Short haul distances are desirable from a cost containment view – less fuel, less vehicular wear, and less labor cost.

Central to success of any collection program is adequate training of the source generation staff as well as the collection and transport staff. To the extent that post-consumer residuals are collected in federal cafeterias that implement the use of biobased serviceware, there will be a

need to prepare and use appropriate and adequate signage and recycling bins. All successful food residuals recycling projects to date have found that training at all stages is absolutely essential.

III. Permitting and Operation of Composting Facility designed for Food Residuals

In the Washington metropolitan region, there are several yard and landscape residuals composting facilities. However, only one 6 acre operation located 30 miles from Washington currently has a permit (“grandfathered”) to handle food residuals. Unfortunately, with high fuel and labor costs the haul distance makes this remote facility an uneconomical and size restricted option for the D.C. federal cafeterias. Currently, there is a clear need for a facility that is located in relatively close proximity to the major downtown federal food residuals generators. This would likely gain greater public acceptance if the composting process that were implemented relied on one of the in-vessel or containment options rather than the more typical open air windrow or static aerated pile technologies. Contained operations would also likely gain greater acceptance by permitting authorities because of reduced risk of nuisance odors, dust, and vector attraction during composting.

Local jurisdictions have virtually no performance based experience in dealing with in-vessel or containment style composting and would benefit from a pilot program that would test and compare the efficiencies and economics of various collection and treatment options. This pilot would benefit local progress and implementation if it also included local jurisdictional compost permitting authorities so that their major concerns could be addressed during the testing period. In addition, other organics recycling streams, e.g., wood chips, leaves, grass clippings, generated in these jurisdictions would also need to be identified and factored into the processing plan. A generic business plan for the operation of a food/organics residuals composting/biomass conversion facility should be one of the basic products of such a pilot testing endeavor. Such a plan could be used by prospective compost facility operators to organize and evaluate the likely success of actual full-scale facilities that are planned. Such a business plan could incorporate the customer base comprised of federal buildings, grounds, and parks managers in the region that procure mulch, compost, and landscape soil amendments in the course of their work.

Regardless of the composting operation that is used, there will be a continuing need for a supply of bulking agent, e.g., woodchips, shredded/chipped wooden pallets, rubber tire chips, newspaper pellets, or 10% (v:v) finished compost. Woodchips and rubber tires can be recycled by screening out small product, 3/8” to 1/2”, as is typical for bulk and bagged product. Need for stockpiling of bulking agent, compost piles, and curing piles all need to be taken into account when a site plan is drafted

Composting should be regarded as one part of the ultimate residuals recycling solution. Anaerobic digestion prior to composting, followed by depolymerization of cellulose and lignins in the material retained from compost screenings, i.e., the ‘overs’, may still provide additional opportunity to capture biologically-fixed energy. Unlike anaerobic digestion trials with high solids input, food residuals and biobased cafeteriaware combined with kitchen and post-

consumer food residuals used in the BARC composting trials, did not stall the decomposition process due to acetogenesis or excess heating in the early or later compost stages. This indicates that with proper handling and processing, even with materials containing high volatile solids content, e.g. food residuals, microbial transformations can be managed to achieve stabilized balanced products.

Finally, process testing during pilot-scale evaluations need to include measures to avoid and reduce nuisance odors, dust, and air emissions that might otherwise impair public acceptance and permitting of such facilities within reasonably close proximity to generation and product user sources. Adverse air impacts, especially odor and dust, in the neighboring communities around composting facilities can be and have been major causes for a facility and operation failure. The success of food recycling and composting programs, which is an essential part of closing the food production and consumption loop, will rely on successful planning and implementation of many steps in the process. The effectiveness of odor containment or reduction will be a significant factor in nearly all urban, suburban, and rural areas. Therefore, designers, planners, and regulators would serve the public need particularly well if they address the odor issue in their project proposals, evaluations, and preparedness plans.

Roundtable Discussion Wrap-up

Food and Biobased Cafeteriaware Composting for Federal Facilities in Washington, DC

Justin R. Barone, Research Scientist
US Department of Agriculture, Agricultural Research Service, ANRI, EMBUL

Introduction

During the Food and Biobased Cafeteriaware Composting for Federal Facilities in Washington, DC Meeting in Beltsville, MD on December 8, 2005, two discussions were held, one centering on the morning session (Pros and Cons In-Vessel, Windrow with Cover, Static Aerated Pile, etc., Composting Options, Debugging and Shredding Options, etc.) and one on the afternoon session (What will help to increase supply of products and facilitate standards/certification establishment?). The following serves as a summary of the approximately one- hour discussions that occurred after each session.

Morning Session: Pros and Cons In-Vessel, Windrow with Cover, Static Aerated Pile, etc., Composting Options, Debugging and Shredding Options, etc.

One large problem facing composting facilities is permitting and regulatory agencies. Specifically, who is a regulatory agency and what restrictions can they impose? Currently, composting facilities can be regulated like waste management facilities because they are viewed as “waste management”. This can include regulation at the local, state, and federal levels as well as public comment periods that can delay permitting indefinitely because of NIMBY concerns. One composter in California, Dbest, paid \$250,000 for a composting permit. Lawn and leaf composting facilities will typically not take food because the health department may impose regulations over the possibility of pathogens. This is in spite of the fact that compost from food may add value to the lawn and leaf compost. The best solution to this problem is to view composters as biobased product manufacturers instead of waste managers. Quality compost has a high value as a biobased product and different composting sources and techniques offer different products. Compost producers need champions in the federal government who understand the value of composting and compost as a product and can express the need to use quality compost.

A second problem is land costs especially near urban areas. Outside of the costly permitting process in terms of time and money, it may simply be cost-prohibitive to buy land to run a

composting facility near large urban areas like Washington, DC. If land costs near urban areas are too high, then how far can a composting facility be from a major urban area before transportation costs make it cost-prohibitive to collect organic and yard waste and compost? In addition, what are the hidden costs of composting?

Emissions from composting facilities are problematic. Typically, there is carbon dioxide, ammonia, and methane from the facility. Talk of emissions occurs concurrently with talk of realistic energy/carbon balances that can take into account all of the biological processes of the plant and all of the biological processes occurring during composting. An important comparison to make would be the carbon balance of a composting facility versus a landfill.

Food based compost has more volatile compounds than lawn and leaf compost, i.e., there is more than 50% mass loss. Food based compost will rapidly degrade into methane. It is known that methane is over twenty times more difficult in producing global warming effects than carbon dioxide. Landfills produce methane that escapes into the atmosphere and landfills are the number one anthropomorphic generator of methane in the country. Landfills are sealed from the surrounding ground. Compost would put carbon back into the soil to be re-used so intuitively a more positive carbon balance over a landfill can be envisioned.

It may be possible to cancel out the carbon dioxide because the compost came from plant matter. Carbon sequestration could be negated by carbon dioxide emission. "Fugitive methane" could be dealt with possibly through trading methane credits. The Chicago Climate Exchange has set a value of \$15/dry ton for landfill- or manure-produced fugitive methane. It was suggested that the future of composting would be dependent on trading methane and carbon credits. Some ammonia and methane may be able to be captured and used in fertilizer or energy applications, respectively. New research uncovers new microbial/biological processes that positively affect carbon balances. Although some carbon may be lost through emissions, the carbon that you are putting back into the soil will feed microbes that have longer lifecycles and will stabilize it.

Afternoon Session: What will help to increase supply of products and facilitate standards/certification establishment?

When it comes to non-traditional cafeteriaware, there is much confusion over definitions and content labeling. Eventually, the U.S. government will issue labels on products that meet certain minimum requirements for biobased content. The minimum requirements for various products are a contentious issue. This leads to the definition of "biobased" versus "biodegradable" versus "compostable" versus "recycled". The U.S. government labeling will apparently address minimum biobased or old carbon content. This is not recycled material. Biodegradation can occur on different time scales under different conditions. The Biodegradable Products Institute (BPI) is a trade organization that offers a normalized test for biodegradability for comparison purposes. This is enormously useful for potential users to compare biodegradability of products. Of course, biodegradation will ultimately be based on local conditions where the plastics are used and therefore will degrade on different time scales based on local composting conditions. Not all compost is the same so biodegradation conditions would be different. Professor Ramani Narayan further made the distinction between

plastics that simply suffer chain scissioning to short chain polymers or monomers and plastics that degrade to compounds that can be metabolized by bacteria in the environment and converted to carbon dioxide, heat, etc. Only the latter is truly “biodegradable” and “compostable”. For packaging applications, “biodegradable” and “compostable” would be advantageous distinctions. However, for many plastics applications, these are not necessarily important and “biobased” content would be more important, i.e., for long-term applications. In the end, the development and use of biobased products is in its infancy and is probably behaving in a “Moore’s Law”-type manner where new and better products are constantly being developed and introduced to the market place.

It was stressed that producers of biobased products, such as composters or biobased plastics manufacturers, need to stress the “best value” points of their product with procurement agents. In many instances, biobased products may come at an additional initial cost over non-biobased products. Therefore, it is important to stress the advantages of these products and where cost savings may occur downstream or indirectly to offset the initial higher or direct cost.

Currently, there is no mandate to compost organic waste from cafeterias let alone cafeteriaware. Therefore, procurement of biodegradable or compostable cafeteriaware would make more sense if the organic waste that is already a by-product of federal cafeterias was required to be composted. In fact, mandating use of compost by, perhaps, the Department of Transportation, a mechanism for which is already apparently in place, may be a way to use internally generated compost or to increase the market for compost.

APPENDICES

Appendix A

CO-COORDINATORS

Patricia D. Millner, Research Microbiologist
USDA-ARS-BARC
Sustainable Agricultural Systems Laboratory and
Environmental Microbial Safety Laboratory
10300 Baltimore Ave, Bldg. 001, Rm 140
Beltsville, MD 20705-2350
T#: 301-504-7199
F#: 301-504-8370
millnerp@ba.ars.usda.gov

Carmela A. Bailey, National Program Leader, Agricultural Materials
US Department of Agriculture, Cooperative State Research,
Education and Extension Service, Plant and Animal Systems
800 9th Street, SW, Room 3403 Waterfront Centre
Washington, DC 20250-2220 (for express mail the zip-code is 20024-2475)
T#: 202.401.6443
F#: 202.401.5179
email: cbailey@csrees.usda.gov

Richard Reynnells, National Program Leader, Animal Production Systems
US Department of Agriculture, Cooperative State Research,
Education and Extension Service, Plant and Animal Systems
800 9th Street, SW, Room 3140 Waterfront Centre
Washington, DC 20250-2220
T#: 202.401.5352
F#: 202.401.6156
email: rreynnells@csrees.usda.gov

Appendix B

PURPOSES

1. To develop recommendations for appropriate composting technology and support operations options for large institutional-, metropolitan-, and regional scale food composting.
2. To advance the use of biobased cafeteriaware by federal facilities.
3. To promote the support of biobased cafeteriaware for the Federal Biobased Procurement Program.
4. To advance the adoption of compost quality and testing standards for Federal procurement programs (i.e., define compost and quality assurance standards).

Appendix C

PROGRAM PLUS SPEAKER CONTACT INFORMATION

FOOD AND BIOBASED CAFETERIAWARE COMPOSTING FOR FEDERAL FACILITIES IN WDC

Roundtable Discussion

December 8, 2005

USDA, ARS, Henry A. Wallace Research Center
10300 Baltimore Ave.,
Building 005, Conference Room 21
Beltsville, MD 20705

Moderator: Richard Reynnells, National Program Leader
US Department of Agriculture, Cooperative State Research, Education,
and Extension Service

800 9th St., SW, RM 3140 Waterfront Centre
Washington, DC 20250-2220
T#: 202-401-5352
F#: 202-402-6156
email: rreynnells@csrees.usda.gov

8:00 – 8:05

Welcome and Organizational Comments

Richard Reynnells, National Program Leader
US Department of Agriculture, Cooperative State Research, Education, and
Extension Service

Ronald Korcak, Associate Area Director
Beltsville Area Director's Office
US Department of Agriculture, Agricultural Research Service.
Building 003, Room 223, BARC-West
Beltsville, MD 20705
T#: 301.504.5193

F#: 301.504.5863
Email: KorcakR@ba.ars.usda.gov

8:05 – 8:10

Charge to the Roundtable Participants

Patricia D. Millner, Research Microbiologist
US Department of Agriculture, Agricultural Research Service
Sustainable Agricultural Systems Laboratory and Environmental
Microbial Safety Laboratory
Beltsville Agricultural Research Center
10300 Baltimore Ave, Bldg. 001, Rm 140
Beltsville, MD 20705
T#: 301-504-8387
F#: 301-504-8370
email: millnerp@ba.ars.usda.gov

8:10 – 8:30

Federal Biobased Products Procurement Program – Status of Cafeteria-ware and Compost

Marvin Duncan, Senior Agricultural Economist
Office of Energy Policy and New Uses
US Department of Agriculture
Room 4059 South Building
1400 Independence Ave. SW, MS-3815
Washington, DC 20250-3815
T#: 202-401-0532
F#:
Email: mduncan@oce.usda.gov

8:30 – 8:50

State of US Food Composting – Institutional and Municipal Scales

Nora Goldstein
BioCycle, The JG Press, Inc.
419 State Avenue
Emmaus, PA 18049
T#: 610-967-4135 ex26
F#: 610-967-1345
Email: noragold@jgpress.com

8:50 – 9:15

USDA Whitten Cafeteria Pilot Program with Biobased Products

J. Mike Green, Program Manager, Biobased Procurement
US Department of Agriculture, OPPM
Reporters Building, Room 342
300 7th Street, S.W.
Washington, DC 20024
T#: 202.720.7921
F#: 202.720.8972

Email: mike.green@usda.gov

Patricia D. Millner, Research Microbiologist
US Department of Agriculture, Agricultural Research Service
Beltsville Agricultural Research Center

Rosalie E. Green, Senior Recycling Specialist
SEE Associate with USEPA, Office of Solid Waste
109 Kent Drive
Manassas Park, VA 20111-2055
T#: 703-308-7268
F#: 703-308-8686
email: green.rosalie@epa.gov

Randy Townsend
US Department of Agriculture, Agricultural Research Service, Beltsville
Agricultural Research Center
10300 Baltimore Ave, Bldg. 001, Rm 140
Beltsville, MD 20705
T#: 301.504.8448

Case Studies: Keys to Successful Large Institutional and Municipal-Scale Food Composting

9:15 – 9:45
Product Ware Use

Keys to Success of San Francisco Food Composting & Compostable

Jack Macy, Commercial Recycling Coordinator
Department of the Environment
City and County of San Francisco
11 Grove Street
San Francisco, CA 94102
T#: 415.355.3751
F#: 415.554.6393
Email: jack.macy@sfgov.org; www.sfenvironment.org

9:45 10:00

In-Vessel Composting: The Wright Way

Bob Kerlinger, President
Mid-Atlantic Composting Association
20 Roberts Landing Drive
Poquoson, VA 23662
Cell#: 757.254.3289
T#: 757.868.3779
F#: n/a
Email: bkerlinger@widomaker.com

10:00 – 10:15

BREAK

- 10:15 – 10:30 **In-Vessel Systems, City of Hutchinson, MN, & Schools**
 Jim McNelly, President
 Renewable Carbon Management
 44 28th Ave. North, Suite J
 St. Cloud, MN 56303
 T#: 320-253-5076; Cell T#: 320-253-4976
 F#: 320-492-5076
 Email: rcm@composter.com
- 10:30 – 10:45 **An Economic Analysis of Composting**
 Nadine H. Davitt
 0248 Ag Engr Building
 The Pennsylvania State University
 University Park, PA 16802
 T#: 814.865.6606
 F#:
 Email: njh103@psu.edu; njh103@enr.psu.edu
- 10:45 - 11:00 **New York Correctional Facilities, Food Composting Operations**
 James Marion, Resource Management Director
 Eastern Correctional Facility
 Division of Agribusiness
 553 Berme Road
 Napanoch, NY 12458
 T#: 845.647.1653
 F#:
 Email: jimdocs@pronetisp.net
- 11:00 - 12:00 **Discussion: Pros & Cons**
In-Vessel, Windrow with cover, Static Aerated Pile, etc Composting Options, Debugging and Shredding Options, etc.
- 12:00 – 12:30 **LUNCH (on-site)**
- Biobased Products Development, Supply, and Procurement: Meeting Quality Standards and Product Demand**
- 12:30 – 1:15 **Panel: Industry Perspectives: Ways to Move Forward**
- 12:30 - 12:45 **Biobased Products: Opportunities and Issues for Growth**
 Steve Mojo
 Biodegradable Products Institute
 331 West 57th Street, Suite 415
 New York, NY 10019
 T#: 1-888-BPI-LOGO (274-5646)
 F#: 973.916.1911
 Email: smojo@galatech.org; info@bpiworld.org

2:45 - 1:00

Earthshell

John Nevling
Earthshell Corporation
Cindy Eikenberg, Marketing Communications Manager
1301 York Road, Suite 200
Lutherville, MD 21093-6005
T#: 410.847.9420 Ext. 13
F#: 410.847.9431
Email: ceikenberg@earthshell.com; www.earthshell.com

1:00 - 1:15

Biodegradable Cutlery Products and the True Composting Link

Li Nie
MGP Ingredients, Inc.
1300 Main Street
PO Box 130
Atchison, KS 66002
T#: 913.360.5246
F#: 913.360.5746
Email: li.nie@mgingredients.com

1:15 – 2:00

Panel: Customer Perspectives on Biobased Packaging and Cafeteriaware Needs and Opportunities

Army and Navy Environmental Research Programs for the Reduction of Solid Waste

Jo Ann Ratto, Materials Research Engineer
U.S. Army Natick Soldier Center
Nanomaterials Science Team
Kansas Street
Natick, MA 01760-5020
T#: 508.233.5315
F#: 508.233.5363
Email: Joann.Ratto.Ross@us.army.mil

Biodegradable/Compostable Plastics

Ramani Narayan
Professor of Chemical & Biochemical Engineering
Department of Chemical Engineering & Materials Science
2527 Engineering Building
Michigan State University
East Lansing, MI 48824
T#: 517.432.0775
F#: 517.
Email: narayan@msu.edu

Customer Perspectives on Biobased Packaging and Cafeteriaware Needs and Opportunities

Ken Letherer
Whole Foods

2001 Pennsylvania Ave.
Philadelphia, PA 19130
T#: 215-266-3540
Email: Ken.Letherer@wholefoods.com

2:00 – 2:15 **BREAK**

2:15 – 3:00 **Panel: Compost Product Users, Stakeholder Education and Information**

Marc Tefteau
American Nursery & Landscapers Assoc.
1000 Vermont Ave. NW, Suite 300
Washington, D.C. 20005-4914
T#: 202-789-2900
F#:
Email: mteffeau@anla.org

Department of Interior's Demonstration Project and Potential Use of Compost by the National Park Service

Heather Davies
Office of Environmental Policy and Compliance
U.S. Department of the Interior
1849 C Street, NW (MS 2340)
Washington, DC 20240
T#: 202.208-7884
F#: 202.208.6970
Email: Heather.Davies@ios.doi.gov

Education and Information: Greenscapes, Roof Gardens, Rain Gardens, Compost Berms, Stormwater Management

Rosalie Green
Office of Solid Waste
US Environmental Protection Agency
109 Kent Drive
Manassas Park, VA 20111-2055
T#: 703-308-7268
F#: 703-308-8686
email: green.rosalie@epa.gov

2:45 – 3:45 **Discussion: What will help to increase supply of products and facilitate standards/certification establishment**

3:45 – 4:00 **Roundtable Wrap-up**
Justin R. Barone, Research Scientist

US Department of Agriculture, Agricultural Research Service, ANRI,
 EMBUL
 Bldg. 012, Room 1-3, BARC-West
 10300 Baltimore Ave.
 Beltsville, MD 20705
 T#: 301.504.5905
 F#: 301.504.5992
 Email: baronej@ba.ars.usda.gov; <http://www.ars.usda.gov/pandp/people>

Appendix D

POWER POINT PRESENTATIONS

Slides were converted to black and white format for the proceedings, but some pictures and information did not photocopy clearly.. Contact the author for the original power point slides.

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Heather Davies, U.S. Department of the Interior 100

Provisions Of The Federal Biobased Products Preferred Procurement Program And Progress In Implementation

Marvin Duncan
USDA

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State of US Food Composting – Institutional and Municipal Scales

Nora Goldstein
BioCycle, The JG Press, Inc.

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USDA Whitten Cafeteria Pilot Program with Biobased Products Materials Procurement

James M. Green
Program Manager, Biobased Procurement
USDA/DA/OPPM

Patricia D. Millner, Research Microbiologist
USDA, Agricultural Research Service
Beltsville Agricultural Research Center

Rosalie E. Green, Senior Recycling Specialist
SEE Associate with USEPA, Office of Solid
Waste

Randy Townsend
USDA, Agricultural Research Service
Beltsville Agricultural Research Center

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Keys to Success of San Francisco Food Composting & Compostable Product Ware Use

Jack Macy
Commercial Recycling Coordinator,
City and County of San Francisco

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In-Vessel Containerized Composting

Jim McNelly
Renewable Carbon Management

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An Economic Analysis of Composting

Nadine H. Davitt
The Pennsylvania State University

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Panel: Industry Perspectives: Ways to Move Forward

Biobased Products: Opportunities and Issues for Growth

Steve Mojo
Biodegradable Products Institute

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Panel: Industry Perspectives: Ways to Move Forward

Earthshell

John Nevling and Cindy Eikenberg
Earthshell

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Customer Perspectives on Biobased Packaging and Cafeteriaware Needs and Opportunities

Ken Letherer
Whole Foods Market

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Composting Food Waste and Food Service Products

Heather Davies
Office of Environmental Policy and Compliance
U. S. Department of the Interior

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Appendix E

ABSTRACTS

**Presented at the December 8, 2005 Round Table,
Provided as an on-site handout**

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Provisions Of The Federal Biobased Products Preferred Procurement Program And Progress In Implementation

Marvin Duncan, Senior Agricultural Economist
Office of Energy Policy and New Uses, USDA

Statutory authority for the Federal Biobased Products Preferred Procurement Program (FB4P) was included in the Farm Investment and Rural Security Act of 2002 (FSRIA). This program will provide for procurement preference by Federal agencies for biobased products that have been designated and qualified by rule making under the FB4P. The Office of Energy Policy and New Uses (OEPNU) within USDA is charged with implementing this program. OEPNU has identified about 100 items (generic groupings of products) to be designated by rule making. Federal agencies are required to procure products designated by this program, unless the products are not readily available, are excessively expensive, or cannot meet the reasonable performance standards of the procuring agency.

The final rule establishing the guidelines for operation of the program were published in the *Federal Register* in January of 2005. The first of several rule designating items for preferred procurement is expected to be published as a final rule about the end of calendar 2005. Three additional designation rules of ten items each are in various stages of drafting and clearance within USDA. Additional designation rules will be published as rapidly as OEPNU is able to gather the technical information required to support designation of items.

FSRIA also provided for a voluntary labeling program that will permit qualifying biobased products to carry the U.S.D.A. Certified Biobased Product label and logo. The proposed rule to establish this program is in clearance within USDA.

Finally, FSRIA provided for a model procurement program to provide education and outreach to Federal agencies regarding their responsibilities to purchase biobased products under this program. USDA's Office of Administration is developing this program, which will be carried to all Federal agencies in cooperation with the Office of Federal Procurement Policy of the Office of Management and Budget.

State of US Food Composting – Institutional and Municipal Scales

Nora Goldstein
BioCycle
The JG Press, Inc.

BioCycle conducted its first nationwide survey of food residuals composting projects in the U.S. in 1995. At the time, there were 58 full-scale and pilot projects processing commercial, institutional and/or industrial food residuals streams. Several years later, in 1998, the *BioCycle* nationwide survey identified 187 full-scale composting operations, 37 pilots and 26 projects in development — for a total of 250. Of the full-scale projects, 54 were processing the full complement of institutional, commercial and industrial (ICI) feedstocks; 91 were composting on-site at institutions and 42 were composting a combination of industrial, agricultural and municipal food residuals streams.

Ten years after the first survey was conducted, there are most likely hundreds of on-site composting projects at institutions, including colleges and universities, correctional facilities, elementary and secondary schools, resorts and military bases. Some use conventional windrows, while others use vessels designed for on-site composting. The number of centralized facilities composting a range of ICI organics has not grown at the same pace. There is a concentration of these projects on the West Coast, and a sprinkling throughout the rest of the United States. Economics, collection logistics and project permitting have all factored into the slow pace of facility development.

Over the past ten years, a number of states have developed, or funded development of, tools to advance the diversion of food residuals. These include GIS mapping of generators and processors, and manuals for source separation at grocery stores, restaurants and other establishments. From a public policy standpoint, there have been no incentives at the federal level for food residuals diversion. More incentives have been presented at the state and local government levels.

This paper will provide a birds-eye view of operating projects, incentives and disincentives, and the role that biodegradable products play in increasing the diversion of food residuals and soiled paper from disposal.

USDA Cafeteria Pilot With Biobased Products

James M. Green
Program Manager, Biobased Procurement
USDA/DA/OPPM

Patricia D. Millner, Research Microbiologist
US Department of Agriculture, Agricultural Research Service,
Beltsville Agricultural Research Center

Rosalie E. Green, Senior Recycling Specialist
SEEAssociate with USEPA, Office of Solid Waste

Randy Townsend,
US Department of Agriculture, Agricultural Research Service,
Beltsville Agricultural Research Center

This presentation will discuss USDA's overall concept and expectations for the pilot, operational strategies, costs, outcomes and lessons learned.

The Pilot was conducted for a period of three month in USDA's small cafeteria in the Whitten building. This venue gave USDA a more controlled environment that would allow for quick identification of problems and increased ability to correct them in a more effective, less intrusive manner.

During pilot, **33,426** patrons were served. In generally patrons easily accepted the change from the typical Styrofoam and plastic ware to products manufactured from biobased feedstock. But, as expected there were those patrons that did not like the change. In fact, we receive fewer than 150 negative complaints. Cafeteria operations and services were not impacted by the change to biobased products.

The pilot included a wide variety of biobased products. See list below. These products, along with food scraps from the cafeteria and leaves that were added at the composting sight, were then composted by the Agricultural Research Service (ARS). We are currently waiting for the final outcome of the composting activities in order to determine the level of savings to the Government.

Biobased products for the pilot cost \$14,367.42 with total freight charges of \$952.83. USDA's part of the overall cost was 66% or \$9482.50 and the cafeteria contractor's portion was 33% of or \$4884.92

The team that conducted the pilot was very diverse. It consisted of representatives from the Department's Departmental Administration, ARS, Agricultural Marketing Service, and the current contractor for the USDA cafeteria. In addition to USDA representatives, representatives from the Environmental Protection Agency also participated.

We feel that the pilot was an overall success. We were able to try out many products that will impact the development of the department's new food service solicitation.

Table 1. Items Used in the 2005 USDA Whitten Cafeteria Biobased Product Pilot Project

7" Sturdy Bagasse Plates	Sugarcane, composts in 45 days
9" Sturdy Bagasse Plates	Sugarcane, composts in 45 days
12 oz Cold Cup - Made from Corn	Corn, composts in 45 days
20 oz Cold Cup - Made from Corn	Corn, composts in 45 days
24 oz Cold Cup - Made from Corn	Corn, composts in 45 days
Flat Lid with Straw Slot for 12/20 oz - Made from Corn	Corn, composts in 45 days
Flat Lid with Straw Slot for 24 oz - Made from Corn	Corn, composts in 45 days
9" x 12" Tray - 99.9% Recycled Content - Biodegradable	Recycled paper, composts in 60 days
2-Cup Carrier - Recycled - Biodegradable	Recycled paper, composts in 60 days
12 oz Bagasse Bowl	Sugarcane, composts in 45 days
32 oz Clear Cylinder Food Container - Made from Corn - No Hot Foods	Corn, composts in 45 days
16 oz Hot Food Container - 99.9% Recycled Content	Recycled paper
12 oz Hot Food Container - 99.9% Recycled Content	Recycled paper
8 oz Hot Food Container - 99.9% Recycled Content	Recycled paper
16 oz Clear Cylinder Food Container - Made from Corn - No Hot Foods	Corn, composts in 45 days
8 oz Clear Cylinder Food Container - Made from Corn - No Hot Foods	Corn, composts in 45 days
Lid for Clear Cylinder Food Container - Made from Corn	Corn, composts in 45 days
12 oz Bio-Coated Hot Cup - Biodegradable	Recycled paper with vegetable-based coating, composts in 60 days
16 oz Bio-Coated Hot Cup - Biodegradable	Recycled paper with vegetable-based coating, composts in 60 days
Hot Cup Jacket - Recycled - Biodegradable	Recycled paper, composts in 60 days
12 oz Recyclable Plastic Water Cup	Plastic, not compostable (see 12 oz corn cup)
8" Thin Straw - Made from Corn	Corn, composts in 45 days
Corn Fork - Not for Hot Food	Corn, composts in 45 days
Fork - Heat-stable	Plant cellulose and limestone, composts in 120 days
Corn Spoon - Not for Hot Food	Corn, composts in 45 days
Spoon - Heat-stable	Plant cellulose and limestone, composts in 120 days
Corn Knife - Not for Hot Food	Corn, composts in 45 days
Knife - Heat-Stable	Plant cellulose and limestone, composts in 120 days
Plastic Lid for 16 oz Hot Food Container	Plastic, not compostable
Plastic Lid for 8/12 oz Hot Food Container	Plastic, not compostable
Black Plastic Lid for 16 oz Bio-Coated Hot Cup	Plastic, not compostable

Case Studies: Keys to Successful Large Institutional and Municipal-Scale Food Composting

Keys to Success of San Francisco Food Composting & Compostable Product Ware Use

Jack Macy
Commercial Recycling Coordinator, SF Environment
City and County of San Francisco

The City and County of San Francisco, in partnership with Norcal Waste Systems, its exclusive service provider, developed and implemented a citywide source-separated composting program of food scraps, plant trimmings and other compostable products. Compostables are collected from residents and commercial/institutional generators, hauled to Norcal's regional composting with the resulting compost used by organic growers and sold to farms, vineyards, golf courses and landscapers, who close the nutrient recycling loop by selling their products back into the city. San Francisco's commercial food composting collection started as a demonstration in 1996 and its residential composting started citywide roll-out in 2000 after 2 ½ years of ongoing pilots. The composting program now serves 150,000 households and 2000 businesses and institutions and diverts more than 300 tons per day of organics consisting mostly of food and related food service ware and packaging. This presentation will review the following keys to commercial/institutional food composting program success:

1. Establish policies and goals to drive programs, achieving high diversion and greater sustainability.
2. Create a beneficial public/private partnership with mutual goals.
3. Provide financial incentives to both generators and service providers to achieve goals.
4. Target a wide range of food and other compostables, starting with easier to recover material.
5. Avoid start and stop pilots, test and demonstrate programs and expand and modify as needed.
6. Design a clear color-coded sorting, collection container and image graphic education system.
7. Give generators options for containers and collection service, including up to daily service.
8. Develop composting and recycling programs to minimize contamination and maximize recovery.
9. Eliminate disposable food service ware through using reusable, compostable or recyclable products.
10. Require that food service products (e.g., bags, cutlery, clear cups, deli containers) be independently certified compostable (e.g., BPI) or made of plant fiber in order to be accepted for composting.
11. Get management buy-in at all levels to make program routine and a basic job responsibility.

12. Provide on-site program set-up assistance, including sorting containers, signage, and multi-lingual staff and management training to address constraints (e.g., space) and any concerns (e.g., mess) and make the program as convenient as possible.
13. Monitor contamination and give quick feedback and assistance to ensure quality control.
14. Create high quality compost, such as certified for use by organic growers, and close the loop with resulting produce or other products being used by program generators.
15. Provide recognition for excellent program participation and results and get good press.
16. Improve collection, processing, and product quality and diversity for sustainable benefits.

Case Studies: Keys to Successful Large Institutional and Municipal-Scale Food Composting

In-Vessel Composting The Wright Way

Bob Kerlinger, President
Mid-Atlantic Composting Association

There are many challenges to consider and overcome when designing a food waste to compost system. The main one of course is control of odors and then project cost, transportation options, maintenance and operating cost, what type of compost system will work best for your situation, space needed, and the list goes on and on.

There are also many reasons why you would want to seriously consider the in-vessel option.

1. Because there is air continuously being pumped through the system and then through a biofilter, there is no odor and the only bi-products of the process are heat and moisture.
2. The system is very flexible size wise and can be built to handle from 600 pounds a day to 30 tons per day. For larger inputs, additional units can be added.
3. It is a continuous flow-through system, which gives the operator the flexibility to put in more or less feedstock, as the daily situation requires.
4. Operating cost is very low, as the system requires very little energy and manpower to operate.
5. Maintenance cost is very low because the entire inside of the system is made of stainless steel.
6. Leachate recirculation eliminates ground water contamination

Refer to our website, www.wrightenvironmental.com, for additional information.

In-Vessel Systems, City of Hutchinson, MN, & Schools

Jim McNelly, President
Renewable Carbon Management

In 1999, The City of Hutchinson, Minnesota was one of the first communities in the United States to organize a program for collection and containerized, in-vessel composting for source separated food scrap organics. This dual compartment compactor collection program is significant in that the feedstocks were derived from not only residences, but from commercial and institutional generators as well.

With initial resistance to the cost of compostable bags certified by the US Composting Council, the city had mixed results from using lower cost chemical and photo-degradable bags. The volume of non degraded plastics posed problems in the form of fugitive plastic debris blowing around the composting site and excess contamination in the oversize material after screening.

In addition to non-degrading "degradable bags", the plastic volume in the compost was compounded by several other types of plastics. These included paper diaper back-sheets, food wrappers, condiment cubs, juice boxes, plastic straws, and LDPE bags full of pet feces and table scraps. The pre-consumer industrial, commercial and institutional organics were relatively clean from plastics as there was an effective education program as these generators typically used bins instead of bags for organics. However, the post consumer organics derived from meal services at hospitals, schools and large businesses were heavily contaminated with food wrappers and condiment containers, even to the extent that the collection program at the high school was abandoned. In addition, these waste streams were contaminated with other materials such as metal cutlery and broken drinking glasses.

Two years before the start of the household organics program, the city had initiated an aggressive home composting program and municipal organics drop off system, eliminating the separate collection of yard trimmings. The city did not desire to resume leaf and grass clipping collection, expressing a desire to process yard trimmings separately from household organics in order to have a major portion of the finished compost stream less contaminated, separate from the more contaminated household organics. This plan, however, was met with resistance from citizens as they invariably included leaves, grass and yard debris in the curbside household organics containers.

The net result of the project was that such a program is feasible in reducing the volume of land filled waste but a challenges was encountered in the area of public education, resulting in varying degrees of contamination with non compostable materials. The city's in-vessel containerized composting was capable of processing and composting the organics, but the net result of contamination in the compost as well as in the oversize material has led the city to consider further processing of the compost using density and air separation methods typically reserved for mixed waste composting.

An Economic Analysis of Composting

Nadine H. Davitt
Organic Materials Processing and Education Center
The Pennsylvania State University

Economic analysis provides a means for establishing costs of production and profitability. Determining costs is a step process that begins with identifying types of costs, labor productivity and allocation of labor/equipment/supplies to specific tasks. While an employee is present and paid for eight hours of work, actual productivity is less due to travel time, breaks, and time associated with start up/end work day. The hourly labor rate needs to reflect costs associated with non-productive labor hours, fringe benefits and replacement labor for vacation/sick leave. Establishing the cost of equipment includes: estimating the life of the machine, accounting for principal, interest, routine maintenance, fuel and major overhauls. Labor and equipment allocation by task identifies the actual cost of each step in a process and can provide critical information when evaluating profit margins. Scenarios illustrating how to establish labor and equipment costs and net income per windrow will be discussed. The presentation will outline considerations for establishing costs of production and discuss how to collect/generate data needed for conducting a cost analysis. The steps presented will be applicable to any operation with source specific data.

New York State Correctional Facilities Composting Operations

James I. Marion
Resource Management Director
NYS, DOCS

This presentation will include the scope and technologies of Organic Waste composting in the New York State Department of Correctional Services.

The program includes 32 composting sites serving 56 of 70 Correctional facilities in the State system with a population of 65,000 inmates and 30,000 staff. During Fiscal Year 2005-06 approximately 14,000 tons of food and wood waste will be processed with an avoided disposal cost of \$2.2 million.

Technologies include; open windrows, covered windrows, aerated bay and in-vessel systems. Ancillary operations include mixing, screening and horticultural applications of finished products. The prison system also composts cattle mortalities from 10 prison farms and slaughterhouse waste from 600 animals per year.

The discussion will compare differing technologies for product quality, capital expense and site specific requirements. Product nutrient and agronomic values will be offered.

The New York DOCS has piloted three different biobased products for service ware and waste bags. The results have all been such that no biobased products are now in use in the system for a variety of performance and economic reasons.

Biobased Products Development, Supply, and Procurement: Meeting Quality Standards and Product Demand

Panel: Industry Perspectives: Ways to Move Forward

Biobased Products: Opportunities and Issues for Growth

Steven A. Mojo, Executive Director
Biodegradable Products Institute

BPI Background

Current Status for compostable products

1. Appropriate Standards/Specifications for compostable products
 - a. ASTM D6400: Specification for Compostable Plastics
 - b. ASTM D6868: Specification for Biodegradable Plastics on Paper and other Compostable Substrates. (Similar to EN 13432)
 - c. ASTM D6852-02 Standard Guide for Determination of Biobased Content, Resources Consumption, and Environmental Profile of Materials and Products
 - d. ASTM D6866-05 Standard Test Methods for Determining the Biobased Content of Natural Range Materials Using Radiocarbon and Isotope Ratio Mass Spectrometry Analysis
2. Large Scale Source Separated Composting Programs are coming on line
 - a. San Francisco & Pacific NW
 - b. NJ & Mass (commercial and preconsumer materials)
 - c. Canada: Toronto suburbs; PEI and NS
 - d. Large venue recycling law in California to promote diversion
 - e. Industry still under development
3. Interest in compostable products growing rapidly in US and Canada
 - a. 9 bag manufacturers and 4 vendors of food service items
 1. Double vs. 2003
 2. All meet ASTM D6400 or ASTM D6868
 - b. Product compositions span the range from little or no renewable content to 100% renewable.
 - c. Major suppliers, such as Heritage Bag; Poly-America & Fabri-Kal
 - d. More on the way, including traditional paper products and other forms of biomass.

4. Labeling & Confusion

- a. Labeling laws in California for plastic bags
- b. Some manufacturers are still mislabeling products of PE (and other commodity resins) as “biodegradable”, “compostable” or “biodegrades in landfills” because they contain additives
- c. Significant consumer misperception that
 - 1. “biobased” or “natural” = “biodegradable/compostable”
 - 2. “petroleum based or synthetic” ≠ “biodegradable/compostable”

Issues to Growth:

- 1. Composting and source separated collection infrastructure need further development and expansion
- 2. What are the lifecycle benefits of food scrap diversion, compost and composting?
- 3. Economic benefits of diversion programs are not apparent to purchasers of foodservice operators
- 4. Biobased resins face resistance from recycling community
- 5. Labeling and USDA regulations for “biobased” products not yet finalized. Potential to increase confusion.

Earthshell

John Nevling
Earthshell Corporation

and

Cindy Eikenberg
Marketing Communications Manager
Earthshell Corporation

1. Introduction to EarthShell
2. Federal Procurement Guidelines – EPP and Biobased Products – How EarthShell Fits
3. EarthShell’s Continued Work with the Government – EarthShell/USDA CRADA
4. Current EarthShell Products and Availability

Biodegradable Cutlery Products and the True Composting Link

Li Nie
MGP Ingredients, Inc.

MGP ingredients has developed filled composite resins for disposable products for cost reduction, enhanced properties, and enhanced biodegradation. Product applications include films, thermoformed packaging shells and food service trays, molded articles. We will give some discussion about the pros and cons of starch filled system, formulation, compounding, molding, properties, Bees analysis, composting result for injection molded cutlery.

Biodegradability is a material property that has its own functional applications. Compostability has to do with organic waste management. Biobased product has to do with sustainability and its economic viability. Each one has its own driver for market growth. It is also necessary to make the connection between biodegradability and compostability.

Plastic products in organic waste are not the problem until organic waste is composted. Without municipal organic waste composting, there is no strong perceived need for biodegradable and compostable plastics in organic waste management. Biodegradable plastics is not the driver for organic waste management. Organic waste management by composting demands mixed in plastics be compostable. Compostability of biodegradable products can show its functional benefit for ease of sorting with organic waste and not messing up the organic humus after composting. Compostable products can also show benefit of overall reduction of waste that has to be managed by other means.

As an industry involved in this side of the business, we believe strongly the role government plays in implementing sound policy and promoting responsible management of solid waste. Society has to reject the way of improper part of landfilling practice by burying organic waste. Society has to learn from the practices of sewage water treatment, animal farm waste management, yard waste management, farmer's way of handling to see what can be done with household organic waste management for urban dwellers. It is government's job to implement sorting program and compostable program for organic waste and compostable waste. It is good for our future. It creates new businesses and jobs. Composting is the most important driver for expanding demands for compostable products by making biodegradability a functional requirement and benefit instead of just perceived environmental benefits.

Panel: Customer Perspectives on Biobased Packaging and Cafeteriaware Needs and Opportunities

Army and Navy Environmental Research Programs for the Reduction of Solid Waste

Jo Ann Ratto, Materials Research Engineer
U.S. Army Natick Soldier Center
Nanomaterials Science Team

Army, Air Force, and Marine Corps consume approximately 46.6 million operational rations each year generating 14,117 tons of packaging waste. Due to the operational requirements for combat rations (i.e. air-droppable, minimum three year shelf life at 80°F, six months at 100°F), the rations must be packaged appropriately to meet these requirements. Shipping containers fabricated from fiberboard and coated paper are necessary to safely transport and store food and other military items for all warfighters including sailors on Navy vessels. This new study which will start this fiscal year through support of the Strategic Environmental Research and Development program will produce new lightweight fiberboard materials, biodegradable polymer-coated fiberboard and paperboard that can be converted to a valuable byproduct, compost. These environmentally friendly materials are expected to meet the operational and performance requirements of combat ration packaging. Composting trials will be ongoing throughout this program to determine how quickly new coated paper and fiberboard formulations biodegrade and if these packaging materials used in combination with other waste (e.g. food waste, grass clippings, leaves, bark etc.) can generate a compost product that could be ultimately sold or given away as a soil conditioner to benefit the local community. Previous research studies involving biodegradable materials, their processing and characterization for the Army and Navy will also be mentioned.

Biodegradable/Compostable Plastics

Ramani Narayan
Department of Chemical Engineering & Materials Science
Michigan State University

Biobased and biodegradable plastics can form the basis for an environmentally preferable, sustainable alternative to current materials based exclusively on petroleum feedstocks. These biobased materials offer value in the sustainability/life-cycle equation by being part of the biological carbon cycle, especially as it relates to carbon-based polymeric materials such as plastics, water soluble polymers and other carbon-based products like lubricants, biodiesel, and detergents.

Biopolymers are generally capable of being utilized by living matter (biodegraded), and so can be disposed in safe and ecologically sound ways through disposal processes (waste management) like composting, soil application, and biological wastewater treatment. Single use, short-life, disposable products can be engineered to be biobased and biodegradable. The need for such products to be fully biodegradable in a defined time frame in the selected disposal infrastructure as opposed to degradable or partially biodegradable is reviewed. In particular, data is reviewed to show that degraded polyolefin fragments can cause irreparable harm to the environment. Emerging ASTM and International consensus standards on biobased content, and biodegradability is presented.

Customer Perspectives on Biobased Packaging and Cafeteriaware Needs and Opportunities

Ken Letherer
Whole Foods Market

Whole Foods Market has been working on creating a full circle composting program. We recently had a store in California go through an entire day and not generate a single piece of trash that would end up in the landfill. We will discuss the challenges and continued opportunities involved in making this happen.

We will disclose our business philosophy of environmental stewardship as it is one of our company's core values.

Our purchasing needs for biobased packaging will come close to 60 million dollars in the next four years. With this need comes many concerns and challenges that we will put forward in this round table discussion. One of the concerns is compostable vs. biodegradable.

There are other retailing facility opportunities including private label selling of cafeteriaware to the general public.

Panel: Compost Product Users, Stakeholder Education and Information

What the Horticulture Industry Needs in Regards to Composted Products

Marc Teffeu

Director of Research and Regulatory Affairs

American Nursery and Landscape Association & the Horticultural Research Institute

Use of composted organic products in the production of nursery and floricultural crops has become an established and accepted industry practice over the last 20 years.

The three most common applications of composted materials in the industry are:

1. Application, as a soil amendment, in the production of field grown nursery stock and as a mulching material for weed control.
2. Use as a substrate component in the production of container grown herbaceous perennials, woody plant material and annual flowers.
3. As mulch and also a soil amendment in landscape planting establishment and maintenance.

Each of the final end users of a composted product requires specific quality and characteristics for that product. No matter what the final end use of the material, however, **Quality** and **Consistency** are the two issues that impact on composted material uses in the production of ornamental crops. Quality, in terms of the biological, chemical and physical characteristics of the composted product and Consistency in terms of how well a standard of product is maintained over time and its market availability.

Extensive research on the characteristics of both plant and animal source composts and use in specific ornamental cropping systems has given the horticulture industry a baseline from which to establish the most appropriate uses of composted products. The introduction into the composting stream of new sources of compost feedstocks, such as cafeteria-ware and solid waste based products, represent a new opportunity to explore the appropriate use of these materials in plant production. Quality and consistency of these products along with a research based understanding of appropriate uses will drive the horticultural industry marketplace acceptance of these and any new composted materials.

Education and Information: Greenscapes, Roof Gardens, Rain Gardens, Compost Berms, Stormwater Management

Rosalie Green
Office of Solid Waste
US Environmental Protection Agency

The prospect for food composting for Federal facilities in the Washington, D.C. area is almost accomplished, that is, there has already been two successful pilot programs: one several years ago at the Department of Interior cafeteria on 18th street, N. W. and the second completed this year at the USDA Whitten Building cafeteria. The success in both cases rested on:

- 1) training sessions with the employees who prepared the food and the employees who served and discarded the food;
- 2) preparing educational materials designed with EPA, OSW for customers of the cafeterias explaining which tableware/food waste to place in the vividly labeled receptacles and what the purpose of the collection for compost production would be....plus a clear explanation of what compost was and what compost was not (handout entitled "Compost: what is it?; and, "what's it to you");
- 3) monitoring of customers and staff for at least the first week to answer questions and watch disposal of compostables;
- 4) pick up and transportation was scheduled. Some Federal agencies have trucks and drivers available; and,
- 5) The conversion from food waste, soiled paper, and biodegradable grain-based tableware to organic, high humus, STA-certified compost was able to occur only because USDA had a compost research facility directed by Dr. Millner at Beltsville, MD., as part of their 600 acre campus. The compost equipment is suitable only for small compost research volumes.

The only reasons that a Federal food composting is not now in progress are:

- 1) more staff;
- 2) official information coordination and distribution of results with EPA, OSW;
- c) a few pieces of larger equipment;
- d) 50 acres on the outside edge of USDA's 600 acres adjacent to a state road. The last reason is the most important.

My presentation on Green Roofs will highlight one important use of compost. Some of the larger Green Roof programs such as Portland.

Oregon's Eco-roof uses 1/3 compost, 1/3 soil, 1/3 perlite (or expanded mineral material) as the growth medium for their Green Roof Program. Green Roofs are a matter of national importance since they can save 1/2 of a building cooling/heating, therefore, saving energy and reducing greenhouse gases (GHG); retaining an average of 60% of stormwater in plants and growth media, and many other benefits.

Appendix F

EVALUATION SUMMARY

Food and Biobased Cafeteriaware Composting for Federal Facilities in Washington, DC

1. **What are the positive aspects of the meeting?**

Multi-stake holders in one meeting
Open panel discussions
Opening, sharing of ideas and good scientific discussion
Good cross section of government, producers and users
Panel discussion and Q&A
Good presentations
Advancing the dialogue
Great content, speakers; thank you—very informative
Drawing together of wide variety of stakeholder, vendors, practitioners, regulators, researchers, government
A lot of activities on composting
A good mix of people, ideas, expertise, and viewpoints. Presentations covered the many facets of the problem.

2. **What are the negative aspects of the meeting?**

Too short for real follow up; upload presentations prior to event
Not enough time for speakers or time between the speeches for conversations and questions
Not enough time to network; not sure what next steps will be to deal with identified issues
Follow up will be key
Would like list of attendees
Perhaps too broad coverage but good way to “smoke out” issues
Content should have been divided over 1 ½ days...
Way too short time frames for presentations; need at least ½ hour per speaker; need 2 to 3 days for interchange; what is the action plan from the gathering?
Lack of people on landfill business
Time management could have been better. It was a packed agenda with little margin for error time-wise. There were a lot of presentations, without much time for interaction and questions. The discussion periods were valuable, but time for questions after each presentation would have been useful. There wasn't enough time for “mingling” and networking—several people slipped away before I had a chance to chat with them, and I left early as well.

3. **Should a follow-up symposium/workshop be held in 2006?**

Yes_XXXXXX!!x_____ No__x_____

Yes, if there has been sufficient progress/change to warrant one. It might be useful to focus a follow-up on just a couple of issues.

4. **If Yes, when and where?**

B/W area is ok; Central US better...Chicago?

After publishing of new grouping

Depends upon objectives and Issues

Same place in November, early December

DC area is good to include government drivers of policy changes

Every few years

Same location is ok; site with more room might be better. It might be helpful to start right after lunch one day and finish at lunch the next—that might cut down on the number of late arrivals/early departures.

5. **If yes, potential topics/speakers should be considered**

Working programs; issues/obstacles to start up of Federal programs

Suppliers of biobased/compostable base resins (metabolics/BASF/Dupont/Natureworks LLC/etc.)

Start with hot topics identified this year; continue to advance discussion

End user marketing

Bioretention emphasis

Pathways to action—local, national, state

Regulators to explain process of new regs—Federal and state

Qualitative research results

Maturity specs—field tests

People from landfill business

Case studies of composting in DC/VA/MD area. Specific obstacles to composting in DC/VA/MD area (land cost, population density, etc.). Siting and regulatory issues, especially in DC/VA/MD area.

6. **I will volunteer for the organizing, sponsorship or other committee:**

sponsorship or contact and organizing help [no name]

Yes—Glen Johnston, Natureworks LLC

Yes—Steve Mojo, BPI; I will be happy to work on/or organize committees to help deal with identified issues that are relevant to compostable products.

Jim Marion, NYS DOCS

Appendix G

LIST OF ATTENDEES

Speaker contact information is available in the program in Appendix B

PARTICIPANTS

Dana Arnold, Chief of Staff
Office of the Federal Environmental Executive
White House Task Force on
Waste Prevention and Recycling
Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460 USA
(202) 564-9319
(202) 564-1393 fax
arnold.dana@ofee.gov

Alan Boehm
Chesterfield Farms
Organic Recycling Facility
1230 Cronson Boulevard
Crofton, MD 21114 USA
(410) 721-7206
(410) 721-7207 fax

Stuart Buckner, Executive Director
U.S. Composting Council
4250 Veterans Memorial Highway
Suite 275
Holbrook, NY 11741 USA
(631) 737-4931
(631) 737-4939 fax
buckstop@vdot.net

Maria L. Cayuela, Research Chemist
Dept of Soil & Water Conservation & Waste

Management CEBAS-CSIS
Council for Scientific Research
Campus Universitario de Espinardo
Murcia 30100 SPAIN
+34 968396261 voice
+34 968396213 fax
mlcg@cebas.csic.es

Lynne R. Harris, Vice President, Science and Technology
The Society of the Plastics Industry, Inc.
1667 K Street, NW
Washington, DC 20006-1620 USA
(202) 974-5217
(202) 296-7005 fax
lharris@socplas.org

Robert R. Hedberg, Science Policy and Legislative Affairs Advisor
USDA, Cooperative State Research, Education and Extension Service
Jamie L. Whitten Federal Building, Room 305-A
1400 Independence Avenue, SW
Washington, DC 20250-2201 USA
(202) 720-4118
(202) 720-8987 fax
rhedberg@csrees.usda.gov

Glenn Johnston, Global Regulatory Manager
PO Box 5830, MS 114
Minneapolis, MN 55440-5830 USA
(952) 742-0457
(952) 742-0477 fax
glenn_johnston@natureworkslc.com

Ronald F. Korcak, Associate Area Director
Beltsville Area Director's Office
Agricultural Research Service
Building 003, Room 223, BARC-West
Beltsville, MD 20705 USA
(301) 504-5193
(301) 504.5863 fax
KorcakR@ba.ars.usda.gov

Benjamin M. Locke, Director

Government Programs
Metabolix
21 Erie Street
Cambridge, MA 02139-4260 USA
(617)492-0505 x217
(617) 492-1996 fax
locke@metabolix.com

Sarah Matheson, Secretariat, Environmental and Social Sustainability
Environment Department
The World Bank
1818 H Street, NW MSN MCS-523
Washington, DC 20433 USA
(202) 473-5635
(202) 477-0565 fax
smatheson@worldbank.org

Kenneth R. Meardon, Principal
MACTEC Federal Programs, Inc.
MACTEC Engineering and Consulting
5001 South Miami Blvd, Suite 300
Durham NC 27703 USA
(919) 941-0333
(919) 941-0234 fax
kmeardon@mactec.com

Rich Mills, Business Development Manager Foodservice
NatureWorks LLC
638 Eaton Circle
Superior, CO 80027 USA
(952) 742-0611 office
(301) 437-3887 cell
(410) 510-1585 fax
rich_mills@natureworksllc.com

Sandy Morgan, Engineering Project Manager
USDA, Agricultural Research Service
Facilities Division, Facilities Engineering Branch
5601 Sunnyside Avenue, MS: 5125
Beltsville, MD 20705-5125 USA
(301) 504-4895
(301) 504-1220 fax
smorgan@ars.usda.gov

Robert R. Serrano, Deputy Area Director
USDA, Agricultural Research Service
10300 Baltimore Avenue
Building 003, Room 203, BARC-WEST
Beltsville, MD 20705 USA
(301) 504-5392
(301) 504-5474 fax
bserrano@ars.usda.gov

Dr. J. L. Willett, Research Leader
Plant Polymer Research
National Center for Agricultural
Utilization Research
USDA/ARS
1815 N University
Peoria, IL 61604 USA
(309) 681-6556
(309) 681-6691 fax
willetjl@ncaur.usda.gov