

COMPOST MARKETS

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INTRODUCTION

With the increasing awareness of composting becoming a part of the infrastructure of solid waste management in the United States, the major question of universal concern is what and where are the markets for compost. This paper will set forth general principles which guide RECOMP Inc.'s market developments and then specially focus on real applications under four classifications, residential retail, horticultural, agricultural and land reclamation, including the specifications for each class that the compost must meet for acceptability.

The real issue on markets is the historic lack of organic material to fulfill the unmet needs of the market. For instance, the U.S. Soil Conservation Service has estimated that more than three billion (3,000,000,000) tons of topsoil are lost every year to various forms of erosion [1].

The total municipal solid waste stream generated in 1988, as reported by the USEPA, was 180 million tons [2]. If one third (60 million tons) were composted and one half of that amount (30 million tons) was final compost to market, one can readily see that there are many more markets for organic soil amendment than there is supply, although the perception is the reverse. A recently completed study, the potential U.S. compost applications study, confirms this view [3]. Thus, the real needs for organic material are largely going unmet and the many benefits to society have been lost.

In harvesting trees and shrubs, approximately 250 tons of topsoil are removed per acre with each crop. A lesser amount of topsoil is removed with each crop

of sod [4]. Replacement for these applications would require 65 tons of compost per acre.

Minnesota alone has approximately 25,000 acres of taconite (iron ore) tailing (residue left from mining) land that would benefit from compost material at loading rates of approximately 20 tons per acre. Although 20 tons/acre is a very low application rate, these tests were carried out utilizing the 20 tons/acre rate. The projected ultimate area for tailings reclamation is 40,000 acres. Tests are currently being conducted in the state utilizing MSW compost.

Usage of compost by the Minnesota Department of Transportation (MnDOT) is currently averaging 240,000 cu yd/year. The compost is utilized in landscape planting such as trees and shrubs, top dressing of lawns and roadsides, to enhance native soils on site prior to landscaping and as a nutrient source when establishing vegetative cover.

Traditional sources of soil amendment are not filling the total need for organic material. Current emphasis on wetland protection makes the long term availability of some traditional soil amendments, i.e., peat, questionable. Nontraditional sources, such as green manure cropping, organic commercial and industrial by-products, sewage sludge and MSW composting will help to fill the gap. Traditional sources tend to be capital (nonrenewable) resources whereas most nontraditional sources tend to be renewable, thus a virtually unlimited resource to supply quantities of material.

Because the conversion of municipal solid waste (MSW) and other organic materials is a nontraditional source of soil amendment, or humus, in this country, there is also a need to establish standards for various

categories of soil products. Current regulations on traditional sources, such as black dirt and peat, tend to be either restrictive or not relevant. Both industry (market) standards and regulatory agency standards will insure uniformity by type of material as it relates to the market, or usage, of that material.

To fully compete with traditional soil amendments, MSW compost must meet the market demands. Comprehensive specifications established on a national basis should not only specify levels of contaminants and particulates, they must also specify maturity, nutrient value and texture consistent with the specifications in place for traditional products. In essence, there must be a level playing field. The Solid Waste Composting Council in Washington, D.C., an organization established in 1990 to promote composting, has been working on the formulation of uniform, nationally recognized standards for compost over the past 2 years. The goal of the Council is to assist the United States Environmental Protection Agency (USEPA) in the establishing of realistic specifications governing compost.

MARKETS

The marketing strategy of RECOMP, Inc. divides the markets into the four categories of retail, horticultural, agricultural and land reclamation. While not mutually exclusive, these categories reasonably divide consumers into groups that have similar expectations, such as consistency from batch to batch, of the product although each compost market has its particular specifications that must be met if they are to use the product. In the following paragraphs, we will describe each group and their basic expectations of the product.

Retail

The retail market consists of residential landscapes and gardens as well as the bedding plant portion of the nursery market.

The retail market is perhaps the most difficult to access. Homeowners tend to be rather selective about the materials they purchase for use on their property. Compost sold in a retail market must meet Minnesota Pollution Control Agency (MPCA) specifications for Class I compost (unlimited distribution). Attempting to use Class II material (restricted distribution) in this market creates problems with permitting, tracking and delivery that the homeowner is reluctant to deal with. Beyond these problems, the very term Class II creates the image of an inferior product.

Maturity

To meet MPCA Class I compost specifications, the product must have achieved a sixty percent (60%) reduction in the Total Volatile Solids (TVS) as measured per EPA method 160.4 as a percent of Total Solids (TS) as measured per EPA method 160.3. The calculation of TVS reduction is done using the Van Kleeck equation (constant ash) comparing the TVS value of the incoming feedstock with that of the compost prior to finish screening.

From the perspective of compost application, biological activity is the main concern. To apply compost at heavy rates, the material must be stabilized to the point that it is not utilizing nitrogen that would otherwise be available and to not produce by-products that could be detrimental to plant health.

Though not easily qualified, assessment of biological maturity becomes a function of feel and smell. Compost should not produce significant heat in the presence of optimum composting conditions, i.e., sufficient quantity of material to provide an insulated mass, a moisture content of 30–40% and oxygen to provide aerobic conditions.

Moisture and Texture

The retail market prefers a material with a 30% moisture content and a loose, crumbly texture. Ideally, the final screening of the product could be done at 0.5 in. and 0.75 in. sizes followed by a destoning operation to remove inert material. The reality is that to meet the demand for a clean product for the retail market, it is necessary to screen at 0.25 in. to remove virtually all visible inert particles.

Another method to reduce the size of the inert particles is to hammermill the finished product. The problem with this method is that the compost texture is destroyed. After hammermilling, the compost has a gritty, silt-like feel decreasing its porosity. With the larger particles eliminated, the compost does not significantly fluff the soil or increase the available air spaces. Hammermilling also decreases the compost's ability to enhance soil friability (crumble factor).

Nutrient Value

The consumer that is not acquainted with utilizing compost appears to be rather surprised when they learn that compost contains only 1–2% total nitrogen and 0.25–0.5% phosphorus and potassium. A common notion seems to be that compost is a miracle fertilizer. In dispelling this myth, one must explain that while the total N–P–K is relatively low, the true value of compost is in the organic matter and microbial activity that it imparts to the soil and that these are the properties that

will, in fact, promote healthy plant growth through increased tilth and water holding capacity.

Availability and Delivery

To implement a successful compost marketing program, it is important to maintain adequate inventories to supply material upon demand. As landscape applications are dependent upon weather conditions, most deliveries must be made within a rigid time frame. Most of the landscape work will be done in the Spring, early Summer and Autumn. With this in mind, you must have access to the compost stockpile through the semi-annual freeze and thaw cycles. Having 5000 cu yd of compost stockpiled in an inaccessible area will not do much good for you or your customer.

The timely delivery of compost requires readily available transportation methods. For most retail applications, a 12 cu. yd capacity, tandem axle dump truck will do nicely. Depending upon the size of the operation and the targeted markets, it may be worthwhile to have your own truck. If not, the establishment of a comfortable working relationship with a reliable contractor is most beneficial.

Contaminants

Because retail markets deal directly with the public and have no control over how the products are used, they are wary of contaminants. Inert particles, i.e., glass and plastic, are of first concern. These are followed closely by heavy metal content. The need for low inert content, low heavy metal content material makes the retail market the most difficult one to reach with MSW compost. It can be done but, a careful analysis of the cost effectiveness of the processing requirements must be performed.

Application

When used for landscaping and gardening, application rates generally range from 200 to 400 cu yd of compost per acre (135–270 tons at 1200–1300 lb/cu yd). If incorporated to a depth of 6 in. into the original soil, this equates to a 4:1–2:1 ratio of soil to compost by volume.

For landscaping applications, compost is usually delivered to site by dump truck, spread by utilizing a skid-steer front end loader (such as a Bobcat) and incorporated by use of a rotary tiller either hand operated or towed. In nursery bedding plant applications, the compost is usually premixed and applied by batch depending upon which plants are being planted.

Horticultural Applications

The horticultural market consists of commercial landscaping projects, highway beautification (medians and shoulders) and nursery stock plantings.

Maturity

Maturity requirements for these markets are the same as for the retail sector. A stable product what will not rob nitrogen from the plants or produce phytotoxic effects.

Moisture and Texture

Again, these parameters are similar to the retail grade product but, due to the large scale nature of these applications, the texture can be slightly more coarse. Moisture content must remain at approximately 30% to allow for proper handling and incorporation.

Nutrient Value

As with the retail market, the nutrient value should be consistent and comply with the specifications supplied by the end user.

Availability and Delivery

Large scale consumers require large quantity deliveries and, as we have seen, the majority of the product is used in the Spring and early Summer. With product demand being very intense for a short period of time, we have found it effective to contract with haulers for deliveries of material.

The product is shipped to the various application sites by 30 cu. yd, end dump trailers. We have found that given the relatively short haul (most sites are within a 50-mile radius of the facility), we can turn between three and four loads per truck per day. Using these 30 cu. yd capacity trucks can, at times, be tricky due to poor access, road restrictions and poor site conditions. Careful planning of delivery times and routes helps to eliminate these problems.

Contaminants

This parameter is the major difference between commercial and retail markets. As the product used on commercial projects tends to have less human contact, small particles of glass and plastic have less impact on product acceptability. The exception to this is nursery stock plantings which will eventually find their way into the hands of the public. All product must, of course, meet the specifications of the ultimate end user, i.e., inert material content, set up by the Minnesota Department of Transportation or other agencies whose projects the landscape contractor is working on.

The issue of heavy metal content also varies with the type of project. A compost that is specified as Class II, due to heavy metal content, by MPCA, may be quite suitable for large scale landscape projects if the size of the project warrants permitting the site and all other parameters set forth by client are met. Using material that is high in metals on applications like this, effec-

tively keeps the metals out of the food chain and in place at the application site.

A product with elevated heavy metals is generally not acceptable on highway landscape projects in Minnesota and the use of such product has not been attempted with nursery stock.

Application

As applications of compost at these projects is basically a one time application, they tend to apply compost at the upper end of the 200–400 cu. yd/acre range as described under retail markets.

Skid steer or front end loaders are generally used to spread the compost after delivery and then incorporated. Nursery stock plantings are usually done on a large field. Compost is spread and then incorporated into the soil. Rates of application for nursery stock tend to follow the 200–400 cu. yd/acre range.

Agriculture

Agricultural markets currently established by RECOMP, Inc. are in the secondary and nonfood chain crop areas. We have experienced great success in field trials using feed corn as the crop. Further testing on corn and full scale testing on Christmas trees is due to commence in 1992.

The current attitude in the agricultural community is that compost is marginally cost effective at \$4.00/cu. yd plus delivery. If one were to implement a “give-away” program, there can be little doubt that all the compost produced at composting plants would be consumed with relatively little marketing effort.

The additional testing that we have planned should help to reveal the true long term value of compost applications in agriculture and that its use is cost effective.

Maturity

For annual agricultural applications, a less mature product can be successfully used. This is due to the repetitive low rate of application associated with such use. At the lower rates, the robbing of nitrogen from the crop is much less severe and phytotoxicity problems are less likely to occur.

It is also the case that while the compost may be delivered when not completely mature, the user can further compost the material on site so that it is more stable when the actual application is done.

Perennial agriculture requires a stable product when one time, large volume applications are made. But, as with annual applications, it is usually possible to further mature the product at the site prior to application and planting.

In the case of Minnesota Class II compost, such storage must be permitted by MPCA along with the actual application site. This can be a problem area as soil and slope requirements for long term storage are more stringent than the standard application requirements.

Moisture and Texture

The moisture content of material delivered to these sites is approximately 35%. It is slightly higher than that of material destined for retail or horticultural markets due to the compost maturity and the desire for further biological decomposition. The less mature nature of the compost also imparts a coarse texture.

Nutrient Value

For agricultural applications, the nutrient value of the individual batch is evaluated against the nutrient requirements of the crop at the predicted yield. This fact makes the consistency of nutrient content slightly less important than the product used for landscaping and retail markets.

Availability and Delivery

The ability for agricultural users to stockpile material is helpful to the overall marketing plan. This ability makes it possible to deliver product to the storage site virtually all year. This helps to reduce storage requirements at the composting facility and keep trucks busy during the entire year.

As with most other compost consumers, the farmer is not likely to have their own trucks making it the responsibility of the composter to provide transportation of the product.

Contaminants

While RECOMP, Inc. opposes use of compost for the disposal of inert material on the land, the agricultural requirements for inert particles is less stringent than for either the retail or horticultural markets.

Aesthetically, inert particles virtually disappear after the second season. From a practical standpoint, as long as inert particles are not going to cause equipment damage or impact the health of animals that will receive the feed, small pieces of glass are tolerable.

The heavy metal content of the material is of concern if it exceeds the MPCA Class I levels. When metal content exceeds Class I limits, the proposed application site is permitted through the MPCA and the heavy metals loading rates are limited based upon cumulative application. In most cases RECOMP, Inc. targets non-food chain crops for applications of such composts.

Application

Application of compost at agricultural sites is generally done in the Spring and Fall. In cases of pasture land or hay crops, additional applications can be made during the Summer. Though not recommended, applications can also be made during the winter, provided snow cover does not prevent movement in the field.

A manure spreader works well to apply compost at the low rates used in the average annual agricultural application. Annual application rates vary between 15 and 30 cu. yd (7.5–15 tons @ 1000 lb/cu. yd)/acre.

Our perennial applications have been at rates similar to those on landscape projects and have been done either with a manure spreader, front end loader or, in the case of a mulching project, manually.

Land Reclamation Projects

Projects of this type include revegetation of mining operations, landfills and urban renewal of old industrial sites.

Maturity

Testing of mineland reclamation sites in Minnesota [5] indicates that MSW compost matured for 90–180 days applied at up to 18 tons/acre result in no unmanageable agronomic or environmental problems. While we have no empirical data on the use of such products on landfill or urban industrial sites, it is felt that the same premises would hold true.

Moisture and Texture

The moisture content of material used on these sites will be between 30% and 35%, depending on maturity.

The texture of product used at these sites is the equivalent of that used in agriculture, though final landfill cover may be acceptable in a coarse texture, particularly if it is to be blended with topsoil for application.

Nutrient Value

Reasonable consistency of nutrient value is acceptable. Under normal circumstances, the compost will be amended with fertilizer prior to planting to ensure adequate nutrients are available to establish the desired cover.

Availability and Delivery

As with other projects, most activity is seen during the Spring and early Summer. With the large scope encompassed by these projects, it is likely that applications will continue through the warm weather. Again, it is reasonable to assume that transportation will be arranged by the compost producer.

Contaminants

Inert particles content is in line with that of agricultural requirements.

Heavy metal concentrations should be within Class I limits for mineland and urban site reclamation projects to avoid the potential problems with permitting such sites as Class II application sites.

Landfill cover applications will likely be less of a problem to permit as a Class II application site based upon the location of such sites and the soils associated with them. It is difficult to control access to an urban renewal site, and mining overburden tends to be extremely permeable with a low cation exchange capacity.

Application

Compost applications at these sites is done using front end loaders or other earth moving equipment followed by incorporation with rotary tillers.

Application rates of 80–200 cu. yd (40–100 tons)/acre are anticipated at these sites.

While these categories are by no means definitive, we know they have broad application throughout the country. Obviously, not all markets are served everywhere. The number of markets and market mix will be defined by the needs in that geographic region, the plant output, local economics, public education and regulatory climate. The dynamics of screening compost creates separate product streams (overs, unders and lights). Having compatible markets for these materials reduces costs and enhances operational efficiency. Initially, compost markets will take 2 years to develop in typical communities. As compost becomes more known and utilized, this timeframe can be reduced. As the awareness grows that it is a controlled process yielding predictable products that meet market and regulatory criteria, composting will become an integral part of solid waste management. This will be true for industry as well as for municipalities. The need for organic material has always been with us; the raw materials to manufacture the organic material have also been readily available; the commitment to recycle these materials, until recently, has not.

REFERENCES

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