



## Recycling Plastics: the Process and Terms

James W. Garthe, Instructor of Agricultural Engineering  
 Paula D. Kowal, Technical Writer

**P**lastics make farming more convenient, efficient, and productive, but they also present a serious waste management problem. Plastic materials take up seven percent of the waste stream *by weight* and 20 percent *by volume*. (See Figure 1 ) Once a plastic product serves its initial purpose, many farmers bury or burn the plastic waste on the farm, or the plastic waste ends up in a landfill. The amount of landfill space is quickly filling up, and in most areas of the United States, on-farm burning and burying is illegal. So, how can farmers manage their plastic?

Many agriculturists, waste management officials, and plastics industry members are looking at recycling as an environmentally sound method to manage used agricultural plastics. Recycling takes material from the waste stream and returns it to the manufacturing process. For extension agents, promoting the recycling of used plastics requires knowing the terms, players, and process.

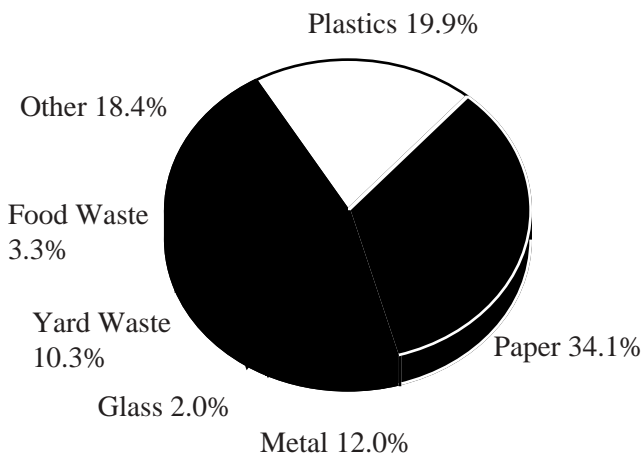
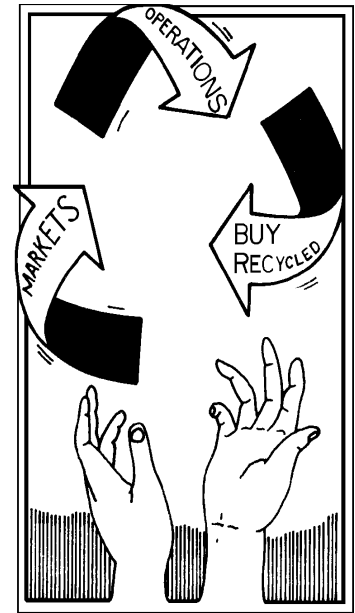


Figure 1: Composition of Waste Stream By Volume

### The Recycling Loop

For a recycling program to work efficiently and effectively, an infrastructure—or system—to manage the recyclable plastic is needed. An infrastructure consists of the collection, the handling and sorting, the reclamation, and the presence of an end user. When all of these elements are present, the recycling loop is complete.



Courtesy of the Pennsylvania Recycling Council

### Collection

After the plastic has served its initial purpose, instead of being thrown out, the plastic is collected for recycling. Collection not only refers to post-consumer scraps—which includes agricultural wastes—but also to industrial scraps such as leftover production trimmings and the products used by the manufacturing industry. There are three primary ways in which plastics are collected.

- **Curbside:** Recyclables are set out in containers at the consumer’s curbside. Most plastics that are recycled (70-90 percent) are collected by the curbside method.
- **Buyback:** Consumers can drop off their used plastics and receive payment for them at buyback centers. Approximately 15-20 percent of post-consumer plastics are collected at buyback centers.

- **Drop-Off:** Recyclables are taken to a designated location to be collected for recycling. Drop-off systems account for 10 percent of all collected postconsumer plastics.

Curbside, which is the most effective method for post-consumer waste collection, is difficult and expensive in rural areas because the travelling distance between the farmers and reprocessors can be far. Also, plastics are quite bulky, which makes shipping even more expensive and less convenient for reprocessors. By working together, farmers can develop a common drop-off location, or they can combine their plastics and make one trip to a buyback center.

Currently, a very small percentage of used agricultural plastics is being collected for recycling. By keeping the used plastics as clean as possible, and storing them in a dry area, farmers can increase the reprocessor's interest in agricultural plastics. (See fact sheet C-8 for the types of plastics used by the agricultural industry and for ways to increase the amount of used agricultural plastics that are being recycled.)

### *Handling and Sorting*

Now that the used plastics have been collected, they must be shipped to a sorting facility where the plastic materials are either accepted or rejected. A recyclable material may be rejected if it is not being recycled by the community recycling program or if it contains a high level of contamination. Many community recycling programs only accept certain types of plastics and products. For example, some communities only recycle clear-colored high density polyethylene milk jugs. Because of different forming techniques and properties, a shampoo bottle made of white-colored polyvinyl won't be accepted. (See factsheet C-9 for a listing of the different types of plastics.) A high level of contamination might also make the material unacceptable. Contamination includes anything besides the primary recyclable material, such as dirt, moisture, pesticides, sand, grease, and other plastic materials. High levels of contamination mean high processing costs for the recycler. If the plastic waste is accepted, it is sorted by the type of plastic that was used to make the product. At this point, the plastics are sometimes baled into bundles or granulated into flakes. The used plastic is then shipped to a reclaimer.

### *Reclamation*

At this stage, the used plastic is put through a series of steps that prepare it for an end use. Depending on the amount of contamination, the plastics must go through all of these steps unless they are commingled.

Commingled plastics, which are a mixture of different types of plastics, do not require any separation or cleaning. When the plastics are mixed, they are directly ground, melted, and formed into wood or lumber substitutes without any additional processing.

- **Chopped and Washed:** The plastic is fed into a guillotine, shredder, or granulator. Most of the contaminants are removed by several washing stages. The dirty water is sent to a treatment system, and the cost of treating the wash water depends on the level of contamination.
- **Separated and Dried:** In a flotation tank, the plastic pellets or flakes go through further separation from other types of plastics and the dirty processing water. Afterward, mechanical and thermal dryers remove the remaining moisture from the plastic.
- **Melted and Filtered:** The dried plastic is sent through a heating and melting process. The molten plastic is forced through a screen which removes most remaining contaminants.
- **Extruded and Re-pelletized:** The plastic is extruded into fine strands, cooled, and chopped. The pellets are then bagged and stored for future shipment. Later, the recycled plastic is sent to the manufacturer in the same form that virgin feedstock, or raw material, would be sold.

### *End Use Markets or Consumption*

End use markets refers to any manufacturer who uses reprocessed plastic as a feedstock in the production of their product. True recycling occurs only when a product that is made from recycled plastic is acquired in the market. If no one wants or uses the recycled plastic, then the recycling loop is incomplete. There are two types of end use markets.

- **Closed Loop:** The reprocessed plastic is turned back into the original product. For example, reprocessed plastic from a used pesticide container is made into a new pesticide container. Because the plastic can be remade into its original product, there's no need to develop new markets.

- **New Markets:** New products, uses, and consumer markets are found for the reprocessed plastic. For example, a polypropylene greenhouse container might be used to make fencing. Some existing markets for reprocessed agricultural plastics include plant containers, animal pens, roadside posts, fencing, pallets, and plastic lumber. To increase the demand for used agricultural plastics, more new markets need to be created. Farmers can increase the demand for recycled plastic by using products that contain recycled material.

## **List of Recycling Terms\***

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**Automated Sorting Systems** A system that automatically sorts plastics by a computerized detector

**Bale** A large bundle of compressed or densified recyclable material such as low density polyethylene (LDPE) film

**Biodegradation** A natural polymer such as corn starch or vegetable oil is added to a product which causes the product to break down into smaller pieces of plastics when product is exposed to an appropriate organic environment

**Buyback Center** Location where consumers can drop off recyclables and receive payment for them

**Closed Loop Recycling** The used product material is recycled back into the original product such as recycling used mulch film back into mulch film

**Commercial Scrap** Recyclables from businesses such as restaurants, stores, theaters, stadiums, airlines, trains, and similar companies

**Commingled** The used product is recycled in the same condition as it is received, without any separation or cleaning

**Composting** The breaking down of organic matter through exposure to natural elements, resulting in a nutrient-rich, humus-like soil amendment or fertilizer

**Contaminant** Any material that will harm the recycling process when included with recyclable material

**Curbside Recycling** A collection process in which separated or co-mingled recyclables are set out in containers at the resident's curbside for pickup

**Densification** The process of packing recyclables closely together, such as baling or re-rolling, to facilitate shipping and processing

**Drop-Off Center** Location where used products can be left for recycling

**End User or Consumer** An industrial plant or other facility where recyclables are used as feedstock to produce new products

**Granulator** A machine that produces small plastic particles

**Handler** A company that performs at least one of the following processes on collected recyclables: sorting, baling, shredding, or granulating

**Industrial Scrap** Recyclables that come from the manufacturing process, such as trimmings and other leftover materials, or recyclable products that have been used by the industry but are no longer needed, such as buckets, shipping containers, signs, pallets, and wraps

**Municipal Solid Waste (MSW)** The combined residential and commercial waste material that is generated within a given municipal area

**Material Recovery Facility (MRF)** Facility where the recyclable materials are sorted and prepared, before they are shipped to a reprocessor for manufacturing

**Photodegradation** The presence of a sun-sensitive component in a product which triggers the material to disintegrate when exposed to a specific amount of sunlight

**Post-Agricultural Waste** Subset of Post-Consumer Wastes. Recyclable commodity that was used by the agricultural community

**Post-Consumer Waste** Recyclable commodity that was used by consumers, not by industries

**Pre-consumer Scrap** See Process Scrap

**Process Scrap** Leftover material from manufacturing processes that are re-used in manufacturing; also called home scrap and pre-consumer scrap

*Reclaimer* A company that performs at least one of the following processes on collected recyclables: washing/cleaning, pelletizing, or manufacturing a new product. Also called reprocessor

*Recycling* The act of collecting, separating, and processing scrap materials that have been taken from the solid waste stream. The wastes are then used as feedstock for new products that would have been produced using virgin materials

*Sanitary Landfill* An area where waste is dumped, then buried beneath a layer of earth. Landfills usually have a liner to reduce soil and water pollution

*Shredder* A machine that tears or grinds material to reduce its size

*Solid Waste Stream* See Waste Stream

*Source Reduction* Disposal method that involves decreasing either the amount or toxicity of waste materials

*Source Separation* Any method that separates recyclables from waste at the point where they are generated. This includes methods such as curbside collection programs, buyback centers, and drop-off locations

*Virgin Materials* The basic materials used for industrial processing that have not been previously used, such as petroleum for manufacturing plastics, iron ore for manufacturing steel, bauxite ore for manufacturing aluminum, or wood pulp for manufacturing paper

*Waste Stream* The total waste material output of a community, region, facility, industry, or private residence

*\*Many of these definitions were provided by the Institute of Scrap Recycling Industries, Inc.*

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For a copy of Fact Sheet Index contact:  
Agricultural and Biological Engineering  
246 Agricultural Engineering Building  
University Park, PA 16802  
814-865-7685  
FAX 814-863-1031

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