



Recycling Used Agricultural Plastics

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The use of plastics is growing rapidly in the agricultural industry, allowing farmers to increase production and decrease costs.

Agricultural plastics are used to wrap bales of hay, cover greenhouses, store pesticides, and mulch crops. Each year, the agricultural industry uses hundreds of millions of pounds of plastic, and the amount is expected to rise.

But what happens to these plastics after the farmer is done with them? Currently, most used agricultural plastics are buried or burned on the farm; the remaining used plastics are landfilled. In a survey taken by the Penn State Cooperative Extension, 60 percent of the farmers indicated that they usually burned their used plastic on the farm. On-farm burning and burying often require a permit and are illegal in some areas. The amount of available landfill space is decreasing because of the filling-up of landfills, stricter regulatory laws, and the difficulty in finding locations for new landfills. As awareness of all of these problems increases, so does the search for solutions. To reduce the amount of plastic waste entering landfills, many municipalities are requiring consumers and industries to recycle.

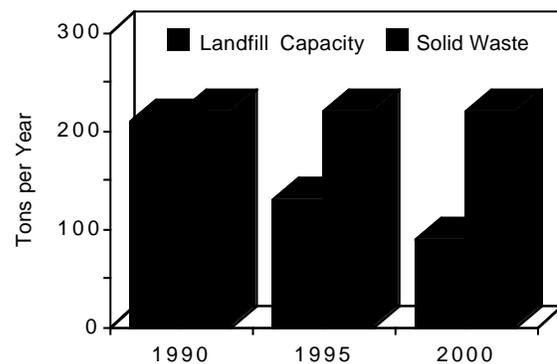
The Value of Agricultural Plastics

Recycling takes material from the waste stream and returns it to the manufacturing process. The used plastics are collected at the farm, at a community drop-off site, or at a buy back center. Then, the plastic is shipped to a recycler where the plastic is separated, cleaned, pelletized or shredded before being reprocessed. (For a more detailed description of the recycling process see fact sheet C 10) Such products as trash bags, flower pots, park benches, industrial pallets, and composite lumber are being made from recycled plastic.

Like many other businesses worldwide, the recycling industry is based on economics and the chance for profit motivates it to grow. Whether or not certain plastics—including agricultural plastics—are accepted by the recycler depends on the value of the plastic. This is determined by the quality, quantity, contamination, current virgin plastic prices, and demand for the recycled plastic material. There are many ways that the agricultural industry can increase both the value of their used plastics and the recycler's interest in used agricultural plastics.

Diminishing Landfill Space

Due to stricter regulations, landfills are filling up and closing down. In 1979, there were 18,500 landfills in the United States, but by 1990, only 6,000 were left. Besides the difficulty in finding locations for new landfills, there are other problems with landfilling agricultural plastics. Hauling and tipping fees at landfills are increasing, and some landfills won't accept certain types of materials. Leachate and toxicants continue to be pollution concerns.



Separating the Used Plastic

Agricultural products are made of many different types of plastics. For example, some nursery containers are made of high density polyethylene and others are made of polypropylene. (For a listing of the uses and types of plastics in the agricultural industry, see Table 1.)

Separating these used products by their type of plastic makes the recycling process easier for the recycler and increases the plastic's quality. The chance for profit increases the recycler's willingness to accept the plastic.

Presorting the used plastics is not as complicated or time-consuming as it may seem. The Society of the Plastic Industry has developed a voluntary code for bottles and containers which makes identifying the type of plastic simpler for both the consumer and recycler. Located on the bottom of the container or bottle, the code consists of the recycling symbol enclosing a number from one to seven. The number indicates the type of plastic that was used to make the product. Even though a plastic product may be marked with the SPI code, it doesn't guarantee that the

Table 1. Types of Plastics Used in the Agricultural Industry.

Plastic Resin	Use in Ag Industry	Benefits	Amount (est.)
<i>Low Density Polyethylene (LDPE)</i>	Greenhouse film	Resists breakage; increases plant growth; decreases energy loss; inexpensive; obtained in large sizes	16-30 million lbs.
	Mulch film	Increases plant growth; warms the soil; conserves moisture; controls weeds, insects, and crop diseases	40-140 million lbs.
	Forage and grain storages	Flexible storage options; increases nutritional value of silage; convenient and inexpensive	12 million lbs.
<i>High Density Polyethylene (HDPE)</i>	Nursery pots	Durable; inexpensive; resists breakage	Blow molded: 80-100 million lbs. Injection molded: 70-80 million lbs.
	Pesticide containers	Thermal and chemical resistance; resists breakage; convenient	40 million lbs.
<i>Polypropylene (PP)</i>	Nursery pots	Durable; light weight; resists breakage	70-80 million lbs.
	Row covers	Increases crop growth; warms the soil; retains moisture; reduces insects and diseases; allows air and light to enter	*
<i>Polystyrene (PS)</i>	Nursery trays; packs; and flats	Inexpensive; durable	50-60 million lbs.

*Information not available.

plastic is recyclable. To be recyclable, the recycler must be willing and able to recycle the plastic. Communicating with the recycler about the type of plastics that are acceptable increases the chance for recycling. When a farmer or group of farmers begin a recycling program, providing the recycler with a sample of the plastic ensures that the plastic is recyclable.

Contamination

Besides separation, the quality of the plastic is also determined by the amount of contamination. Contamination includes anything besides the primary plastic product, such as dirt, sand, grease, vegetation, moisture, and other types of plastic. Often, contamination can be the main problem with recycling used agricultural plastics. For example, it is not uncommon for mulch film, which is used to control weeds and increase crop growth, to be contaminated by more than 50 percent of its weight with dirt, moisture, and vegetation. A high amount of contamination greatly reduces the recycler's willingness to accept the plastic.

Two types of contamination unique to agriculture are ultraviolet (UV) light degradation and pesticide residue. UV and heat degradation are caused by exposure to extreme sunlight and heat. The value of the product goes down because the plastic loses its flexibility and its recyclability. Pesticide residue contaminates films as well as plastic storage containers. Even though the effect of residual pesticides on recycled products hasn't been determined, the biggest concern is the public's perception of pesticides. The plastic needs to be thoroughly rinsed to make sure that no dried pesticides remain yet even proper rinsing doesn't guarantee that the plastic will be accepted for recycling.

Not only is contaminated plastic expensive to clean and process, but it adds to the collecting and shipping fees: the product becomes heavier and more expensive to transport. Communicating with the recycler about the condition of the plastic and their available cleaning equipment can reduce some of the costs.

Many recyclers are unwilling to accept contaminated agricultural plastics because there is plenty of clean, used plastic available. Accepting only clean plastic reduces the cost and time that the recycler must spend for processing. There are several ways that members of the agricultural community can reduce the level of contamination and increase the recycler's interest in their plastics. Removing the plastic

immediately after its use makes the contamination less of a problem. Shaking off the plastic or providing a light field washing helps to remove some of the contaminants. Compacting the plastic increases the density and makes transportation more convenient and less costly. Storing the compacted plastic in a dry, sheltered area protects the plastic from additional contamination.

Collection and Transportation Costs

Location of the farm to the recycler is very important because transportation and collection represent the largest cost of recycling agricultural plastics. There are few recyclers near rural areas to collect these plastics. Also, most recyclers want a large quantity of plastic to make their collection trip more worthwhile.

The bulkiness of plastics adds to the transportation costs. Even though plastics only represent seven percent of the waste stream *by weight*, they take up 20 percent of the waste stream *by volume*. The amount of contamination also increases the required space and the shipping fees.

One of the most difficult agricultural plastics to manage is low density polyethylene (LDPE) film, which is used for many purposes such as mulching crops, covering greenhouses, and wrapping bales. Many recyclers want plastic that can be mixed with other types of plastic, but LDPE can't be mixed. The inability to be mixed, the bulkiness, and the high level of contamination make recyclers less willing to accept this film for recycling.

Farmers can help promote recycling agricultural plastics by saving up enough plastic to make a trailer load instead of only a few bales. By working together, farmers can organize common drop-off sites and even help pay for some of the transportation costs, which are about the same as the tipping fees at landfills. Instead of money, the profit that farmers receive from recycling is the reduction of waste, less damage to the environment, and stronger public relations. By reducing the cost for the recycler, the value of agricultural plastics increases.

Price of Virgin Plastic and the Demand for Recycled Plastic

If there is no end market—or new product—for the used agricultural plastic, it is useless to pay for the collection, handling, and processing. One main determinant of end markets for recycled plastic is the price of virgin plastic. If the price of virgin plastic is high, manufacturers will be

more willing to use the recycled plastic rather than pay more for the new plastic. Currently, the demand for recycled plastics is low and the processing costs are high. (The high processing costs usually are caused by the amount of contamination.) The low profit for the recycler decreases the recycler's demand for used plastic products. Because of the low demand for the recycled material, the recycler often needs to receive a tipping fee.

The use and demand for recycled plastic is also determined by the available markets. Some products have well-defined markets while markets for other products aren't so clear to locate. For example, a polyethylene terephthalate (PET) soda bottle can be remade into a PET soda bottle, but a market for a used polystyrene greenhouse container might be more difficult to find. Manufacturers need to create more end products to increase the demand for the recycled plastic rather than the virgin plastic.

Farmers can influence the demand for recycled plastics by talking to local distributors and officials about increasing their recycling efforts. Also, buying products that are recycled or contain recycled material helps to increase the demand for used plastic. Like recyclers, manufacturers are driven by profit and will use recycled material in their products if there is demand for recyclable products. With support from the farmers and government, the use of more recycled plastic by manufacturers and processors will increase the demand, and therefore, the markets for plastic.

Summary

Do all of these problems mean that recycling agricultural plastics is impossible? With clear communication and cooperation between farmers and recyclers, recycling *is* possible in the agricultural industry. Some steps the farmer can take to increase the potential for recycling agricultural plastics are to keep the plastics as clean as possible, to help pay shipping fees, and to demand more recyclable and recycled products. Finding pilot projects will help increase recycling and show the commitment of the agricultural community to recycle. By working together and communicating with recyclers, the agricultural community can 1) increase the value of their used plastic, 2) make a recycling program work successfully, and 3) help to reduce the waste stream.



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