Baling Used Agricultural Plastic

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Introduction:

Use of plastics in vegetable production has greatly increased over the past several years (Figure 1). Plastic mulch reduces weed and other pest pressures, enhances earliness and increases yields of higher quality fruit. Irrigation through plastic drip tape increases water use efficiency and allows growers to fertilize crops on a timelier basis. Use of plastics, however, increases labor and material costs for application, removal and disposal. Costs that are offset by greater fruit production and quality.

Figure 1. Applying plastic mulch and drip tape in 2005 using a three-row applicator. Clear plastic is used for low tunnels for earlier production

Disposal of agricultural plastics has been a subject many growers are reluctant to discuss. But one of the first questions asked by the general public is, "What happens to all the plastic?" Historically it was sent to local landfills in large, 30-yard construction bins. At the end of the season growers would have their crews go through the field, remove the plastic by hand and place it into the bin. Recyclers were not interested in the product since it contained a fair amount of soil and plant debris that was difficult to remove, and it was black making it usable only for other black products. Also, in a loose form it was not possible to economically truck and then handle at a receiving station. Recent developments in cleaning technology and an increase in oil prices oil have made recycling this plastic a possibility. The first step, however, is in compressing the plastic in such a way that it can be shipped and handled efficiently by the recycler. This report provides guidelines on one way to accomplish this step through making round bales out of the plastic. It draws on my experience and experience of growers who are already utilizing round balers for plastic disposal.

Selecting a Baler:

The goal in baling plastic is to provide savings in labor and disposal. Stationary balers exist that will bale plastic, but they save little in labor costs since the plastic is brought to the baler. Round hay balers have been used to bale greenhouse poly film so they were investigated for usefulness in removing plastic from the field much as they are used to bale hay and straw.

For the greenhouse poly, balers producing a "soft" bale were found to work best. These are balers that the baling chamber starts out large and only compresses the bale near the end of the baling procedure. Balers producing a "hard" bale start with the chamber small and compress the bale through out the entire process. Only soft-bale technology was tried for baling field plastic

There were two types of basic technology for the round balers evaluated – belts and dual chains connected by bars (Figure 2). Belt balers have a series of belts and rollers that spin the material in the chamber. Chain baler technology uses chains and connecting bars combined with a roller at the bottom of the chamber to spin the material. Both types work, but the belt/roller system will occasionally catch plastic between the roller and the belts, tearing out pieces that trail behind the baler. The chain baler is basically an enclosed can and this does not happen, leaving the field somewhat cleaner.

Other things to consider when selecting a baler are any kind of teeth or other protrusions that are helpful for baling hay, but a hindrance when baling plastic. Extra protrusions only serve to snag the plastic. Bale size should be kept to 4 or 5 feet in diameter. It is difficult to get a bale started in larger size chambers and the bales are extremely heavy. Expect to replace at least the bottom belts on a used belt baler. Bales of plastic are much heavier than bales of hay and used belts tend to break.

Figure 2. Belt baler (top) and chain baler (bottom) represent the two types of balers used to bale used plastic.

Baler Modifications:

Balers I tried have been successful with minor modifications. The biggest problem occurs when the plastic is initially picked up to start a bale (see Baling Procedure). It can, and often does, get pulled by the tines into the pick-up head (Figure 3). When this happens, the plastic will eventually bind up the head. The tines are only useful to start a row of plastic into the baler. Once in the chamber, the tumbling and spinning of the bale draws the plastic in, not the tines. I found it helpful to remove both outside sets of tines. For some reason these two sets tended to cause more problems then others. Experience with speed and how the plastic is laid at the beginning of each row

Figure 3. Pick-up head showing plastic caught by tines.

reduces the amount of plastic that gets caught in the head.

To completely eliminate the plastic binding up, some growers have simply removed the pick up head. This makes it necessary to physically throw enough material into the chamber to get it tumbling when starting a bale. Once the bale is started, they then stop the baler at the end of a row with enough material left to tie to the beginning of the next row. This requires more workers, but does eliminate the frustration of untangling plastic.

If you keep the head on, a serrated knife and a hook made from a bent and sharpened tine are helpful in removing plastic from the head.

The Baling Procedure:

To prepare the plastic for baling plants should be chopped long enough in advance so that the plant material has time to dry. This allows it to readily fall off the plastic when workers remove it from the soil. The plastic and tape are removed by hand and placed in long strips in the alleyways. Mulch and tape can be mixed together. Mulch alone can be picked up, but tape alone cannot. Tape does not weigh enough on its own. Do not mow alleyways just prior to placing plastic in them. If you do, you will pick up a lot of plant material with your bale.

Plastic and tape from two sections are pulled from the soil and placed loosely in the alleyway. The balers have easily handled up to 12 rows of plastic and tape. It is best to have the plastic dry. Wet plastic adds to the weight of the bale and soil and plant material will adhere to it, further adding weight.

The baler should be set at the lightest possible setting. These balers are made for hay and straw that weigh much less than plastic. Having them on a heavy setting will seriously stress the baler. Also it is a good idea not to use a large horsepower tractor. The sound of your tractor will help you know when the bale is getting large and making the tractor work. You don't get that signal if you tractor is too large.

The biggest problems occur when starting a bale. There needs to be enough material introduced into the chamber that it can tumble. If there is not enough to tumble, the plastic will not be pulled in and will get caught on the tines and wrap around the pick up head. To make sure there is enough material, the first 100-feet or so of plastic at the beginning of the row should be placed in a loose pile (Figure 4). This way, when the baler approaches the pile and pulls it in, it places enough material in the chamber that the tumbling action is initiated and will continue pulling in the plastic. This is usually only necessary when first starting a bale. After that there is enough material that plastic from a new row will catch and be pulled in.

Figure 4. The first 100' or so of plastic in the row should be piled up to start a new bale.

Tractor speed that works best is about 4 mph (a fast walk). Some adjustments on gearing will be necessary to coordinate PTO speed (baler speed) and ground speed. If you notice the plastic ahead of the tractor being pulled in faster than the tractor is going, you may want to speed up one gear. If you see the drip tape being pushed ahead of the baler, you may need to slow down a gear

(Figure 5). When the tape is pushed ahead of the baler it may get caught on the tractor or the baler.

Try to minimize any obstructions on the tractor or baler that may interfere with the plastic going into the chamber. Make sure the pin used to attach the baler to the tractor does not extend too far down below the draw bar - if it does, it may catch on the plastic and stop the bale from tumbling.

Some balers will have a net wrap or string tie. Either work, but the bales seem to hold together well without any kind of outside binding.

Figure 5. Tractor speed is too fast as indicated by the drip tape being pushed ahead of the baler (arrow).

Disposal:

When the bale is complete it can either be expelled from the baler right in the field or picked up later (Figure 6). The baler can be used to transport bales to a central location before they are expelled. The bales are then loaded onto trucks and taken to their final destination. If they are recycled, the recycler will unwind the bale, wash it, shred it and then turn it back into raw material to be used again.

Figure 6. Bales can either be expelled in the field when the chamber is full (left), or be transported to a central location (right) for loading later.