

Managing Fruit and Vegetable Waste

Gary L. Hawkins, Ph.D.

Crop and Soil Sciences Department

The production, harvest, sorting and packing of fruits and vegetables produces close to a billion pounds of produce annually, according to the annual agricultural report for Georgia. These processes also result in material that is rotten, has bad spots not noticed in the field, or that is removed from packing lines and not shipped to the consumer. Properly dealing with discarded products can reduce the potential for environmental pollution while also protecting the individual who is responsible for the discarded materials.

In Georgia, the Environmental Protection Division regulates the disposal of all solid wastes. Fruit and vegetable culls are considered solid waste as soon as they are transported from the packing shed or point of discard. While not all of the listed methods of dealing with fruit and vegetable waste material may be applicable for every situation, one of the best methods of dealing with the culls or waste products from a packing house is to reduce the amount of unusable material brought to the packing house.

Managing Fruit and Vegetable Waste

There are seven commonly used methods of managing fruit and vegetable waste. The list of methods provided here will define the method of management, list some pros and cons of that method and discuss operational details. This list cannot be easily arranged in order of best management practice from an environmental standpoint due to individual situations of the farmer and packing house where culls originate. The management options are provided as a means to help better explain how each may be used. The seven management methods are:

- 1) Store the culled fruit and vegetables on-site in a pile or bermed area for a limited time
- 2) Return fruit and vegetable waste to the field on which it was grown
- 3) Feed fruit and vegetable waste to livestock
- 4) Give the fruit and vegetable culls to local food banks
- 5) Compost fruit and vegetable culls
- 6) Process fruit and vegetable culls to separate juice from pulp
- 7) Dispose of fruit and vegetable waste in a local Sub-Title D landfill.

Managing Culled Fruit and Vegetables

The following list of management methods provides a protocol for managing waste fruit and vegetables as well as pros and cons of each method.

1. Store the culled fruit and vegetables on-site

Storing culled fruit and vegetable waste on-site is a temporary solution to final disposal or reuse of materials. To use this method, the culls may be hauled or transferred via mechanical methods to a location that has been prepared for holding the culls. At a minimum, the holding area should be bermed to capture and hold rainfall and any liquids that have formed from the decomposition of the culled fruit and vegetables. Other options for such a site include storage in tanks or bunkers with easy access for removing liquids or solids for later management. The culls stored in the bermed area should be crushed, if possible, to allow available liquid to better evaporate. Crushing the culled fruit and vegetables and placing them in a bermed area helps control the leachate, run-on and runoff, makes managing the material easier, allows extra liquids to evaporate and reduces the volume that will need to be managed at a later time. The pros and cons of temporarily storing culls on-site are:

Pros:

- Low disposal cost
- Low transportation cost to disposal site based on reduced volume and distance
- Fruit and vegetable culls will generally decompose in weeks
- Associated fruit and vegetable juice will infiltrate into the ground
- A constructed bunker area will help improve solid and liquid management
- The same small footprint can be used year after year



Cons:

- If the area used for storage is not properly managed according to local and/or state regulations, the operator may be subject to fines
- Potential unsightliness for packing house and neighbors;
- Potential odors associated with disposal of culled fruit and vegetables
- Tanks may need to be purchased, bunkers may need to be built and a method of crushing culls has to be in place

2. Return fruit and vegetable waste to the field

From an agricultural nutrient management and organic building viewpoint, returning fruit and vegetable waste to the field may be one of the better options. This management method returns the culls back to the growing field where the nutrients can be recycled, allowing the fruit and vegetable pulp and juice to help build or maintain the soil organic matter content. The cost can be very low based on distance to the field and the amount of liquid removed. The protocol for transporting the culls to a growing field will consist of storing the culls at the packing house or at the field site until final harvest of the crop. After final harvest, the culls or remaining solids and liquids can be loaded into spreader trucks and applied evenly across the field. As a matter of practice, the material should be incorporated, which will reduce the potential for problematic odors and runoff. The pros and cons of this method are:

Pros:

- The nutrients in the fruit and vegetable culls can be available for the next crop
- Organic matter in fruit and vegetable culls will increase soil carbon
- Low cost of disposal

Cons:

- Transferring fruit and vegetable culls from the trucks and trailers used to transport them back to the field site to the spreader equipment can be a problem
- High labor costs of unloading intact fruits and vegetables
- Trucks may have to be modified to carry and manage liquid resulting from crushed culls
- Bad fruit and vegetables can potentially result in disease transmission between harvested crops
- Proper distribution of culled fruits and vegetables can be a problem
- Fruit and vegetable culls cannot be returned to the growing field until all harvests (generally three to four per year) have occurred

- Fruit and vegetable culls have to be stored on-site until they can be disposed of in the field

3. Feed fruit and vegetable waste to livestock

Managing culls by feeding fruit and vegetable waste to livestock may be a good option based on the overall management system of the livestock operation. One of the major issues that must be addressed involves the nutritional benefits and effects of feeding culls to livestock. Farmers should consult with animal scientists or veterinarians to confirm the effects of feeding culls to livestock. If the nutritional aspect of feeding fruit and vegetable waste to livestock met, other pros and cons include:

Pros:

- Low disposal cost
- Potential low transportation cost to livestock area
- Fruit and vegetable culls will potentially offset cost of animal feed
- No need to wait until harvest is completed
- The sale of fruit and vegetable culls for feed can produce income
- Fruit and vegetable culls can be taken to livestock at time of culling, thereby eliminating the need for storage

Cons:

- Livestock may not eat rotten fruit and vegetable culls
- Transportation cost may be high depending on distance to livestock area
- Volume of fruit and vegetable culls can be too high for available livestock to consume
- Incorporation of fruit and vegetable waste into animal diets may not improve animal productivity
- Removing fruit and vegetable culls from the trucks and trailers used to transport them back to the field site can be a problem due to the potential liquid content and methods for transferring to the spreader equipment
- High labor costs of unloading intact fruits and vegetables

4. Give good fruit and vegetable culls to local food banks

Food banks may be an option to manage some of the culls resulting from the sorting of the fruits and vegetables. Giving culls to a food bank may be an option and the Good Samaritan Law will protect the donating company. However, since fruit and vegetables are perishable, not all of the culls can be utilized by this method. The farmer

should stay in contact with the local food bank coordinator to inform them of harvest dates and what may be available, as well as to determine whether anyone would be allowed in the packing house and whether bins of culls would be available for further off-site culling and packaging for distribution to other food banks. The coordinator would need to provide a means to safely transport the culls to a location for further processing, if needed, and the remaining culls would have to be disposed of using another method listed in this document. Some of the pros and cons of donating fruit and vegetable culls to a local food bank are:

Pros:

- Provides a needed food supply
- Low disposal cost
- The food bank may provide its own pick-up and delivery

Cons:

- Food banks can only use a portion of the fruit and vegetable culls
- Having food bank personnel on-site at packing may be a liability to the packing company
- The remaining portion of culled fruit and vegetables will still have to be disposed of through another appropriate method

5. Compost fruit and vegetable culls

Composting culled fruits and vegetables is one option that can reduce the volume of culls as well as other “waste” materials in a community, if the land and equipment is available. Culls used in the compost process would either be transferred in a truck to the composting facility or mechanically transported if the compost facility is on-site. The culls would be mixed in proper ratios with other organic materials as recommended by composting professionals to produce compost suitable for reincorporation into fields or for selling. Georgia has a set of composting guidelines and regulations that should be referenced to ensure proper environmental protection and to obtain information on final management of the compost product. The pros and cons of a composting system are:

Pros:

- Low disposal cost
- Potential on-site composting
- Potential low transportation cost to disposal site
- Fruit and vegetable culls will generally decompose in weeks
- Associated fruit and vegetable juice will be one source of needed water in the compost pile
- The final product can potentially be sold for profit
- The product can be returned to the growing field to

provide stable nutrients and organic matter for the next crop

Cons:

- Filler material for composting fruit and vegetable culls can be a high cost
- Additional labor may be needed to manage the compost pile properly
- Additional pest management may be needed
- Runoff control will have to be implemented
- Getting rid of compost may be a problem
- Proper permits have to be obtained
- Removing fruit and vegetable culls from the trucks and trailers used to transport them back to the field site can be a problem due to the potential liquid content and methods for transferring to the spreader equipment
- High labor costs of unloading intact fruits and vegetables

6. Process fruit and vegetable culls to separate juice from pulp

The method of separating the fruit and vegetable culls into juice and pulp is accomplished by using a press. Typical systems are screw presses that can effectively separate the juice from the pulp. After separation, each fraction has its benefits for different reasons and purposes. If the culls are of good food quality they can be used as juices in food applications based on available markets. The pulp can also potentially be used as a component of foods. For those culls that are not of human food quality, the separated pulp can be used as one component of compost or animal food. (If the pulp is used for animal feed, check with an animal scientist or veterinarian prior to feeding.) The pulp can also be used as a soil amendment or as one component of a composting process. The juice can also be used as a feedstock for ethanol production or anaerobic digestion processes. For either process, there should be a market for the final products, ethanol or methane. A few pros and cons of separating juice from pulp are:

Pros:

- Low disposal cost
- Potential on-site processing
- Low transportation cost to processing site
- Fruit and vegetable juice will evaporate quicker if separated from pulp
- Pulp can be used in composting
- Less composting filler materials will be needed
- Pulp can be fed to animals
- Fruit and vegetable juice will be easier to transport and apply to the receiving field/pasture
- Fruit and vegetable juice can be a feedstock for ethanol or anaerobic digestion processes

- Fruit and vegetable juice is easier to store than whole fruit and vegetables

Cons:

- A method of separating fruit and vegetable juice and pulp has to be in place
- Fruit and vegetable juice storage has to be in place
- A composting site and procedures have to be ready
- A tank is necessary for storing and transferring fruit and vegetable juice to the location to be used for the production of ethanol or anaerobic digestion.

7. Dispose of fruit and vegetable waste in local Sub-Title D landfill

Disposal of culled fruit and vegetable waste in a Sub-Title D landfill is a method that should be considered after all other options. From a sustainability standpoint, disposal of these culls in a Sub-Title D landfill is probably not the best option based on fees. If landfilling is the chosen option, management of the culls should reduce leakage of liquids from the transport truck. The following are pros and cons of landfilling culls:

Pros:

- Once the fruit and vegetable culls are dumped, all responsibility is transferred to the landfill operator/owner
- Juice associated with fruit and vegetable decomposition could increase methane production in the landfill that would be beneficial if the landfill is collecting methane for energy production

Cons:

- High cost of disposal in tipping fees
- Potentially high transportation cost to disposal site
- Juice associated with fruit and vegetable culls will add to leachate that has to be handled by the landfill operator/owner
- Juice associated with fruit and vegetable decomposition could increase methane production in the landfill
- Juice from decomposing fruit and vegetables that can drain out of truck/trailer transporting fruit and vegetable culls to landfill must be accounted for and managed
- If leakage from transport trucks occurs, complaints, bad press and regulatory issues could be possible

Management of Fruit and Vegetable Waste for a Specific Packing House

The above methods for the disposal or reuse of fruit and vegetable waste are provided for all fruit and vegetable packing houses. The disposal method specific for any given packing house may be different and must be a decision based upon the particular location and situation. There may be more disposal methods available to specific packing houses, different pros and cons not listed here and different and more extensive methods of disposing of culled fruit and vegetables. Individual packing houses will have to identify additional pros and cons and take them into account. This document is provided only as a guide to aid the individual packing house in identifying different options that may be suitable for disposing of culled fruits and vegetables. Detailed questions related to local and state regulations and ordinances should be directed to local and state agencies that specifically deal with those questions. For application rates to meet nutrient needs of fields or growing crops, contact your local county Extension office.

extension.uga.edu