Cull Potato Management

Northwest Potato Research Consortium
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Cull Piles

Potatoes that do not meet grade or are for other reasons discarded have to be disposed of somehow. These "cull" potatoes are often piled near sorting operations going into or out of storage buildings, or other places where raw potatoes are handled. Cull piles are an inescapable part of the potato industry, but proper management of them is important.

Risks Associated with Cull Piles

Cull piles represent a risk to all surrounding potato acreage due to the pests and diseases that can survive, overwinter, or build up on the tubers or sprouted plants.

1. Late blight

The most serious problem associated with cull piles is late blight. Culls are a good place for the fungus that causes late blight to overwinter because piles of potatoes can stay quite warm. In the spring late blight can begin to proliferate on the sprouting plants in the cull pile. It only takes a small infection point like a cull pile to start a region-wide epidemic of late blight. Culls coming out of storage in late winter or early spring are especially threatening sources of late blight because infected tubers have been protected from low winter temperatures which aid in decomposition of tubers and the subsequent death of the fungus. If these culls develop late blight, the fungus is poised to move into susceptible, emerging volunteers and current season potato plants.

2. Tuberworm

Cull pile and waste potato management is also important for management of potato tuberworm (a.k.a. tuber moth). Any potatoes exposed to moths can be food sources for larvae and contribute to building tuberworm populations. One of the most likely places moths will build up is the grounds surrounding storage buildings and other places where potatoes might be piled intentionally or spilled accidentally. Cull piles and piles of dirt mixed with potatoes are likely a major means of overwintering of tuberworm, and important in the build-up of populations in the spring.

A tuberworm trapping network identified one population build-up near a complex of storage buildings in 2005. Tuberworm moths had colonized the area and, because there are usually no insecticides applied to this kind of situation, had built up to huge numbers. It is important to note that the amount of waste potatoes in the area was not unusually large – no large heaps of culls or pits full of potatoes. There were piles of mostly dirt with a few potatoes, and quite a few potatoes lying about which had been spilled from trucks. Tuberworm larvae are not afraid to share their food, and 25-50 (or more) larvae can develop in one tuber. Therefore, what seems like a small number of tubers in comparison to the thousands of tons workers handle each day could be enough to support large numbers of moths. Such moths can then colonize neighboring fields or overwinter and start the race anew in the spring.

3. Aphids and Viruses

Aphid-transmitted viruses affecting potatoes cause problems such as yield loss and internal tuber defects. *Potato leafroll virus* (PLRV) causes serious net necrosis problems in some varieties such as Russet Burbank. Some new strains of *Potato virus Y* (PVY) can cause internal defects such as necrotic arcs and rings in the tuber flesh. These viruses can and do overwinter in cull piles and other discarded potatoes. In the presence of aphids, these sources of virus can be important in the incidence and severity of virus problems in commercial potatoes.

The most serious aphid pests of potatoes in the Northwest are the green peach aphid and the potato aphid. Both species can transmit PVY and PLRV, and both can overwinter on weeds and other plants that stay green during the winter. Potatoes sprouting and growing on cull piles can get aphids started building up very early in the spring. As aphids multiply they begin developing wings and can migrate to newly emerging potato fields, taking potato viruses with them.

Management of Cull Piles

Cull potatoes are only a threat during the growing season. Piling culls can be a viable practice during the period from harvest to planting. Cull piles should always be placed at least 50 feet away from springs, wells, streams, canals, and other bodies of water. They should be contained or placed on well-drained soil at least 40 inches to bedrock and where the water table is deep. Many of the potatoes in cull piles will remain viable through even the harshest of winter weather due to the insulating effect of the overlying tubers and heating produced by the rotting tubers at the center of the pile. Before planting season comes, cull piles should be disposed of in one of the ways described below.

Cull Disposal Alternatives

Chopping/Spreading. A good method of cull disposal is to spread them on fields not intended for potato production. Avoiding potato fields is important because spread potatoes carry pathogens that would potentially add to the disease pressure faced by a crop of potatoes grown on ground used for spreading culls. Spreading of culls should take place before or during winter, when extended periods of sub-freezing temperatures are expected. Potatoes freeze at about 28°F, and they must remain at such cold temperatures for several hours to freeze completely. Potatoes should be spread no more than 6 inches deep, allowed plenty of time to freeze, then dry out. Be careful to avoid tillage operations until the potatoes have frozen and dried so that no live potatoes are turned into the soil to sprout in the spring. Chopping potatoes before or during spreading will also reduce the risk of tuber survival to sprouting in spring. Growers should also remember that the spread potatoes have value as fertilizer for the following crop.

Composting. Potatoes can be composted, and this may be a good way to handle culls if careful attention is paid to proper composting methods. A private company in Maine conducted a study of composting potatoes in the late 1980s and found that composting is feasible and effective at disposing of culls and killing pathogens they may have carried. The research involved 5 different composting mixes as shown in Table 1.

Table 1. Composition of Aroostook potato composts on a fresh weight basis.

Ingredients	Pile 1	Pile 2-3	Pile 4	Pile 6	Pile 7
Whole Potato Culls	62%	26%	22%	20%	0%
Potato Processing Sludge	0%	35%	22%	22%	57%
Softwood Sawdust	29%	28%	20%	18%	0%
Paper Fiber Sludge	0%	0%	32%	28%	41%
Fairfield Wood Ash	9%	11%	4%	0%	3%
Limestone	0%	0%	0%	12%	0%

All these compost mixes worked to varying degrees, but most had some kind of drawback or handling mistake. Compost piles should attain internal temperatures of nearly 160°F, and in the case of piles 1 and 2 heating was not happening early in the process due to lack of ash. After ash was added to these piles at the rate shown in Table 1, the piles heated properly. The report concluded that Piles 3 and 4 performed the best, but it was not a fair comparison since the ash was added so late to Pile 1. Although the entire study was not replicated, it pointed to several important issues in composting potatoes:

1. Without wood ash in the mix, pH of the compost piles was too low. Limestone was not as effective as ash. It is clear that pH manipulation of some sort is important in composting potatoes.
2. A carbon source such as sawdust (as in the Maine study) is critical. It is likely that straw and other agricultural biomass would work just as well.
3. Piles must be turned frequently. In the Maine trials, the piles were windrows and they were turned daily for the first 2 weeks and every second or third day for the remainder of the 50-70 day composting term. Turning was accomplished in the Maine study with a specially designed compost turning/mixing machine powered by a tractor.

Composting is a sensitive process requiring attention to detail, but when done properly it can be an excellent way to dispose of cull potatoes.

Feeding. Many potatoes are fed to cattle in the Northwest, and this is a good way to dispose of them. Potatoes should be stored for as short a time as possible, so that the net effect is not a relocation of a cull pile to an animal feeding operation. Potatoes can be fed raw to cattle and horses or cooked to pigs and poultry. It is best to chop potatoes prior to feeding to reduce the risk of choking. For more information, see the fact sheet from the University of Maine at the following website: https://extension.umaine.edu/potatoes/wp-content/uploads/sites/49/2012/01/FeedingLivestock.pdf

Burying. In some cases, a good disposal option for unwanted potatoes is burial. It is important to bury potatoes under at least 18 inches of soil to prevent their regrowth and emergence. It is best to bury alternate layers of soil and potatoes to facilitate breakdown of the potatoes. Additional soil will be required to fill the trench after the potatoes have entirely decomposed. As long as the potatoes are being buried on the same ownership they were grown, there are no regulatory restrictions unless a "nuisance" is presented. This guidance would hold true if the potatoes had been in storage, but it does become more complicated if processing wastes are involved.

Useful References

Feeding Potatoes to Livestock. U. Maine Coop. Ext. Fact Sheet. https://extension.umaine.edu/potatoes/wp-content/uploads/sites/49/2012/01/FeedingLivestock.pdf

Cull and Waste Potato Management. U. Idaho Extension Bulletin. https://www.extension.uidaho.edu/publishing/pdf/CIS/CIS0814.pdf

Composting Potato Culls and Potato Processing Wastes. 1990. Woods End Research Laboratory, Maine. https://woodsend.com//wp-content/uploads/2016/06/Composting-Potato-Culls_Brinton_1990.pdf