BURIAL

DEADSTOCK BURIAL INVOLVES DIGGING A HOLE, PLACING DEADSTOCK IN IT, THEN COVERING WITH EXCAVATED SOIL. THIS CHAPTER EXPLAINS:

- **site selection**
- **trench and hole types, and how to estimate what type and size to dig**
- **deadstock placement procedures**
- **how to calculate costs.**

HOW AND WHY BURIAL WORKS

Farmers have buried deadstock for generations, but that does not necessarily mean it was always done properly or in the right place. Scavengers can exhume poorly buried carcasses. Burial on inadequate sites – such as those shallow to bedrock or a shallow water table – poses a higher risk for groundwater contamination.

Decomposition of buried deadstock is like a slow batch-composting process. Deadstock compost best when mixed well with a good carbon substrate under favourable moisture, aerobic and temperature conditions.

Similarly, buried deadstock decompose best under optimum conditions, such as:

- ▶ soils that are well-drained
- ▶ soils that are more aerobic (meaning with oxygen)
- ▶ placement in the biologically active part of soil
- ▶ lots of soil-to-deadstock contact
- ▶ soils that are warmer.

Decomposition can occur in a few months under favourable soil conditions. But in unfavourable conditions, it can take several years, especially if deadstock are packed tightly in a large mass.

Burial is a traditional deadstock disposal method.

ADVANTAGES AND DISADVANTAGES OF BURIAL

ADVANTAGES	DISADVANTAGES
• burial is simple and requires little training • burial uses readily available equipment • burial is relatively inexpensive, if you own a backhoe • most farms have several suitable locations available • biosecurity is maintained as deadstock stay on the farm	• burial is limited to deep, well-drained, aerated soils • site-limiting factors such as depth to water table can be difficult to predict • burial is virtually impossible in frozen winter soil • there can be human safety issues with digging deep holes • can be costly if you don't own a backhoe – or labour-intensive • it is not convenient to haul heavy, awkward deadstock to remote burial sites, especially in bad weather

SELECTING THE RIGHT SITES

Choosing the right burial site is critical to promote good deadstock decomposition and to protect the environment. Generally, soil materials ranging from sandy loams to clays that are well-drained to imperfectly drained are suitable for burial.

However, the regulation does **not** permit burial of deadstock in soils where there is a higher risk of polluting groundwater. These soils include:

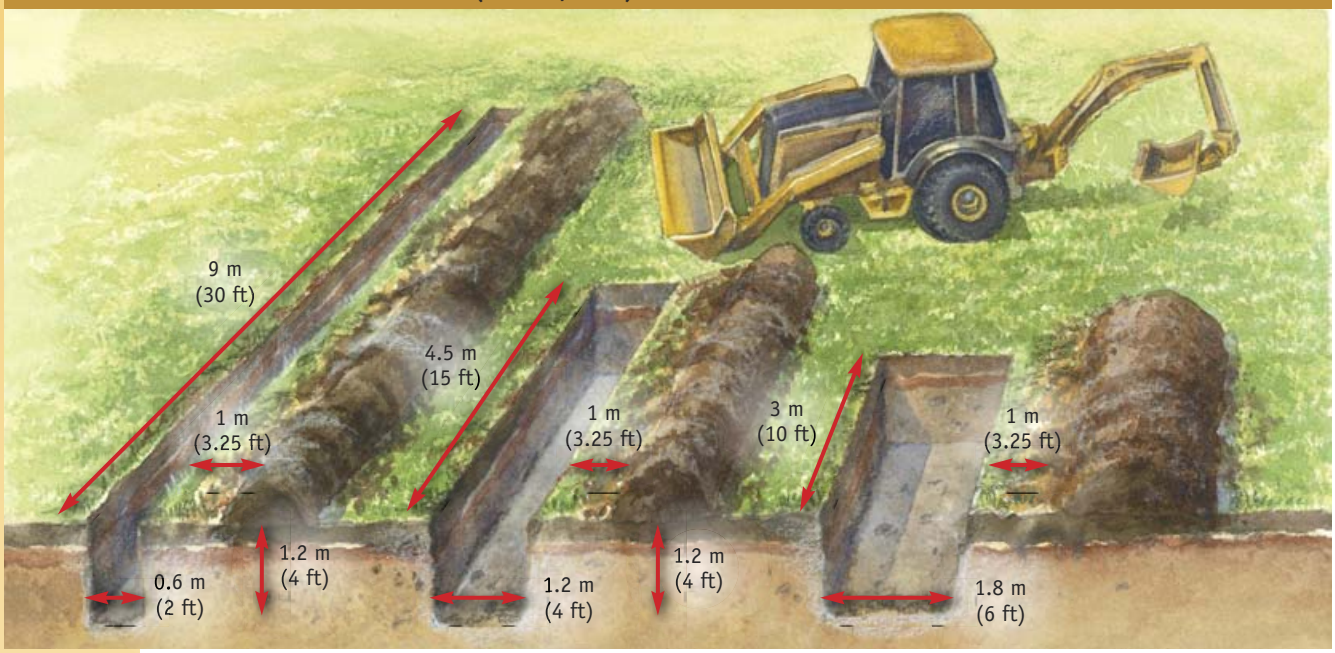
- ▶ organic soils – more commonly known as peat, muck, bog or fen soil, and
- ▶ soils considered as hydrologic soil group AA, which have a combination of rapid infiltration rates (e.g., gravel) and a depth to the uppermost identified bedrock layer of less than 0.9 m (3 ft)

  ▷ these conditions are not common in Ontario.

The regulation does not permit the burial of deadstock in areas subject to flooding once or more every 100 years. To find out if you are in such an area, contact your local conservation authority or municipality. The regulation requires the lowest point of a burial pit to be at least 0.9 m (3 ft) above the top of the uppermost-identified bedrock layer or aquifer.

DEADSTOCK SIZE	AVERAGE WEIGHT PER ANIMAL – kg (lb)	NO. OF DEADSTOCK TO FILL BURIAL PIT TO MAX. ALLOWABLE TOTAL OF 2,500 kg (5,512 lb)
SMALL DEADSTOCK – e.g., poultry, mink	2.5 kg (5.5 lb)	1,000
MID-SIZE DEADSTOCK – e.g., sheep, veal, goats, swine	50 kg (110 lb)	50
LARGE DEADSTOCK – e.g., cattle, horses	500 kg (1,102 lb)	5

DIMENSIONS (TRENCH/HOLE) FOR LARGE AND SMALL DEADSTOCK



Each of these burial pits is 1.2 m (4 ft) deep and each has the same overall excavated volume. Each will hold about 2,500 kg (5,512 lb) of deadstock. Smaller deadstock might be buried in the narrower pits to maximize soil-to-deadstock contact, while larger deadstock might be buried in the wider pits to accommodate their more awkward body dimensions.

The regulation allows up to 2,500 kg (5,512 lb) of deadstock per pit. This limitation means you should not dig very large or deep pits. In fact, unless there is a good reason to do so, digging deeper than about 1.2 metres (4 ft) makes little sense. Going no deeper than 1.2 metres is preferable because:

- deadstock are placed in the biologically active part of the soil
- groundwater is better protected
- shallower trenches are safer than deep ones.

The Construction Safety Association (CSA) describes trenches (pits) as excavations where the depth exceeds the width of the pit. The CSA states that anyone digging trenches needs to be aware of factors such as soil type, moisture content, weather, and excessive weight like heavy equipment beside a trench that might cause cave-ins.

There are safety concerns with deep pits, so never climb into any pit deeper than 1.2 m (4 ft) **unless it is properly sloped, shored, or protected by a trench box,** which is impractical for burying deadstock.

TYPES OF PITS

The regulation specifies that a burial pit must be immediately closed when 120 days have elapsed since the day the pit was first opened, or when 2,500 kg (5,512 lb) of deadstock have been buried in the pit, whichever comes first. There are three types of pits: single-use, multiple-use, and auger pits.

The type of soil determines the strength and stability of pit walls, and this is especially important for pits that will remain open for up to 120 days. Suitable soils that will allow pit walls to be stable for an extended period include:

- Type 1 soils – compacted loamy and clayey soils, dense loamy glacial tills, and
- Type 2 soils – well-structured loam, clay loam, clay.

Unsuitable soils that might have unstable pit walls over an extended period include:

- Type 3 soils – sand, granular materials, and silty or wet clays, and
- Type 4 soils – silty clays with high moisture content.

Once a pit is dug, its sides are exposed to drying. The longer the exposure, the greater the risk of cave-in. Rain, melting snow, thawing earth, and surface water all produce changes in soil conditions that can severely affect pit stability. Heavy equipment beside a pit can affect its stability, so stay as far away as possible. Soil excavated from the pit should be at least 1 m (3.25 ft) from the edge of the excavation.

TYPE	SUITABILITY
SINGLE-USE PIT	• death of one or more animals at same time (e.g., sickness, heat stress), or for deadstock stored over time so burial is done all at once (e.g., freezer full of dead chicken broilers) • single-use pits are usually open only a few hours
MULTIPLE-USE PIT	• operations with daily to weekly deadstock (weaner pigs, poultry) • because all deadstock placed must be covered at all times with 0.6 m (2 ft) of soil, these pits should be dug oversized since soil is being constantly added as deadstock are placed – this takes a lot of room • pits should be flagged as open and/or fenced • frozen soil may make covering difficult in winter
AUGER PIT	• smaller deadstock on smaller farms with a few periodic death losses

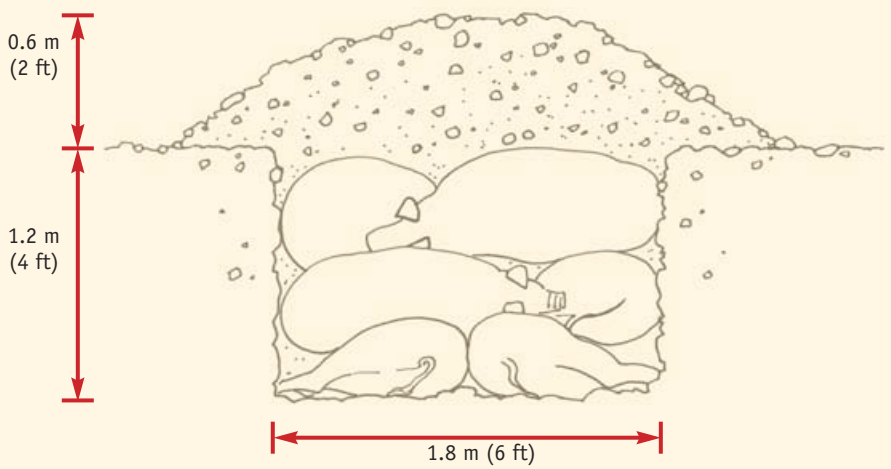
Auger holes are dug quickly using a large-diameter post-hole auger. However, even a hole that is 0.9 m (3 ft) in diameter and 1.8 m (6 ft) deep will only hold about 450 kg (1,000 lb) of deadstock.

HOW BIG SHOULD THE BURIAL PIT BE?

Deadstock have odd shapes, making them difficult to bury, especially if they have begun to bloat or rigor. The **effective burial bulk density** (EBBD) of deadstock is the **weight of a deadstock carcass at death divided by the effective volume it takes up in a burial pit.** The effective volume is difficult to establish because different animals have different profiles, have awkward shapes when buried, and there are unavoidable air pockets.

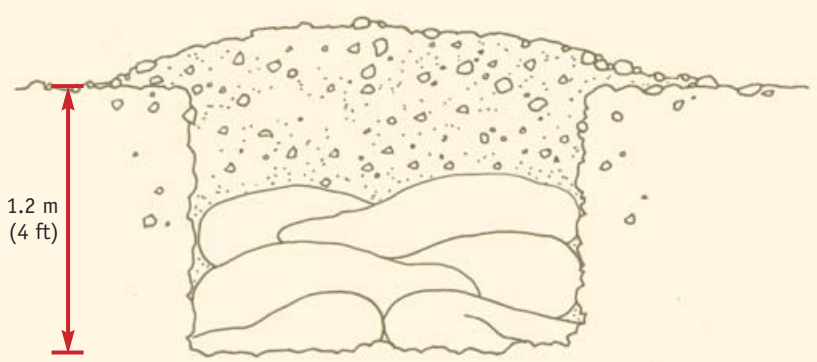
EBBD of deadstock is estimated in the broad range of 175 to 1,000 kg/m^3 (10.9–62.4 lb/ft^3). For planning, use 400 kg/m^3 (25 lb/ft^3). When soil is placed on deadstock, it fills some air pockets, and as deadstock decomposes, soil settles into body cavities.

MOUNDED SOIL AFTER CLOSING BURIAL PIT



When closing a burial hole or trench, add enough soil to the top to allow for eventual settling and to help shed surface water.

MOUNDED TRENCH – AFTER SETTLING



Use the table below as a guide for burial pit dimensions dug by backhoe. Modify dimensions as necessary based on the shape of your deadstock. **It is better to over-dig than under-dig,** because once deadstock are in the pit, they should not be moved again. For multiple-use pits, the pit length may have to be increased because deadstock must at all times be covered with at least 0.6 m (2 ft) of soil between burial placement events.

The assumptions in the table below are:

- **EBBD** is 400 kg/m^3 (25 lbs/ft^3)
- pits are minimum 0.9 m (3 ft) deep, maximum 1.2 m (4 ft) deep
- pits are narrow to maximize soil-to-carcass contact, using standard backhoe bucket width 0.6, 1.2, 1.8 m (2, 4, 6 ft)
- top of each deadstock is below original grade level.

EBBD = effective burial bulk density

The formula for calculating **length** of pit in metres is:
L = Total kg of carcasses ÷ EBBD (kg/m^3) ÷ Width of pit (m) ÷ Depth of pit (m).

APPROXIMATE DIMENSION OF BURIAL PITS BASED ON TOTAL WEIGHT OF DEADSTOCK TO BURY AND THE RELATIVE SIZE OF ANIMAL
e.g., 40 dead feeder lambs weighing a total of 1,000 kg require a burial pit at least 1.2 m wide x 1.2 m deep x 1.8 m long (4 x 4 x 6 ft)

DEADSTOCK SIZE AND TYPE	BURIAL PIT SIZE		
	250 kg (551 lb)	1,000 kg (2,204 lb)	2,500 kg
SMALL – poultry, mink	0.6 m (2 ft) wide 0.9 m (3 ft) deep 1.2 m (4 ft) long	0.6 m (2 ft) wide 1.2 m (4 ft) deep 3.6 m (12 ft) long	0.6 m (2 ft) wide 1.2 m (4 ft) deep 9.0 m (29.5 ft) long
MID-SIZE – sheep, veal, goats, swine	1.2 m (4 ft) wide 0.9 m (3 ft) deep 0.6 m (2 ft) long	1.2 m (4 ft) wide 1.2 m (4 ft) deep 1.8 m (6 ft) long	1.2 m (4 ft) wide 1.2 m (4 ft) deep 4.5 m (15 ft) long
LARGE – cattle, horses	n.a. n.a. n.a.	1.8 m (6 ft) wide 1.2 m (4 ft) deep 1.2 m (4 ft) long	1.8 m (6 ft) wide 1.2 m (4 ft) deep 3.0 m (10 ft) long

Similarly, use the next table as a guide for determining how many kilograms of deadstock you can bury in augered holes of a fixed diameter and depth. Unless augered holes have a large diameter and are deep, they will not hold many deadstock, but may still be a viable option for some operators.

APPROXIMATE DIMENSIONS OF BURIAL PITS BASED ON TOTAL WEIGHT OF DEADSTOCK TO BURY IN AUGER PITS AND RELATIVE SIZE OF ANIMAL
e.g., 8 dead feeder lambs weighing 200 kg total require an auger burial pit at least 1.2 m deep x 0.75 m diameter (4 x 2.5 ft)

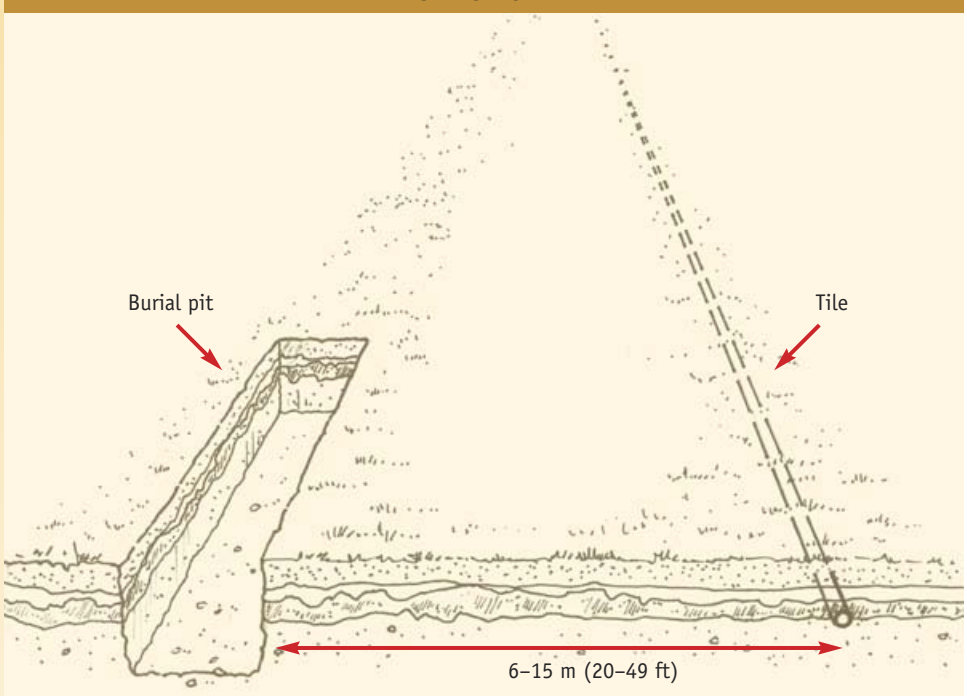
DEADSTOCK SIZE AND TYPE	50 kg (110 lb)	200 kg (440 lb)
SMALL – poultry, mink	1.8 m (6 ft) depth 0.3 m (1 ft) diameter	1.8 m (6 ft) depth 0.6 m (2 ft) diameter
MID-SIZE – sheep, veal, goats, swine	0.9 m (1 ft) depth 0.45 m (1.5 ft) diameter	1.2 m (4 ft) depth 0.75 m (2.5 ft) diameter

DIGGING NEAR FIELD DRAINAGE TILES

Field drainage tiles are prevalent on Ontario farms. Great care must be taken to avoid burying deadstock near tiles so as to prevent leachate reaching them. The regulation specifies every part of a burial pit must be at least 6 m (20 ft) from a field drainage tile. Further, if any part of the burial pit is less than 15 m (49 ft) from a field drainage tile, deadstock must be placed so that the highest point of the uppermost deadstock is lower than the lowest point of the nearest field drainage tile. The reason is if there is any leachate from the burial pit, it should not be able to reach the tile since the leachate would be below the level of the tile.

Deadstock must be buried below the depth of any tile drains that are within 6–15 m (20–49 ft) of the burial pit.

DISTANCE TO TILE



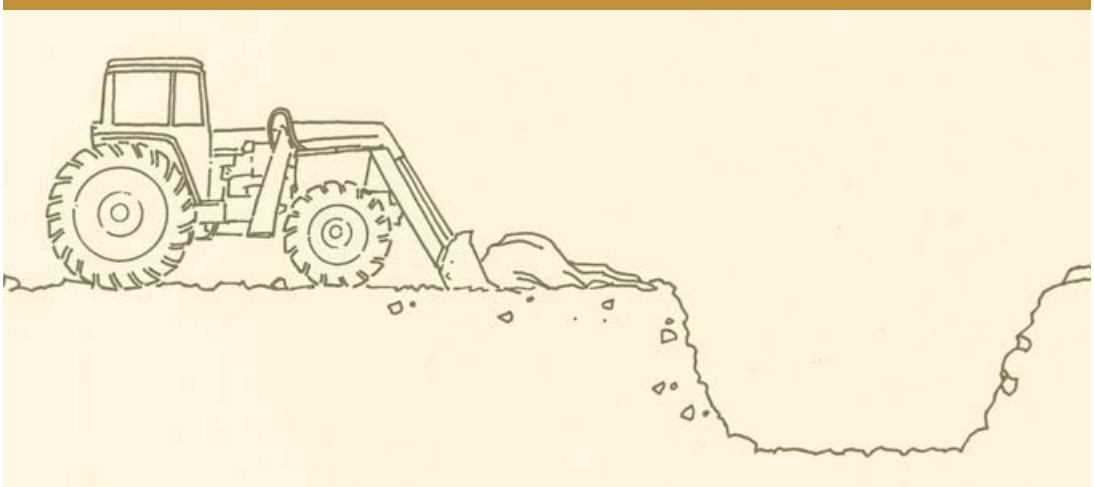
DEADSTOCK PLACEMENT

Within about 48 hours of death, some deadstock begin to bloat due to retained gases, so sometimes lancing (puncturing or venting) larger deadstock (>100 kg) is necessary. Use a bale spear to make a deep stab wound posterior to the ribs to vent the thoracic and abdominal cavities. Lancing should be done just before placing deadstock in the pit. Noxious gases and bodily fluids are likely to escape.

Plan carefully how to place deadstock in the pit. For safety reasons, do not drop them in from a tractor front-end loader bucket unless your front wheels are well back from the pit. Push large, heavy carcasses such as cows into the pit from the side. Always stay as far away as possible from the pit with the tractor.

Adding lime on top of carcasses is not recommended. In the past, lime was added to discourage scavengers, prevent odours, and slow decomposition. If buried correctly, scavengers and odours are not an issue.

PUSHING DEADSTOCK INTO BURIAL PIT



Pushing a large deadstock into a pit is safer than getting too close to the pit with a tractor and loader while dropping the deadstock in.

COVERING DEADSTOCK WITH SOIL

Place as much soil as possible in the air pockets between deadstock to encourage quicker decomposition. Push in soil rather than dumping it in to reduce the chance of cave-in.

The regulation specifies that to close a burial pit, an operator must fill it with enough soil so that the top of the fill soil forms a mound that is higher than the level of the ground at the perimeter of the pit by the greater of:

- half of the depth of the pit measured with reference to its lowest point and
- 0.6 m (2 ft).

This ensures enough soil on top of the deadstock to reduce the chance of scavenging, but also allows for settling as the deadstock decompose and soil falls into the voids between them. Depending on pit depth, the **minimum** amount of soil required **above ground** after closing the pit varies. See the table below.

Lightly compact the soil using a front-end loader or backhoe bucket. For safety reasons, don't drive over the pit. Mark the area with a flag for a period of time so you can find the location again and monitor it for scavenger problems, uneven settling, or leaching.

See the regulation about required record-keeping regarding deadstock, including the location. GPS coordinates of the site would be helpful.

MINIMUM AMOUNT OF SOIL REQUIRED ABOVE GROUND TO CLOSE A PIT – VARIES, DEPENDING ON ORIGINAL PIT DEPTH

DEPTH OF PIT	MINIMUM SOIL DEPTH REQUIRED ABOVE GROUND
1.8 m (6 ft)	0.9 m (3 ft)
1.5 m (5 ft)	0.75 m (2.5 ft)
1.2 m (4 ft)	0.6 m (2 ft)
0.9 m (3 ft)	0.6 m (2 ft)
0.6 m (2 ft)	0.6 m (2 ft)

ESTIMATING THE COST OF BURIAL

Joe grows 25,000 chicken broilers per crop on a 9-week cycle and produces 6 crops per year. His death loss is 4% and the average carcass weight is 0.76 kg. Joe wants to use chest freezers holding 0.71 m^3 each (25 ft^3) to collect and freeze dead birds as they occur. He proposes to bury all the birds from the freezers once every 6 months, or about every 180 days, in May and November when the freezers are full.

QUESTIONS

1. How many freezers does Joe need?
2. How big a burial pit should the hired backhoe operator dig each time if the bucket is 0.6 m (2 ft) wide?
3. What is the cost per year per kg of deadstock?

ANSWERS

1. 25,000 birds × 6 crops × 4% death loss × 0.76 kg/bird = 4,560 kg/year (2,280 kg every 6 months)
   - ► EBBD is 400 kg/m^3, so freezers hold 0.71 m^3 × 400 kg/m^3 = 284 kg each
   - ► 2,280 kg ÷ 284 kg/freezer = 8 freezers
2. From the table on page 89 under the columns for small animals and 2,500 kg, the pit must be at least 0.6 m wide × 1.2 m deep × 9.0 m long (2 × 4 × 29.5 ft.)
3. New freezers of this size cost about $1,000 each, so 8 freezers amortized over a 10-year life is $800/year (8 × $1000/freezer/10 years). Assuming a hired backhoe and operator costs $80/hour, and 5 hours' travel to and from the farm, dig the pit, push the birds in, then cover and close the pit, this is $400 twice annually, or $800/year.

   The burial pit costs per year are:

   - ► $800 for freezers
   - ► $800 for hired backhoe labour
   - ► $1,600 total yearly cost.

   The cost to bury (not including labour to transport and empty freezers of deadstock to the burial pit) is:

   $1,600/4,560 kg = $0.35/kg ($0.16/lbs)