

2017 ACORN Conference & Trade Show
Best Western Glengarry - Truro, NS

Workshop Title: Root Cellar Design and Development - Part 1

Speaker: Zach Loeks

Executive Summary: This workshop provides an introduction to root cellar design, construction, and management. Filled with tips for efficient layout, siting, cultivar requirements, and staff movement, the essential elements for construction in any situation are described.

Detailed Notes:

This session was the first of a two-part presentation on root cellaring. The presentation focused on four aspects of root Cellars:

- Cellaring Principles
- Cellar Conditions
- Types of Cellars
- Designing to scale

Cellaring Principles:

- Soil Health: healthy soil will produce healthy plants, which will store better. Soil health equals cellar health.
- Correct cultivars: selecting the right cultivars for the right storage conditions will result in greater success.
- Post-harvest handling is critical to storage health. Cultivars damaged in handling will not store well.
- Cellar conditions, especially regarding temperature and humidity, will greatly affect long-term storage success.
- Whole system design: the cellar needs to be designed with the whole farm in mind, as well as with these principles. Finding the right location will ensure efficient use.
- Cellar management: good record keeping is essential. A root cellar is a storage for living vegetables. Regular monitoring of conditions and crops is essential to success.

Select Storage Varieties:

- Not all crops store well or long. Conduct trials to determine which varieties store well in your situation. Zach has found that bolero carrot, gold rush potatoes, Detroit beet, red Italian garlic, and Cortland onion are all good storage crops.
- Tips: assess your market or personal taste or demand; don't store too much, be realistic, find a niche, know your favourites, and select what grows well for you and has no disease
- Leave things in the ground if you can't use it. The ground will love the nutrients found in plants left in the field over the winter.

Cellar Conditions:

- Temperature and humidity: It is very important to understand these two concepts. Every cellar needs a thermometer and hydrometer so that conditions can be monitored and specific requirements maintained for specific groups of cultivars.
- Light/dark: keep things dark and have zoned lighting or task lighting if one is going to work in the cellar. Also, have shatterproof light bulbs if possible. One does not want shards of glass spread over storage crops.

Cold and Very Humid Conditions:

- Go for as close to 0°C as possible and 95% relative humidity for carrots, beets, turnip, and leeks.
- Right at the freezing mark for these crops. Windswept fields will not hold carrots. They want high humidity.

Slightly above freezing and lower relative humidity (RH):

- 0 - 4°C and 50-65% RH for onions and garlic.
- Basements are generally good for these crops with the addition of a dehumidifier.

A basement can be divided into two rooms for dry and moist storage areas. A sand floor in the moist area and a dehumidifier in the dry side. Empty the dehumidifier into the sand to maintain higher humidity on the moist side.

Slightly warm and dry conditions:

- 10 - 15°C and 65%RH works well for squash and pumpkins

Types of Cellars:

Before discussing different types of cellars, Zach referenced some other methods of storage, including:

- Dry Cellars: Zach stores onions in the top floor of his barn, with blankets thrown on top after they freeze up.
- Leaf Cellars: piling leaves on top of certain crops will encourage dormancy and provide protection from frost. Row covers and hoop houses with row covers also provide degrees of protection.
- Field Greens: some greens, such as kale, can be left in the field after frost and maintain quality for some time. Russian kale will self-seed and come up early in the spring. Wait for a light frost before harvest because the frost will result in an increase of sugar.
- Pantry storage works for some things like dry beans and peas.

No matter what the cellar design, certain features can be integrated to increase efficiency and success with long-term storage. Having separate bays or sections within the cellar enables the grower to isolate certain crops from others (apples and carrots for instance). Many cellars have an airlock entry system to protect the crops from

temperature changes. Also, cellars often serve as work areas for market preparation so give consideration to ergonomics and ability to move around.

There are many variations of in-ground storage. Having a hill to dig into can make the construction of an in-ground cellar possible. A small cache is perhaps the easiest method of construction for a root cellar. A cache has many advantages:

- Doesn't freeze down to -30°C .
- Holds about 450lbs.
- Great for homesteaders.
- Provides valuable storage for spring markets.
- Zach recommends playing around and starting with these small caches. Using cedar or hemlock posts, poly fabric for roof and walls, and backfilling on the roof can result in a very affordable structure.
- A well-fitting door will prevent rodents from entering the cache.
- A cache should be located where there will be easy access in deep snow. A roof extension over the door is a great addition.

Basement or garage retrofits for root cellars are common solutions for long-term storage.

- These can cost between \$10 to \$30 per square foot, depending on the materials used.
- Built on an exterior wall in a basement; the interior walls are well insulated.
- Exterior walls access earth temperatures.
- Air intake cooling near the floor is necessary, as is ventilation for the ceiling of the structure.
- It is best to build near a basement window to provide easy ventilation. Passive air intake and exhaust can be achieved.
- Common designs feature one corridor with shelving on one side.

Wine cellars are another specific type of root cellar.

- 12°C is a good temperature
- A wine cellar doesn't need much air.

Other considerations in design and construction:

- Crushed stone or sand are good material for floors.
- Add humidity if needed. Creating a humidity sink with materials like wet sand is common practice.
- Although most cellars are designed to make use of passive air exchange, fans and thermostats can be added to fine tune cellar environments.
- Design the root cellar for product flow and ease of movement for staff.

Venting is critical in the root cellar. A passive exchange is possible because warm air rises and as it does, cool air is drawn into the intake vents located near the floor level. The air exhaust is always located near the ceiling. Each separate chamber or section within the root cellar requires two vents.

Shelving Options:

- Zach recommends cedar or hemlock for shelving. He also suggests finished wood, not rough lumber as this will more likely trap mold and bacteria.
- Painting shelving is a good idea.
- Use crates for storage as these are flexible, movable, and easy to clean and sterilize.
- Allow air to flow behind shelving.

Coolbot:

- Traditional walk-in coolers are available but these are generally pretty expensive for the average farm.
- CoolBots are now common on many farms. Zach recommends going to the CoolBot website for guidance regarding the size of the air conditioner unit for specific size spaces.

Storage Styles:

- Feed bags for carrots; wash and then store in crates until ready to market.

You can reach Zach at the following addresses to receive more information on root cellar design and construction.

www.kulafarm.ca

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