



# Best Practices for On-Farm Cold Storage

Technical Assistance Training

Provided by NC Growing Together, Natural Capital  
Investment Fund, and NC Cooperative Extension



# Welcome & Agenda

- Overview of Cold Storage Training
- Introduction of Presenters:
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After completing the training, applicants should contact Rebecca Dunning, Project Manager, at [rebecca\\_dunning@ncsu.edu](mailto:rebecca_dunning@ncsu.edu), to confirm the technical assistance component of the financing package.



# Training Overview



- This training was created to assist farmers with on-farm cold storage technical assistance, as part of a joint financing and grant program available from the NC Growing Together Project, an initiative of the Center for Environmental Farming Systems, and Natural Capital Investment Fund (NCIF), in the fall of 2017.
- The training covers important best practices for installation, use, and management of on-farm cold storage units, including both purchased and constructed units, for meat and produce storage.

**For more information about the NC Growing Together Project, please visit [www.ncgrowingtogether.org](http://www.ncgrowingtogether.org).**



# Overview of On-Farm Cold Storage

## Unit Parameters to Consider

- Type of Storage (crop volume, bulk, or containers)
- Length of Storage (short 30 days/long 3-6 months)
- Compatible crop to unit (Temp, Humidity, Ethylene, odor)
- Money to invest

## Types of units

- Root Cellar
- Refrigerator
- Walk-in / Drive-in Coolers
- Built-in-place cooler
- Self contained unit (Reefer type trailer or cool bot)

# Overview Of On-Farm Cold Storage

## Refrigeration Systems

### Types of Refrigerants

- Avoid - R-12 & R-22
- Acceptable - R134a & R404a
- Evaporator Fan Motors
  - Can be higher cost to operate than compressor
  - PSC - Permanent Split Capacitor - 50-60% efficiency
  - EC - Electronically Commutated - 65-80% efficiency
- Refrigeration Sizing
  - Field heat removal
  - Equipment heat gain (lights, fans)
  - Infiltration heat gain (door openings, leaks)
  - Conduction heat gain



# Overview Of On-Farm Cold Storage

- **Field Heat** - Factors affecting removal rate
  - Types of packaging and containers
    - Slotted vs solid
  - Low refrigeration capacity
  - Air flow rate
  - Quality reduction in storage if not removed
    - ripening, wilting, spoilage, short self-life
  - Precooling
    - Hydro-cooling - water bath, forced air, ice pack, and vacuum types
- **NC Growing Together** - On Farm Infrastructure Tool Kit - <https://www.ncgrowingtogether.org/>
- **NC Produce Safety** - Post Harvest Information and Resources - <https://ncfreshproducesafety.ces.ncsu.edu/ncfreshproducesafety-postharvest-handling/>



# Best Practices for Using On-Farm Cold Storage for Produce

- Products to be stored
- Access to unit
- Building codes / food safety concerns



# Products To Be Stored



- Is there a need for different temp zones?
- Humidity concerns / requirements
- Will there be a need for top icing?
- Will there be a need for different zones for other reasons (food safety, ethanol, etc..) ?




# Access To Unit

- Will product be boxed or palletized ?
- Size of door is very important
- How will product flow?
- How will product be stored in cooler ?





# Building Codes & Food Safety

- Some codes require fire suppression in coolers
  - Fire sprinklers must be charged with potable water
  - Will there be product stacked?
  - Is the unit secure from pests?
- 


# Best Practices for On-Farm Storage of Meats

- Location is essential
- Available power
- Resources-local repair
- Plan for the future
- Alarms and Alerts
- Sources






# Location is Essential

- Locate in area with easy access, gravel or paved
  - Consider all weather conditions, receiving and shipping are year round
  - Can be inside or free-standing
  - Well-lit and secure location
- 



# Available Power

- Determine requirements for unit
  - Expensive to run 3 phase lines
  - Multiple chest freezers
  - Large enough for expansion
- 

# Alarms and Alerts

- Power failures
- Food safety issues
- Backup Plan for natural disasters, inclement weather, and power loss





# Resources for Units

- Used freezers
- Local
- Internet



*Thanks to Shipley Farms Signature Beef for input.*

# NCGT & CFSA On-Farm Infrastructure Toolkit



## ON-FARM INFRASTRUCTURE TOOLKIT



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<http://go.ncsu.edu/ncgt-infrastructure-toolkit>

# Additional Resources

- **Find your local county center:**

<https://www.ces.ncsu.edu/local-county-center/>

- **NC Growing Together Resources:**

<https://www.ncgrowingtogether.org/for-producers/>

- **NC Growing Together Spec Guide for Produce:**


<https://www.ncgrowingtogether.org/ncgt-resources/wholesale-and-retail-product-specifications-guidance-and-best-practices-for-fresh-produce-for-small-farms-and-food-hubs/?portfolioCats=192%2C195%2C187%2C188%2C189%2C211>

- **NC Choices Technical Assistance for Meats:**

[www.ncchoices.com](http://www.ncchoices.com)

- **Pack 'n' Cool Construction Guide & Budget:**

<https://plantsforhumanhealth.ncsu.edu/2012/08/20/pack-n-cool/>



# Thanks for completing the cold storage training requirement.

After completing the training, applicants should contact Rebecca Dunning, Project Manager, at [rebecca\\_dunning@ncsu.edu](mailto:rebecca_dunning@ncsu.edu), to confirm the technical assistance component of the financing package.

Please visit [www.ncgrowingtogether.org](http://www.ncgrowingtogether.org) for additional resources.