Project Planning for Postharvest Efficiency, Profitability & Food Safety

UVM

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Footprint Farm

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PASA – Lancaster, PA

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Agricultural ENGINEERING

FOOTPRINT FARM

Outline

Introduction: Who is in the room and what is your post harvest challenge

Postharvest and Produce Safety: Produce is alive and good for us

Flow & Lean Principles: Planning for efficient flow of product, people, & water

Buildings & Infrastructure: Structures, utilities, design, & materials

Equipment: Wash lines, spinners, cleaning and sanitizing, and coolers

Tools: Containers, hoses, cleaning tools, thermostats, and records

Whiteboard Activity: Planning your project

Introductions

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INTRODUCTIONS

Name, Farm, Location

Postharvest Bottleneck, Challenge or Point of Pain?

Postharvest & Food Safety

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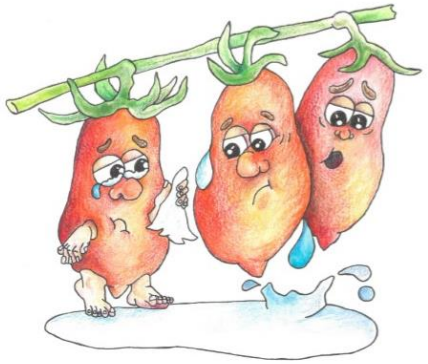
Fresh Produce…

IS ALIVE

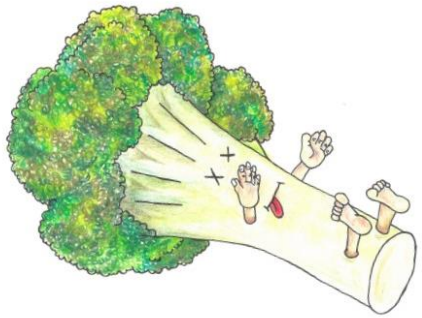
BREATHES

RELEASES HEAT



LOSES MOISTURE

CAN GET SICK



CAN EVEN DIE

Illustration by Virginia Jaquish.

More info: USDA Handbook 66 – go.uvm.edu/respiratorymetabolism

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Produce Safety Overview

Risk Reduction

Isn't Rocket

Science,

but….

capsvt.org & producesafetyalliance.cornell.edu

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Contamination Sources

Humans

Soil

Produce

Animals

Buildings
Equipment
Tools

Water

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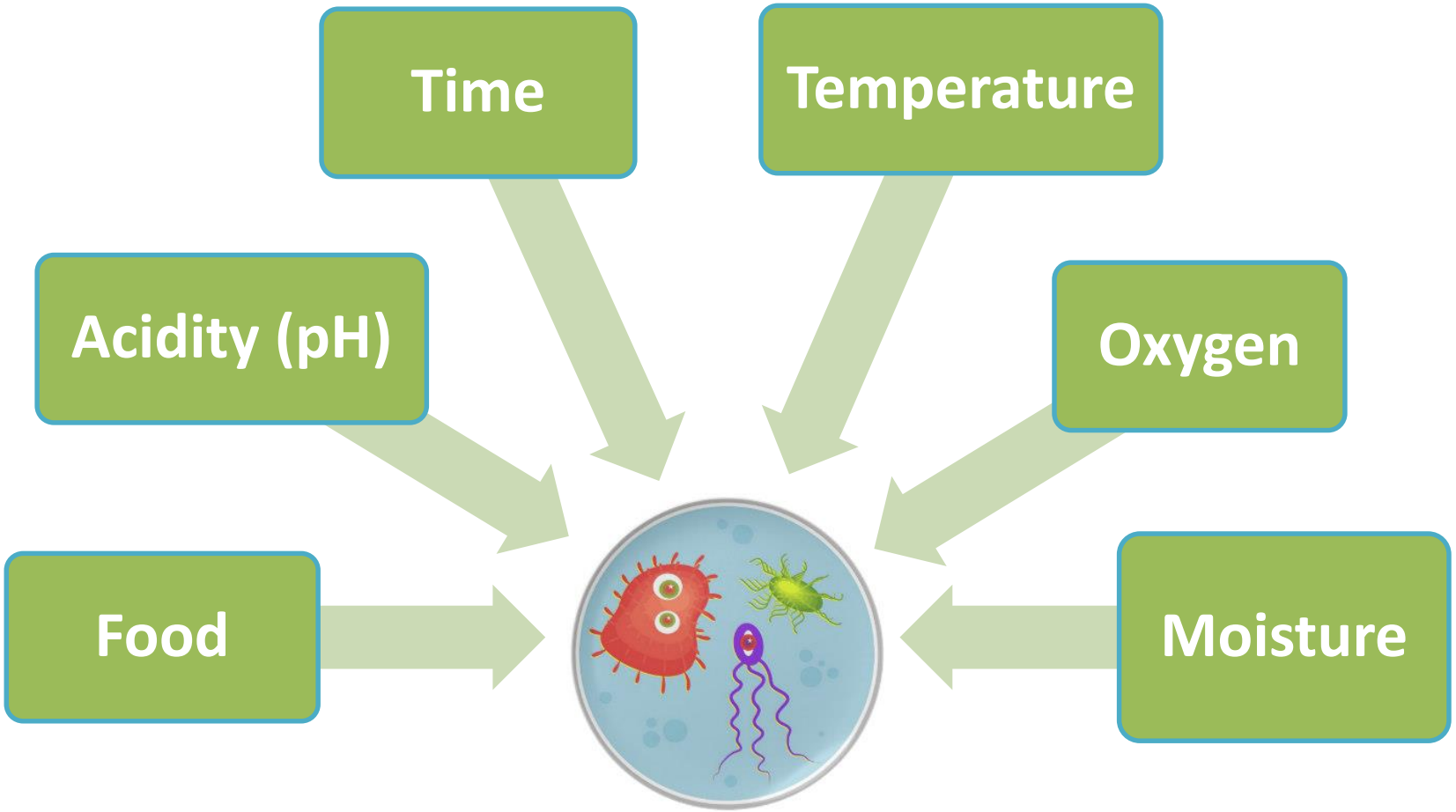
Conditions for Bacterial Growth



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Flow & Lean Principles

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Principles of Lean

Identify Value – What does your customer want?

Map the Value Stream – How do you provide value to the customer? Where is there waste? How can you remove that waste?

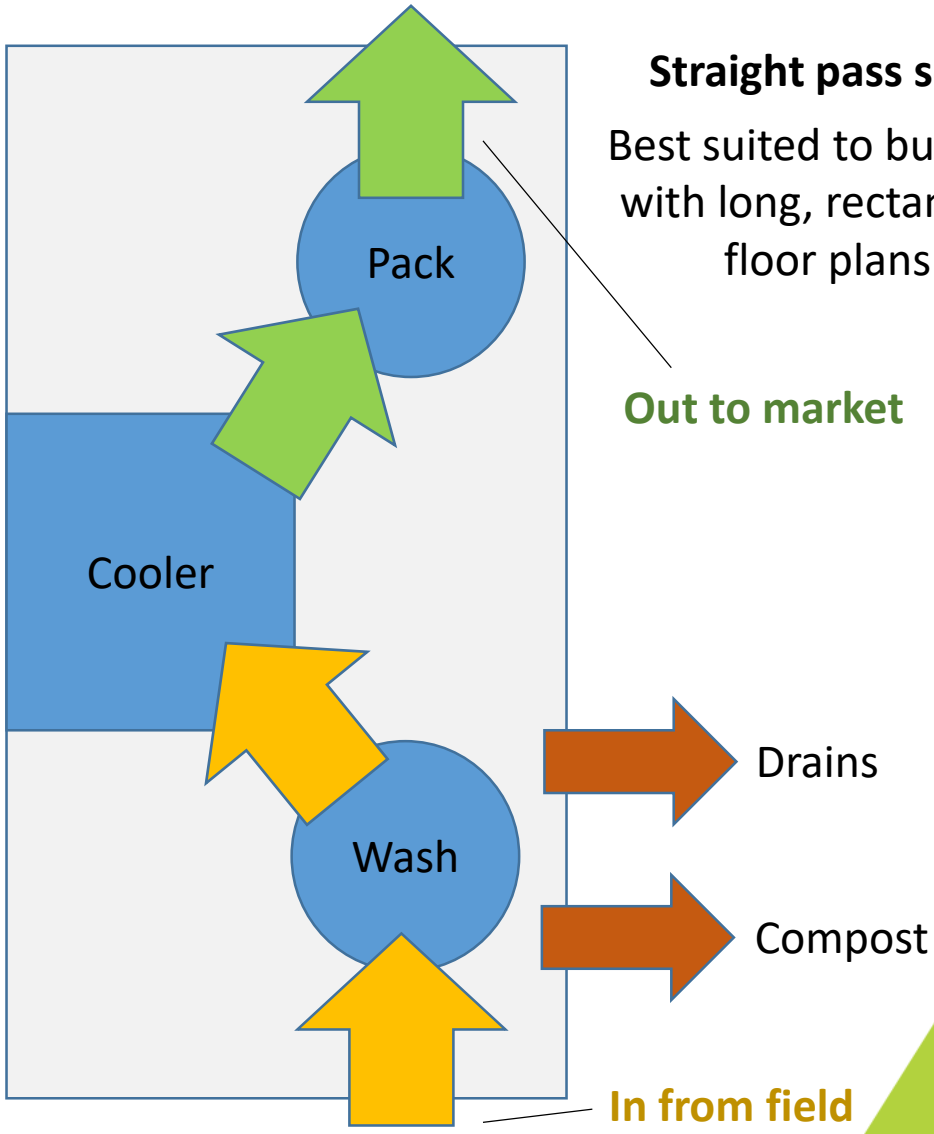
Create Flow – Avoid interruptions, delays and bottlenecks. Plan for movement.

Establish Pull – Customer can depend on “just-in-time” delivery as needed.

Seek Perfection – Always look for opportunities to improve.

Flow of Product

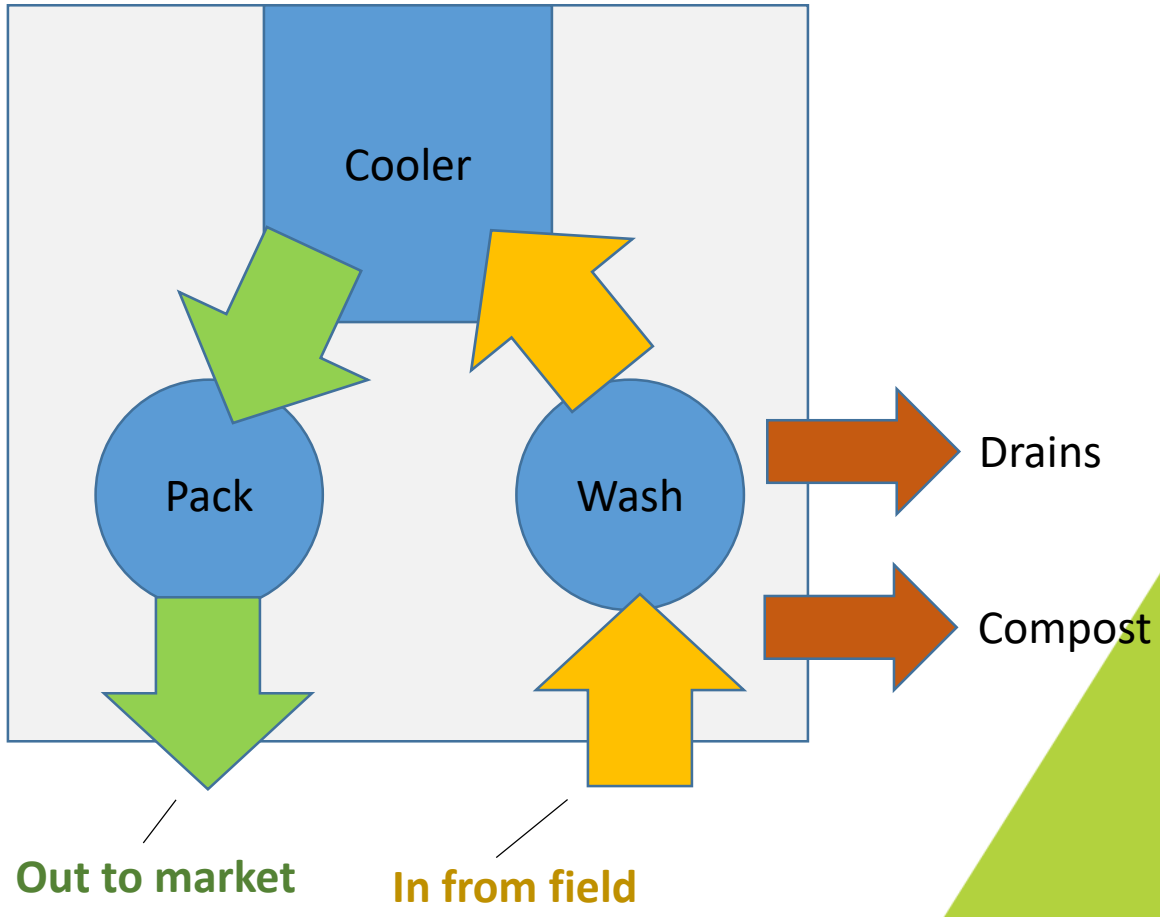
- Smooth, single pass flow of product.
- Minimizes wasted energy.
- In the direction from field to customer.



Flow of Product

- Smooth, single pass flow of product.
- Minimizes wasted energy.
- In the direction from field to customer.

U-turn setup
Best suited to square floor plans.
Can use a single large door.



Flow of People

- Consider specialization of tasks (e.g. harvest crew, wash/pack crew)
- Location of other tasks (e.g. tool storage, hand washing, break room.)

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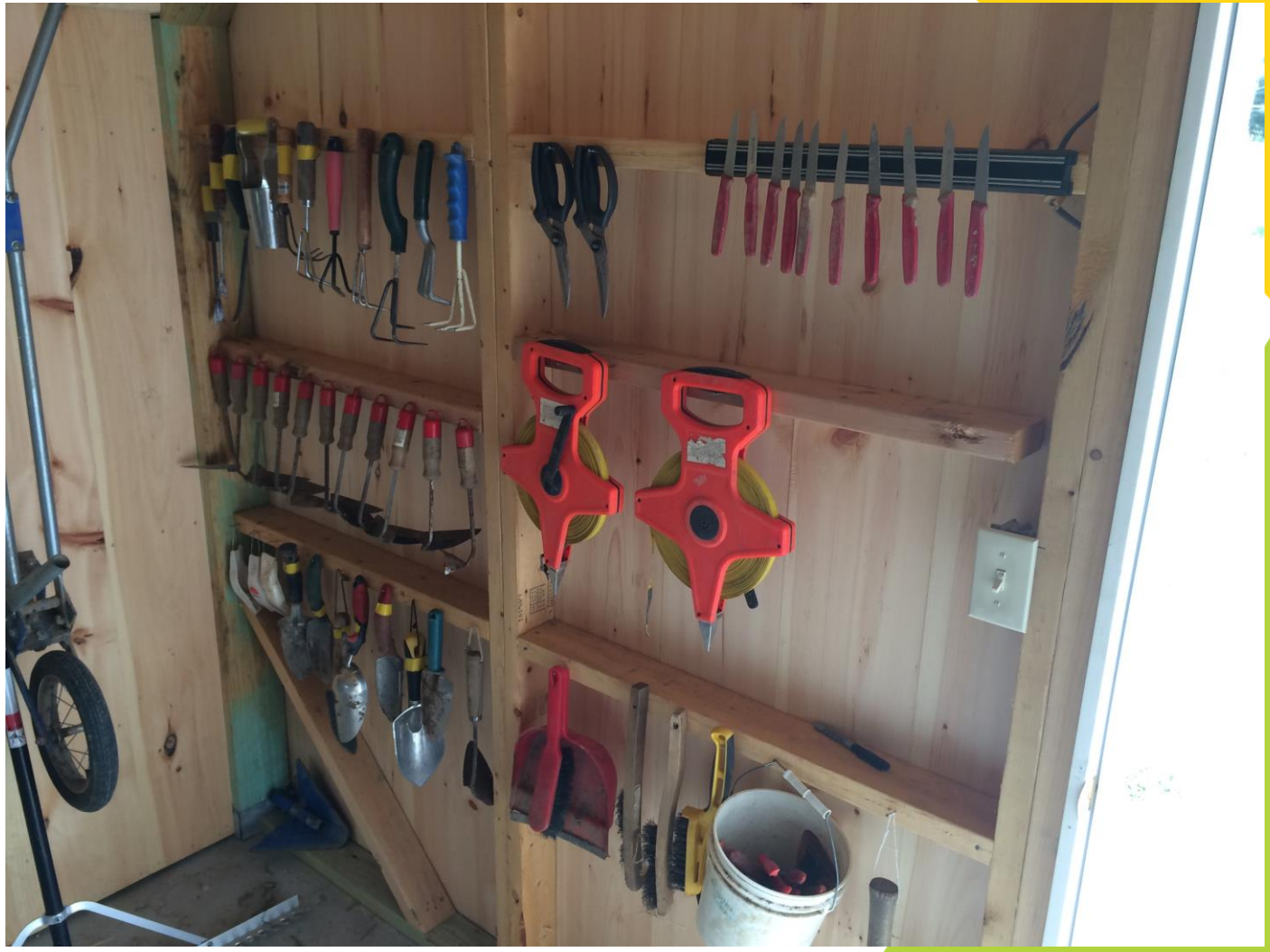

Flow of Water

- Hard plumbed vs. hoses
- Hose hangers/trolleys
- Multiple drops for hoses
- Drains

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Any Scale, any Budget...

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Any Scale, any Budget...

Virtual Tour of Footprint Farm

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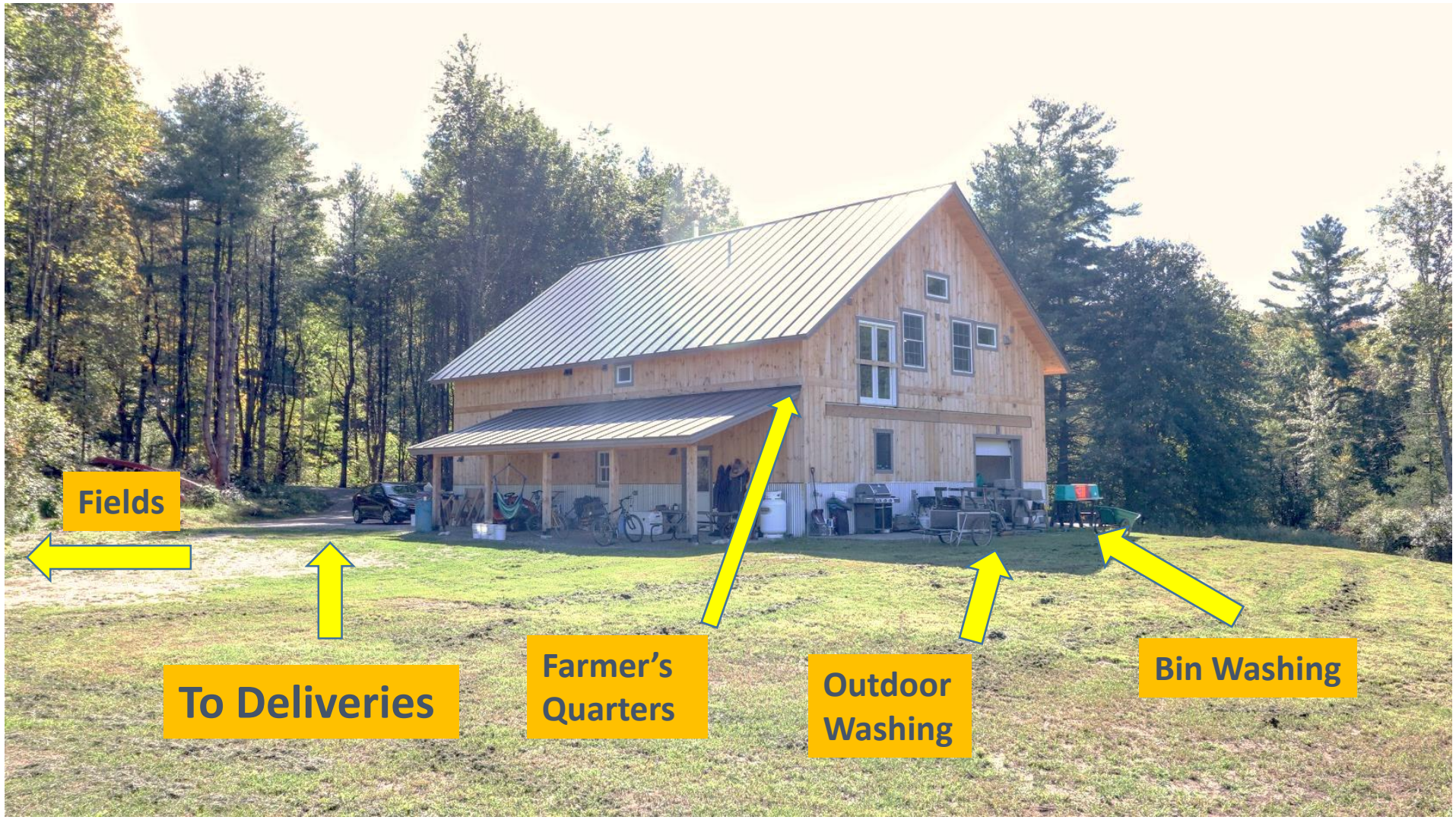
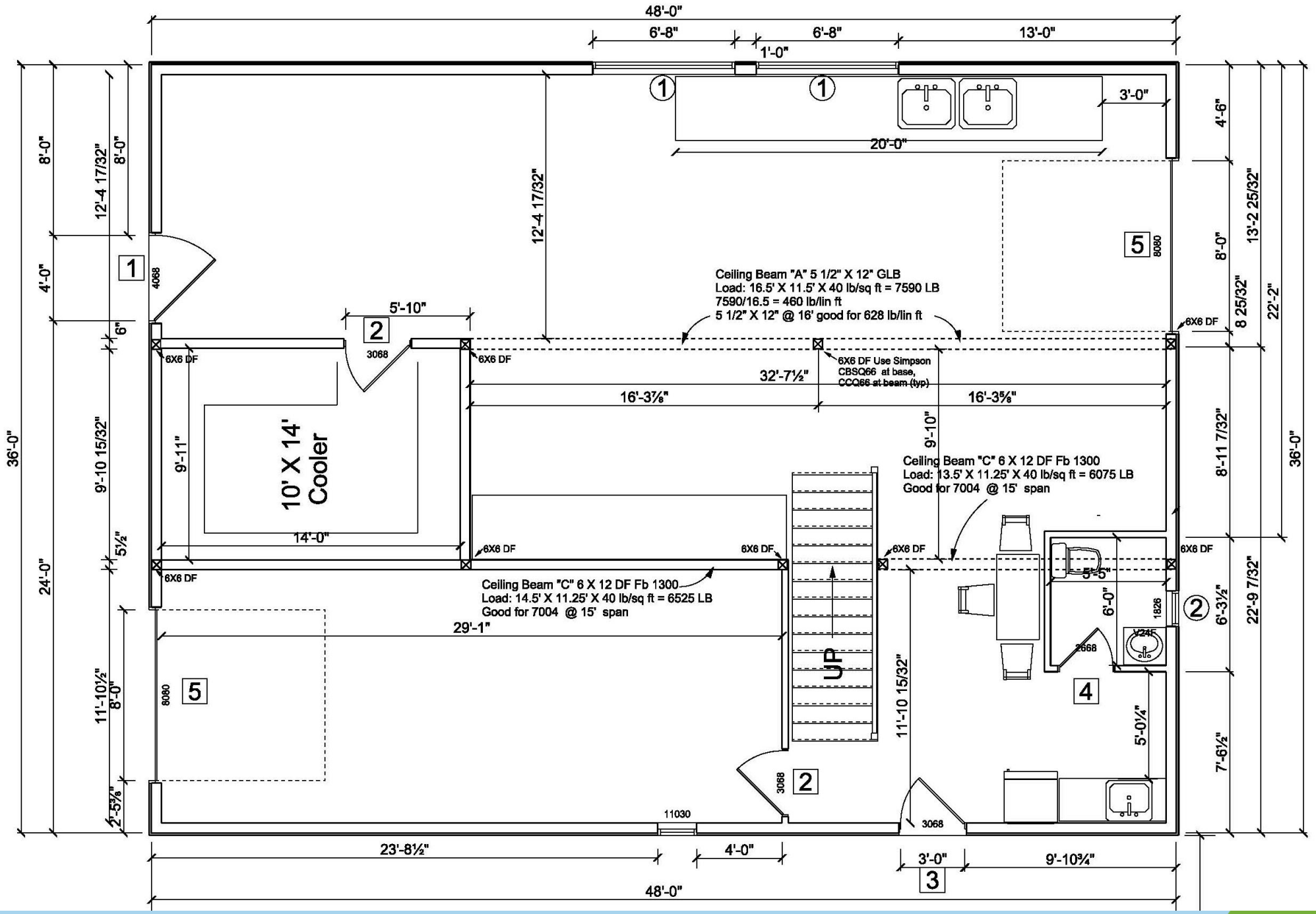
Tatro Rd
Footprint Farm


Produce
Barrel Washer
Harvest Bins
Footprint Farm
To Market


Fields
To Deliveries
Farmer's Quarters
Outdoor Washing
Bin Washing


48'-0"
6'-8"
6'-8"
13'-0"
1'-0"
3'-0"
20'-0"
12'-4 17/32"
8'-0"
4'-0"
6"
5½"
2'-5⅜"
36'-0"
24'-0"
9'-10 15/32"
11'-10½"
4'-6"
8 25/32"
13'-2 25/32"
22'-2"
8'-11 7/32"
22'-9 7/32"
7'-6½"
5'-10"
3068
4068
8080
6X6 DF
6X6 DF Use Simpson CBSQ66 at base, CCQ66 at beam (typ)
Ceiling Beam "A" 5 1/2" X 12" GLB
Load: 16.5' X 11.5' X 40 lb/sq ft = 7590 LB
7590/16.5 = 460 lb/lin ft
5 1/2" X 12" @ 16' good for 628 lb/lin ft
32'-7½"
16'-3⅞"
16'-3⅝"
9'-10"
9'-11"
10' X 14'
Cooler
14'-0"
Ceiling Beam "C" 6 X 12 DF Fb 1300
Load: 13.5' X 11.25' X 40 lb/sq ft = 6075 LB
Good for 7004 @ 15' span
Ceiling Beam "C" 6 X 12 DF Fb 1300
Load: 14.5' X 11.25' X 40 lb/sq ft = 6525 LB
Good for 7004 @ 15' span
29'-1"
UP
11'-10 15/32"
5'-5"
6'-0"
1826
2668
5'-0¼"
11030
23'-8½"
4'-0"
3'-0"
9'-10¾"
48'-0"


SPEED QUEEN

Activity #1: Sketch Overall Site Plan (10min)

**People, product, water, vehicles,
existing buildings, fields etc.**

**Draw: Flow arrows, pinch points,
risk areas or red flags**

Activity #2: Postharvest Building Flow (20min)

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Sharing & Q&A (10min)

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Break (10min)

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Buildings & Infrastructure

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Packshed Essentials

- A wide range of buildings (or spaces) can be effective
- “Four sticks and lid”
- Key features
  - Sound construction
  - Protection from the weather
  - Exclusion of pests
  - Siting
  - Heating/Ventilation
  - Adjacent uses
  - Flow, grade, access
  - Budget & Skill

Postharvest Case Studies

Footprint Farm – BarnHouse Construction ($300k)

go.uvm.edu/footprint

Mighty Food Farm – New Construction ($100k)

go.uvm.edu/mighty

Last Resort Farm – Dairy Barn Renovation ($60k)

go.uvm.edu/lrf

Root 5 Farm – Conversion and Expansion of Pole Barn ($40k)

go.uvm.edu/root5farm

Insulation

Foam boards

- Blue (polystyrene)
- White (poly isocyanate)

Spray foam (poly iso)

Rockwool or Mineral wool batts

Generally avoided due to high moisture issues:

- Fiberglass (pink)
- Cellulose

Insulation Options	$/R/ft2
Spray Foam - Closed Cell	0.1667
Spray Foam - Open Cell	0.1083
Blue Board	0.0968
Poly Iso Board (HiR)	0.0732
Fiberglass Roll	0.0024

Structural Insulated Panels (SIPs)

- Pre-fabricated insulated panels that can be used for cooler siding
- Can be load-bearing
- Can be used for roof-insulation
- Think about smooth and cleanable finish surface

Avoid Bare Wood & Liquid Water

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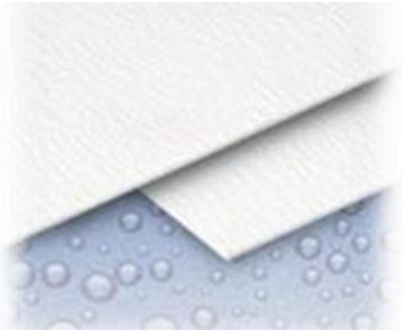
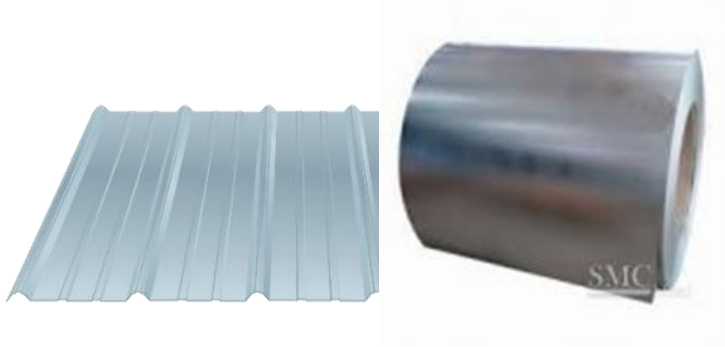
Smooth and Cleanable Materials

Fiber Reinforced Plastic (FRP) aka
"Dairyboard"
$1.03-1.92 / ft^2



WallTuf
$1.25 / ft^2



Galvanized Aluminum (Galvalum)
$0.76-0.95 / ft^2

TrussCore
$1.52 / ft^2

Extrutech
$2.20 / ft^2

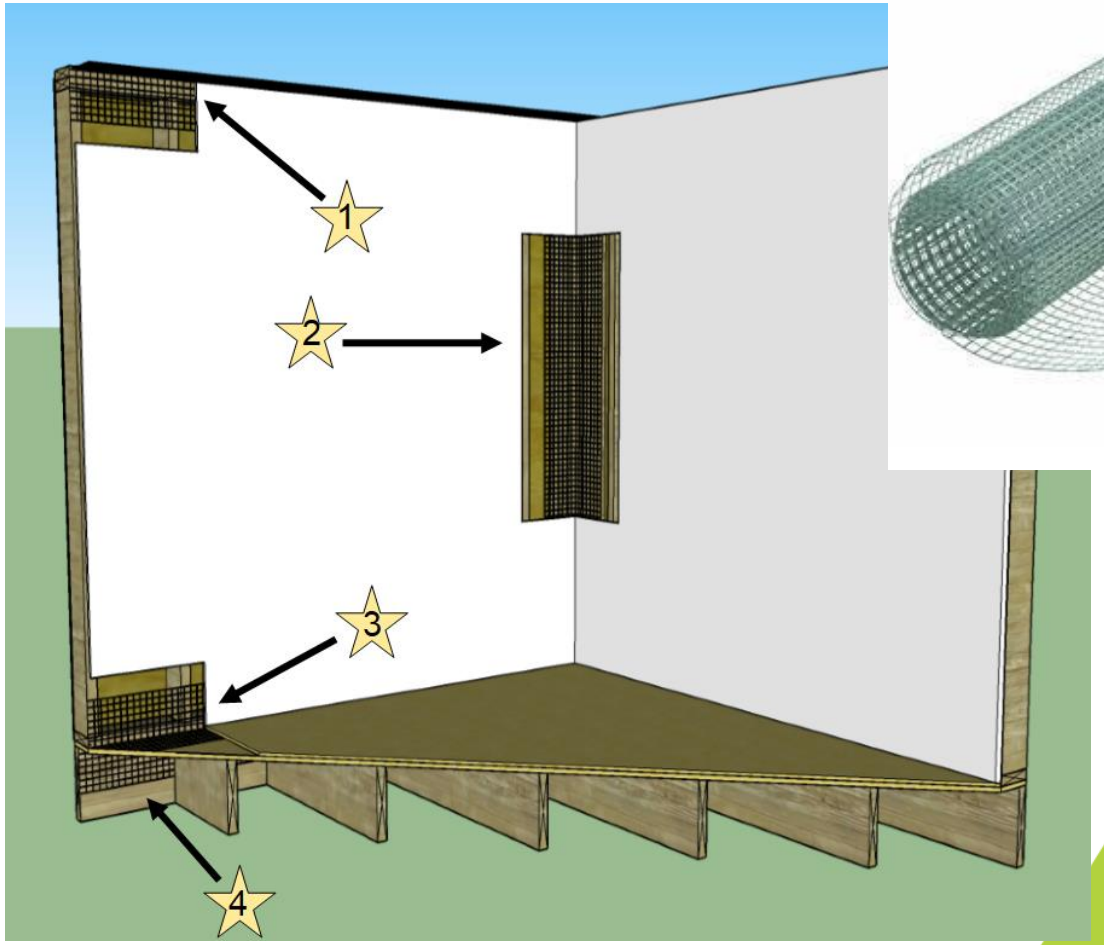
Utilite
$1.85 / ft^2

Ribcore
$0.77 / ft^2

Rodent & Pest Control

Limit Access

- Tight construction
- Flashing/wire mesh/hardware cloth at corners
- Cement curbs



Evaporator Drains

Lots of moisture collects on the floors in coolers

- Build entire cooler slanted towards the door (or drain)
- Incorporate a drain into the cooler

Route condensation line intentionally.

Also CoolBots™!

Equipment

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Dunk/Dump Tanks

Bubbler!

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Double/Triple Bay Sinks

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Drum/Barrel Washers

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Brush Washers *How do you clean this?*

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Rinse Conveyor

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Spinners

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Speed Queen Washing Machine Spinner

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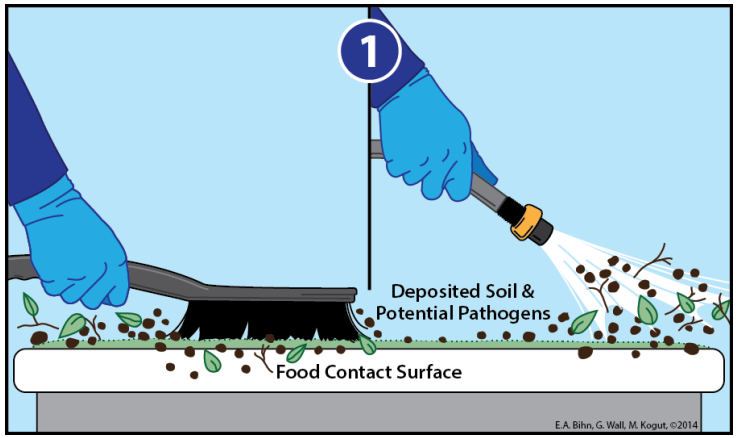
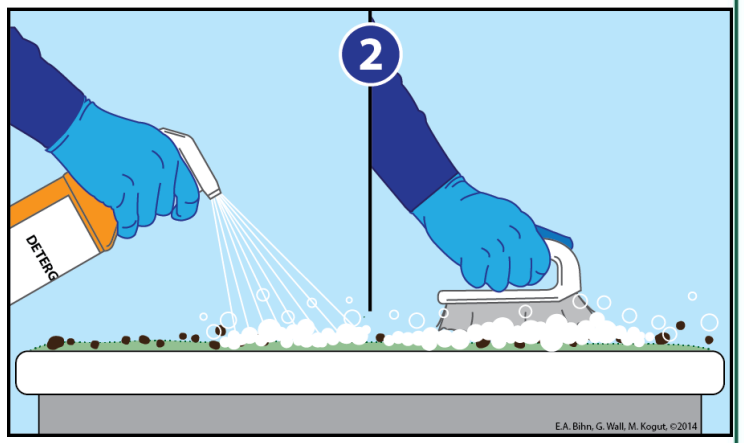
Cleaning & Sanitizing Food Contact Surfaces

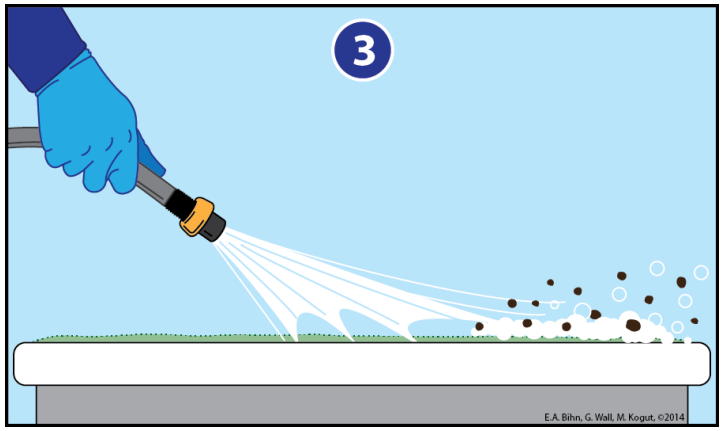
1: Remove any obvious dirt and debris from the food contact surface



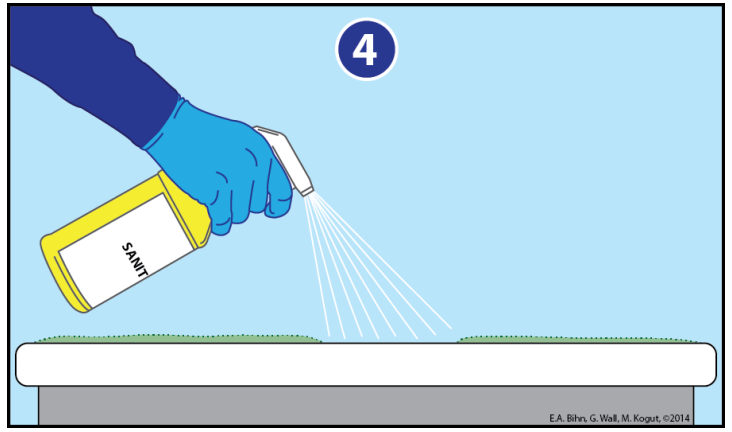
2: Apply an appropriate detergent and scrub the surface



3: Rinse the surface with clean water, making sure to remove all the detergent and soil



4: Apply a sanitizer approved for use on food contact surfaces. Rinsing may be necessary. Let the surface air dry.



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Coolers

- Volume
- Number of zones
- Sizing of refrigeration or heating
- New planning tool:
  - http://go.uvm.edu/cropplanner

Cold Storage At Footprint Farm

Washing Greens at Footprint Farm

Washing Greens at Footprint Farm

Washing Greens at Footprint Farm

Washing Greens at Footprint Farm

Tools

The University of Vermont

CoolBots™

Pro's

- Low initial cost
- Easy to retrofit into existing spaces with basic construction
- DIY install and maintenance
- BYOB – Build Your Own Box

Con's

- Slow to "pull down" temperature
- Slow to recover from rises in temp (e.g. door openings).
- Can not freeze, only cools down to ~35F

Containers: Totes, Lugs, Cartons, Bins, Boxes

- What crops?
- Drain holes or a solid bottom?
- Vented sides?
- Cleanable?
- Durability
- Can you easily label?
- Light blocking and UV resistance
- Stacking/Nesting?
- Different colors?
- Is the container ergonomic?


Bulbcrates

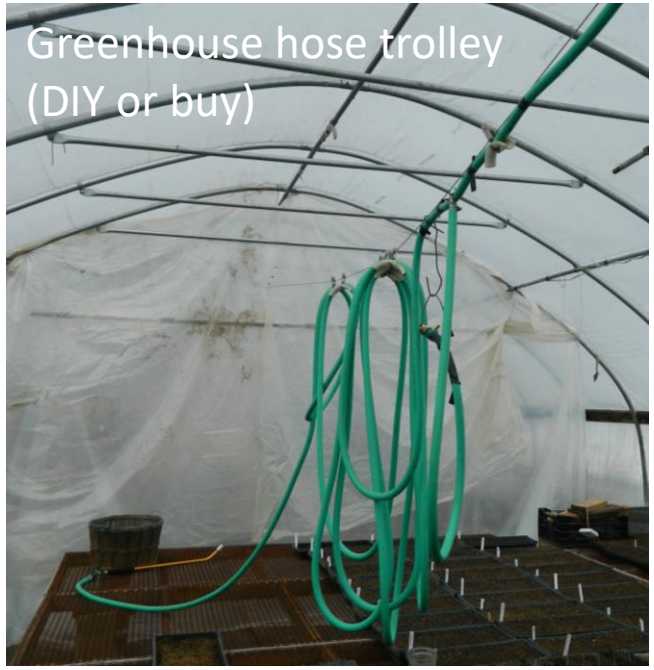

“Red” and “Yellow” Totes


Buckhorn

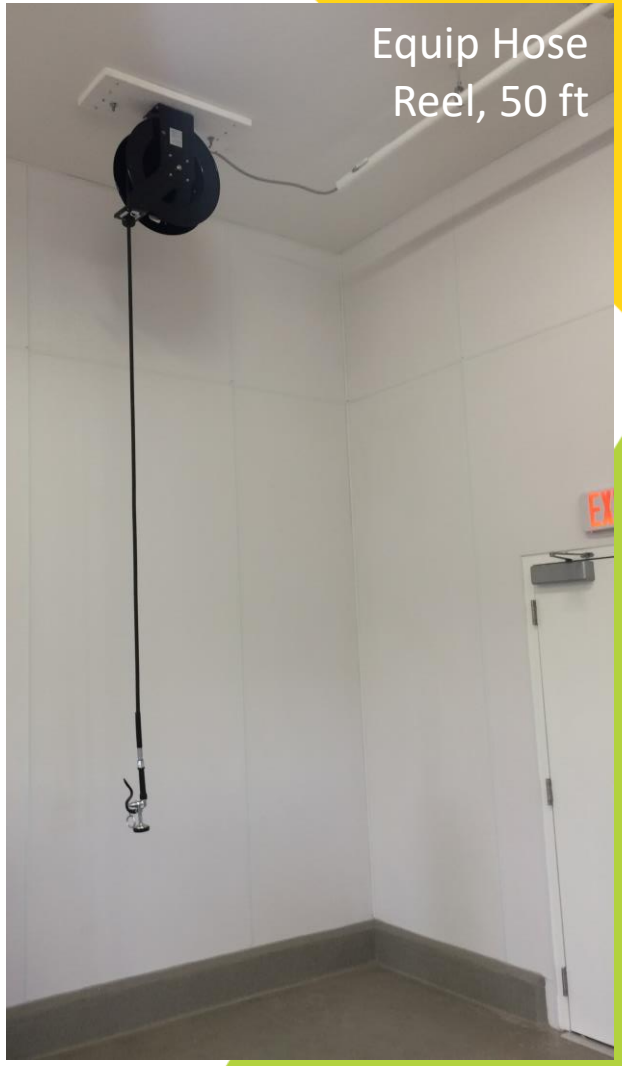

MacroBins

Hoses

- Helpful to have multiple hose drops/spigots
- Aim to keep hoses off the ground
- Many types of nozzles



Hannay Reel



Thermostats

- Digital allows for more precise setting and measurement
- Low differential
- Remote probe (can be extended)
- Pay attention to full load amperage limits (may need relay)
- For heating or cooling
- Can be wired with plugs

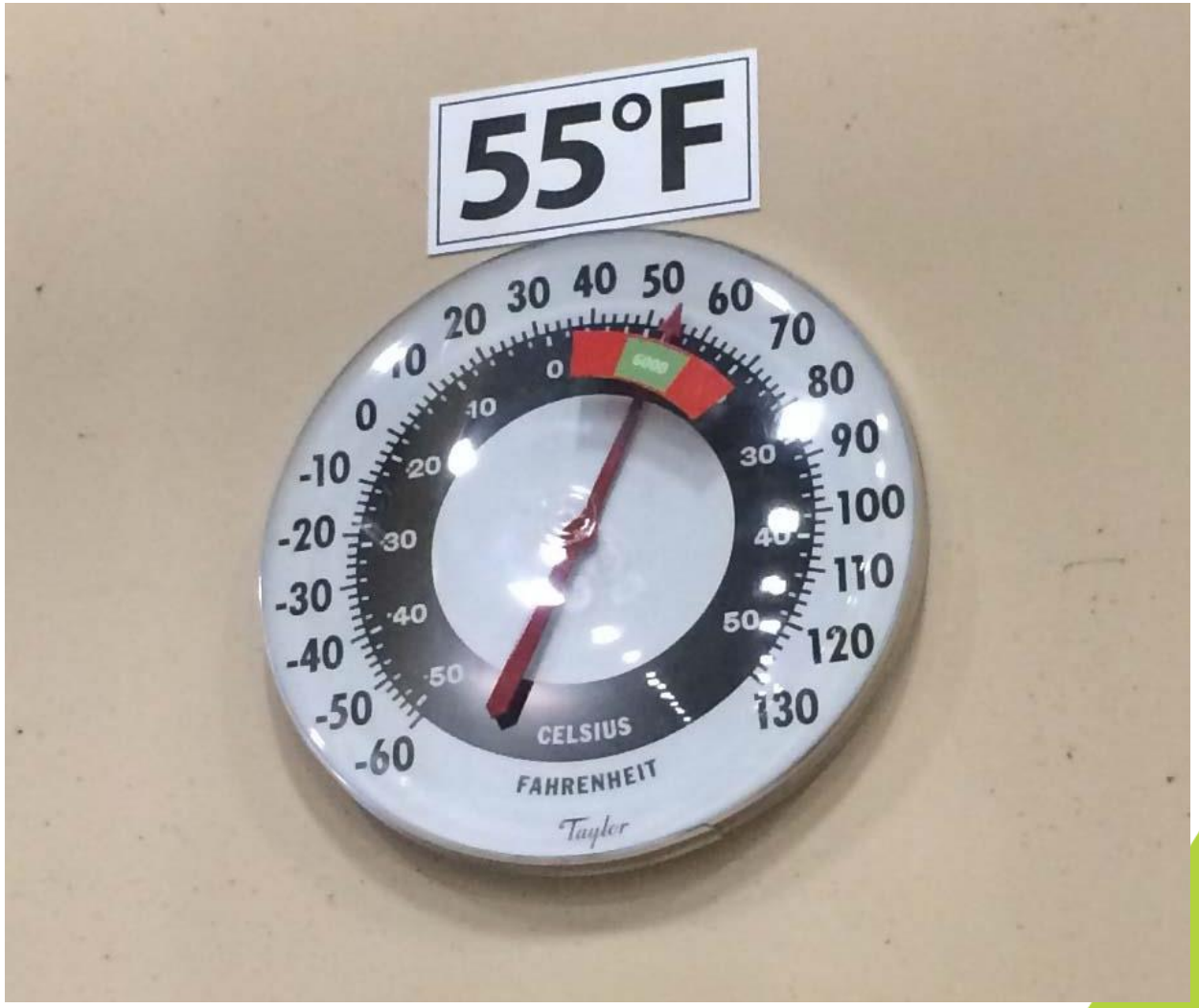
Johnson Control A419
$60

Ranco ETC11200
$60

DuroStat 102720
$100

Dial Type
$45-90
Not Preferred

Simple Works, Too.



Tools at Foot Print Farm

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Activity #3: Equipment Layout/flow (25 min)

(Planning the details of your improvement project)
Q&A with the team

Sharing with the Group (15 min)

Wrap up, Parking Lot Questions (5 min)

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