How to Wholesale
Post-Harvest Handling Best Practices for the Wholesale Market

Adapted from Wholesale Success by FamilyFarmed
Introduction

The High Desert Food & Farm Alliance (HDFFA) compiled this guide to provide Central Oregon farmers post harvest handling information and best-practices.

We have compiled information gathered from the *Wholesale Success: A Guide to Food Safety* by FamilyFarmed and created our own easy-to-read fact sheets for crops identified by farmers and our collaborators as high volume crops grown well in our region. More detailed information on these crops can be found in *Wholesale Success*.

We recognize that a lot of time goes into planning, planting, nurturing, and finally harvesting the fruits of farmer’s labor. Our goal is to support farmers to get their product to market in the shape and form that meets consumer and industry standards. The practices highlighted in this document can help to ensure that the crops farmers worked so hard to grow on all-season maintain their freshness, quality, and are up to wholesale standards.
Table of Contents

General Tips
- Harvesting
- Humidity
- Cleaning
- Respiration
- Cooling

Best Practices
- Cooling and Curing
- Cleaning and Drying
- Sorting and Packing
- Storage and Transportation
- Increasing Efficiency and Safety in your Washing Shed
- Example Grower Agreement

Crop Profiles and Cheat Sheets
Each crop listed below has information on the following principles:
- Quality Control
- Harvesting
- Cooling
- Cleaning
- Storage
- Farmer notes

- Arugula
- Basil
- Beets
- Cabbage
- Carrots
- Chard
- Culinary herbs (excluding basil)
- Garlic
- Greens (kale and collards)
- Lettuce
- Onions
- Potatoes
- Radish
- Salad Greens
- Spinach
- Summer squash
- Tomatoes
- Winter Squash (Various)

References and Resources
General Tips

Harvesting

Harvest as early in the day as possible to avoid field heat. You can even harvest at night under lights to take advantage of cooler temperatures. Avoid direct sun exposure to your harvested product, moving it into the shade as soon as possible. Taking steps to lower your produce’s internal temperature from the beginning will help with shelf-life.

Minimize dirt on produce while harvesting. If possible, harvest when it isn’t muddy and keep tools clean. Do as much counting, trimming, and bunching as you can in the field (for applicable crops) for more efficiency.

Humidity

Freshness = water. Water loss plays a major role in the deterioration of your product, affecting its quality and marketability. Airflow is necessary to remove respiration heat, but the rate of movement must be kept as low as possible. Well designed packaging materials and stacking patterns for crates and boxes can contribute to controlled airflow.

Cleaning

Dirt particles can accelerate spoilage which is why it’s crucial not to save on the washing stage. Products that aren’t totally clean may frustrate customers whose employees have to spend more labor hours such as scrubbing potatoes or topping carrots. Avoid issues by making sure your product is as free of dust, soil, and debris. Additionally, the use of sanitizer when applicable (like chlorine, chlorine dioxide, peracetic acid, hydrogen peroxide, etc.) is important to prevent pathogens from one product to another and reducing the risk for foodborne illnesses.

Respiration

Different crops respire at different rates after harvest, correlating with the shelf life of the product. Respiration rates can be slowed at lower temperatures, while higher temperatures increase respiration rates. Fruits and veggies with a higher respiration rate are particularly important to store at its lowest safe temperature.
Cooling

For every 18°F increase in internal product temp., there is a 2-3 times increased rate of deterioration. Getting your produce down to storage temperature as soon as possible is one of the most important things you can do to increase the shelf-life of your crops and making sure it is up to your buyer’s standards.

Cooling Methods

Room Cooling: Utilizes the ambient temperature of refrigerated storage. This is good for low respiration crops like potatoes, winter squash, onions but not adequate for medium to high respiration crops.

Hydrocooling/Water tank bath: This is one of the most efficient cooling methods. Cooling via water can be almost 15 times faster than simply room cooling. For crops that can be hydrocooled, this is the recommended method since a product that is cooled faster will keep longer. This method also retains moisture better.

Ice cooling: Ice cooling is a great method to use to bring high respiration crops that can withstand ice contact down to storage temperature quickly. There are different ways to do this, such as putting ice on top of produce, or pouring a water-ice slurry in between packages. Ice machines can be pricey at first, but they are a great investment and are useful markets when refrigeration is not possible.

Forced-Air Cooling
Room cooling works especially with fans to direct air movement through produce and therefore cooling it faster.
## Cooling Information Chart

<table>
<thead>
<tr>
<th>CROP</th>
<th>Harvest Quality</th>
<th>Cooling Method</th>
<th>Respiration Rate</th>
<th>ICED</th>
<th>Cool To Store Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>bracts at tip closed</td>
<td>R, F, H</td>
<td>low</td>
<td>NO</td>
<td>32-38</td>
</tr>
<tr>
<td>Asparagus</td>
<td>fresh, tender leaves</td>
<td>H, I</td>
<td>extremely high</td>
<td>YES</td>
<td>35</td>
</tr>
<tr>
<td>Basil</td>
<td>seeds developed, plump</td>
<td>R, F, H</td>
<td>high</td>
<td>NO</td>
<td>50</td>
</tr>
<tr>
<td>Beans, snap</td>
<td>crisp pods, seeds immature</td>
<td>R, F, H</td>
<td>very high</td>
<td>NO</td>
<td>41-46</td>
</tr>
<tr>
<td>Beans, lima</td>
<td>crisp fresh leaves</td>
<td>R, F, H</td>
<td>high</td>
<td>NO</td>
<td>41-43</td>
</tr>
<tr>
<td>Beets, bunches</td>
<td>firm, deep red roots</td>
<td>R, F, H</td>
<td>moderate</td>
<td>Can</td>
<td>33-36</td>
</tr>
<tr>
<td>Blackberries</td>
<td>full color, sweet</td>
<td>R, F, H</td>
<td>high</td>
<td>NO</td>
<td>32</td>
</tr>
<tr>
<td>Blueberries</td>
<td>full color, sweet</td>
<td>R, F, H</td>
<td>moderate</td>
<td>NO</td>
<td>32</td>
</tr>
<tr>
<td>Broccoli</td>
<td>firm head, buds not open</td>
<td>I, F, H</td>
<td>very high</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Brussels sprouts</td>
<td>firm sprouts</td>
<td>H, V, I</td>
<td>very high</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Cabbage</td>
<td>crisp, firm, compact head</td>
<td>R, F, H</td>
<td>moderate</td>
<td>NO</td>
<td>32</td>
</tr>
<tr>
<td>Cantaloupe</td>
<td>full slip, rind color</td>
<td>H, F</td>
<td>moderate</td>
<td>NO</td>
<td>36-41</td>
</tr>
<tr>
<td>Carrots, topped</td>
<td>tender, sweet roots</td>
<td>I, R</td>
<td>moderate</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>compact, white curds</td>
<td>H, V</td>
<td>high</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Celery</td>
<td>crisp, tender</td>
<td>I, F, H</td>
<td>moderate</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Corn, sweet</td>
<td>plump tender kernels</td>
<td>H, I, V</td>
<td>extremely high</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Cucumbers</td>
<td>crisp, green, firm</td>
<td>F, H</td>
<td>moderate</td>
<td>NO</td>
<td>50-55</td>
</tr>
<tr>
<td>Eggplant</td>
<td>seeds immature; shiny, firm</td>
<td>R, F</td>
<td>low</td>
<td>NO</td>
<td>50-54</td>
</tr>
<tr>
<td>Endive</td>
<td>fresh, crisp, tender leaves</td>
<td>H, I</td>
<td>very high</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Garlic</td>
<td></td>
<td>N</td>
<td>low</td>
<td>NO</td>
<td>32</td>
</tr>
<tr>
<td>Leafy Greens</td>
<td>crisp, dark green leaves</td>
<td>H, I</td>
<td>very high</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Herbs</td>
<td>fresh, crisp, tender leaves</td>
<td>NO</td>
<td>32-41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leeks</td>
<td>size, crisp</td>
<td>H, I</td>
<td>high</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Lettuce</td>
<td>compact head, crisp, tender</td>
<td>H, I</td>
<td>moderate</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Mushrooms</td>
<td>size, firm</td>
<td>H, I</td>
<td>very high</td>
<td>NO</td>
<td>32</td>
</tr>
<tr>
<td>Onions, bulb</td>
<td>firm bulbs, tight necks</td>
<td>N</td>
<td>low</td>
<td>NO</td>
<td>32</td>
</tr>
<tr>
<td>Onions, green</td>
<td>crisp stalks, firm white bulbs</td>
<td>H, I</td>
<td>very high</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Parsley</td>
<td>crisp, dark green leaves</td>
<td>H, I</td>
<td>extremely high</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Pear</td>
<td></td>
<td>F, R, H</td>
<td>moderate</td>
<td>NO</td>
<td>32</td>
</tr>
<tr>
<td>Peas, in pods</td>
<td>tender, green, sweet pods</td>
<td>F, H, I</td>
<td>extremely high</td>
<td>CAN</td>
<td>32</td>
</tr>
<tr>
<td>Peppers, bell</td>
<td>firm, shiny, thick walls</td>
<td>R, F</td>
<td>moderate</td>
<td>NO</td>
<td>45-50</td>
</tr>
<tr>
<td>Peppers, hot</td>
<td>firm, shiny, thick walls</td>
<td>R, F</td>
<td>moderate</td>
<td>NO</td>
<td>41-50</td>
</tr>
<tr>
<td>Potatoes, early</td>
<td>well shaped, defect free</td>
<td>R, F</td>
<td>moderate</td>
<td>NO</td>
<td>50-59</td>
</tr>
<tr>
<td>Potatoes, late</td>
<td>well shaped, defect free</td>
<td>R, F</td>
<td>low</td>
<td>NO</td>
<td>50-59</td>
</tr>
<tr>
<td>Pumpkins</td>
<td>hard rind, good color, heavy</td>
<td>N</td>
<td>moderate</td>
<td>NO</td>
<td>54-59</td>
</tr>
<tr>
<td>Radishes</td>
<td>firm, crisp, dark green leaves</td>
<td>H, I</td>
<td>high</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Raspberries</td>
<td>full color, sweet</td>
<td>R, F</td>
<td>high</td>
<td>NO</td>
<td>32</td>
</tr>
<tr>
<td>Rutabagas</td>
<td>roots firm with smooth surface</td>
<td>R</td>
<td>low</td>
<td>NO</td>
<td>32</td>
</tr>
<tr>
<td>Spinach</td>
<td>dark green, fresh, crisp leaves</td>
<td>H, I</td>
<td>extremely high</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Squash, summer</td>
<td>firm, shiny, right size</td>
<td>R, F</td>
<td>moderate</td>
<td>NO</td>
<td>41-50</td>
</tr>
<tr>
<td>Squash, winter</td>
<td>hard rind, heavy, good color</td>
<td>R, F</td>
<td>moderate</td>
<td>NO</td>
<td>50-55</td>
</tr>
<tr>
<td>Strawberries</td>
<td>full color, sweet</td>
<td>R, F</td>
<td>high</td>
<td>NO</td>
<td>32</td>
</tr>
<tr>
<td>Sweet potatoes</td>
<td></td>
<td>N</td>
<td>low</td>
<td>NO</td>
<td>55-59</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>firm, uniform coloration</td>
<td>R, F</td>
<td>moderate</td>
<td>NO</td>
<td>45-55</td>
</tr>
<tr>
<td>Turnips</td>
<td>firm, heavy roots</td>
<td>R, H, V, I</td>
<td>low</td>
<td>YES</td>
<td>32</td>
</tr>
<tr>
<td>Watermelon</td>
<td>crisp, good flesh color, not mushy</td>
<td>N</td>
<td>low</td>
<td>NO</td>
<td>50-59</td>
</tr>
</tbody>
</table>

F = forced-air cooling, H = hydrocooling, I = package icing, R = room cooling, V = vacuum cooling, N = no precooling needed.

Sources: USDA Agricultural Marketing Service, Kansas State University Extension, and Jim Waltrip at PetoSeed

Maintaining the Cold Chain

Despite the paramount importance of removing field heat immediately, it is only the first step in a long chain of handling, packing, shipping, and delivery. Below, Lisa Kitinoja and Adel Kader from the University of California-Davis discuss the “cold chain” from field to wholesaler. Farmers should measure and record produce and storage area temperatures at each stage until the wholesaler has picked up or received it.

Harvest
- Protect the product from the sun.
- Transport quickly to the packinghouse.

Cooling
- Minimize delays before cooling.
- Cool the product thoroughly as soon as possible.

Storage
- Store the product at optimum temperature.
- Practice first-in, first-out rotation.
- Ship to market as soon as possible.

Transport to Market
- Use refrigerated loading area, if possible.
- Cool truck before loading.
- Load pallets toward the center of the truck to minimize cool air loss through the walls.

- Put insulating plastic strips inside door if the truck makes multiple stops.
- Avoid delays during transportation.
- Monitor product temperature during transport.

Handling at Destination
- Use a refrigerated unloading area.
- Measure product temperature.
- Move product quickly to the proper storage area.
- Transport to retail markets or foodservice operations in refrigerated trucks.
- Display at proper temperature range.

Shaded areas should be available for harvested produce, cooling facilities, packing and storage areas, and transport vehicles. Trees not only provide shade in the field, but also can drastically reduce ambient temperatures around packinghouses and storehouses. Also, lighting options should be evaluated; incandescent bulbs are in fact better suited for small-scale heating purposes than for lighting a cooled storage room. Look for fluorescent or high-pressure sodium lights, which produce far less heat and require less energy to provide the same amount of light as incandescent bulbs. Higher up-front costs will save money over the medium- and long-term. Make sure to shield bulbs so that if they break, glass shards will not contaminate any produce.

Comparison of Five Common Cooling Methods

<table>
<thead>
<tr>
<th></th>
<th>Room cooling</th>
<th>Forced-air</th>
<th>Hydrocool</th>
<th>Water spray</th>
<th>Ice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical Cooling Time (hours)</td>
<td>20 to 100</td>
<td>1 to 10</td>
<td>0.1 to 1.0</td>
<td>0.3 to 2.0</td>
<td>0.1 to 0.3</td>
</tr>
<tr>
<td>Product Moisture Loss (%)</td>
<td>0.1 to 2.0</td>
<td>0.1 to 2.0</td>
<td>0 to 0.5</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>Water Contact with Product</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Potential for Decay Contamination</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>
Strawberries are too fragile to be washed, so straw mulch is usually placed around plants to keep berries from touching the soil. At Harmony Valley Farm, millet is grown between strawberry rows. The millet will “winter-kill” and provide grown-in-place mulch to help keep strawberries clean the following season. Additional mulch may be needed in the second growing season.

Besides the fact that all produce should be clean when shipped, there is one more absolute. All produce washing systems require potable – safe to drink – water.

<table>
<thead>
<tr>
<th>Quick Glance Cleaning/Drying Chart</th>
<th>Cleaning Options</th>
<th>Drying</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baby Salad Greens:</strong> Spinach, Arugula, Spring Mix, Braising Mix</td>
<td>Double-wash/rinse in a water tank. After drying, cull sticks, weeds, and bad leaves. Wash in a baby greens washing/cooling pack line.</td>
<td>Spin-dry.</td>
</tr>
<tr>
<td><strong>Beans and Peas</strong></td>
<td>Field pack if clean and cool, or if they can be cooled quickly. Avoid washing if possible. If washing or hydrocooling is necessary, batch wash in harvest tote in water tank. 2nd tank rinse.</td>
<td>Picked dry.</td>
</tr>
<tr>
<td><strong>Berries</strong></td>
<td>Do not wash.</td>
<td>No.</td>
</tr>
<tr>
<td><strong>Bok Choy</strong></td>
<td>Tank wash with sanitizer.</td>
<td>Drain upside down.</td>
</tr>
<tr>
<td><strong>Broccoli, Cauliflower, Cabbage</strong></td>
<td>Harvest clean and pack without further cleaning. Broccoli and Cauliflower can be cleaned in a tank of water with sanitizer. Cabbage should not be immersed in water. If soiled, trim soiled area with a knife. If washing is necessary, spray soiled areas lightly.</td>
<td>No. No. Air-dry.</td>
</tr>
<tr>
<td><strong>Cantaloupe or Muskmelon</strong></td>
<td>If it is not muddy, dry-brush at harvest with glove or cloth. Spray-wash in harvest tote. Do not immerse in water. Mechanical brush wash.</td>
<td>No. Air-dry. Pack line absorber unit or air dry.</td>
</tr>
<tr>
<td><strong>Celery</strong></td>
<td>Spray-wash.</td>
<td>Drain upside down.</td>
</tr>
</tbody>
</table>
### Section 5: Cleaning and Drying

<table>
<thead>
<tr>
<th>Quick Glance Cleaning/Drying Chart</th>
<th>Cleaning Options</th>
<th>Drying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Roots and Tubers:</td>
<td><strong>Hand method:</strong> Spray wash on screen table or in harvest tote.</td>
<td>Air-dry excess.</td>
</tr>
<tr>
<td>Potatoes, Carrots, Turnips,</td>
<td><strong>Mechanical:</strong> Brush washer is generally best for round vegetables.</td>
<td>Pack line absorber unit.</td>
</tr>
<tr>
<td>Rutabagas, Beets, Winter</td>
<td><strong>Mechanical:</strong> Barrel washer is generally best for long root crops.</td>
<td>Pack line absorber unit.</td>
</tr>
<tr>
<td>Radishes, Parsnips, Celeriac</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green-top Bunched Roots:</td>
<td><strong>Spray wash on drain table. Pressure washer can be used on roots.</strong></td>
<td>No</td>
</tr>
<tr>
<td>Carrots, Beets, Turnips, Radishes</td>
<td><strong>Washer can be used with care on roots only.</strong></td>
<td></td>
</tr>
<tr>
<td>Head Lettuce</td>
<td><strong>Field pack if lettuce is clean and cool, or if it is clean and can be cooled quickly.</strong></td>
<td>None.</td>
</tr>
<tr>
<td></td>
<td><strong>If very dirty, gently spray off the bulk of the soil. Wash in water tank. Second tank rinse.</strong></td>
<td>Drain-dry upside down on drain table.</td>
</tr>
<tr>
<td>Bunched Herbs</td>
<td><strong>If picked clean and cool no washing is needed.</strong></td>
<td>No.</td>
</tr>
<tr>
<td></td>
<td><strong>If bunched herbs need to be cooled and/or cleaned, tank wash in sanitized water. Basil, keep water above 55° F.</strong></td>
<td>Drain-dry upside down on drain table.</td>
</tr>
<tr>
<td>Onions, Garlic, Shallots</td>
<td><strong>Fresh market:</strong> Trim roots and tops and spray wash. <strong>Storage:</strong> Cut tops and dry brush after curing.</td>
<td>Air-dry excess moisture.</td>
</tr>
<tr>
<td>Peppers, Cucumbers</td>
<td><strong>Can be dry brushed with a clean glove or cloth.</strong></td>
<td>None.</td>
</tr>
<tr>
<td></td>
<td><strong>Handbrush wash in water tank.</strong></td>
<td>Air-dry while packing.</td>
</tr>
<tr>
<td></td>
<td><strong>Wetbrush wash in pack line.</strong></td>
<td>Absorber removes excess moisture.</td>
</tr>
<tr>
<td></td>
<td><strong>Jacuzzi water bath. (peppers)</strong></td>
<td>Air/drain dry as packing.</td>
</tr>
<tr>
<td>Sweet Corn</td>
<td><strong>Pick clean, no washing needed</strong></td>
<td>No.</td>
</tr>
<tr>
<td>Tomatoes</td>
<td><strong>Dry brushed with a clean glove or cloth at harvest and packing.</strong></td>
<td>None.</td>
</tr>
<tr>
<td></td>
<td><strong>Washing is not recommended. Do not immerse in water.</strong></td>
<td>If washed in a mechanical pack line, the absorber unit will dry.</td>
</tr>
<tr>
<td></td>
<td><strong>If washing is necessary, clean by hand with a wet cloth or in a mechanical pack line using soft brushes.</strong></td>
<td></td>
</tr>
<tr>
<td>Watermelons</td>
<td><strong>Wipe off dirt at harvest.</strong></td>
<td>None.</td>
</tr>
<tr>
<td></td>
<td><strong>Wet brush by hand or machine if more washing is needed.</strong></td>
<td>Air-dry or pack line absorber unit.</td>
</tr>
<tr>
<td>Winter Squash and Pumpkins</td>
<td><strong>Wipe off dirt at harvest. Wet brush by hand or machine if dirty.</strong></td>
<td>Air-dry or pack line absorber unit.</td>
</tr>
<tr>
<td>Zucchini, Summer Squash</td>
<td><strong>Dry brushed with a clean glove or cloth at harvest.</strong></td>
<td>None.</td>
</tr>
<tr>
<td></td>
<td><strong>Washing is not recommended. If washing is necessary clean by hand or in a mechanical pack line using soft brushes.</strong></td>
<td>Pack line absorber unit.</td>
</tr>
</tbody>
</table>
### Standard Packs For Local Produce Using Generic Cartons and Protection Materials.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Pack</th>
<th>Carton</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arugula, Bulk</td>
<td>3#</td>
<td>Flat 5/8</td>
<td>Plastic Liner</td>
</tr>
<tr>
<td>Arugula, Bagged</td>
<td>12 - 4 Oz.</td>
<td>Flat 1/8</td>
<td>Small Zip Bag With Label</td>
</tr>
<tr>
<td>Arugula, Bunched</td>
<td>24 Ct.</td>
<td>3/4 or 1 1/8 Bu.</td>
<td>Paper And Ice</td>
</tr>
<tr>
<td>Mizuna, Bunched</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basil, Bulk</td>
<td>3#</td>
<td>Root 5/8 Bu.</td>
<td>Plastic Liner, Blanket In Cooler</td>
</tr>
<tr>
<td>Basil, Bunched</td>
<td>24 Ct.</td>
<td>Root 5/8 Bu.</td>
<td>Plastic Liner, Blanket In Cooler</td>
</tr>
<tr>
<td>Beans, Fresh</td>
<td>1 Bu. (25#)</td>
<td>Bean Box or 1 1/2 Bu.</td>
<td>Line And Top With Paper</td>
</tr>
<tr>
<td>Beans, Fresh</td>
<td>10#</td>
<td>1/2 Bu.</td>
<td>Line And Top With Paper</td>
</tr>
<tr>
<td>Beets, Bulk</td>
<td>25#</td>
<td>Root 5/8 Bu.</td>
<td>Plastic Liner, Can Ice</td>
</tr>
<tr>
<td>Beets, Bulk</td>
<td>40#</td>
<td>Root 1 1/6 Bu.</td>
<td>Plastic Liner, Can Ice</td>
</tr>
<tr>
<td>Beets, Bunched</td>
<td>12 Ct.</td>
<td>1 1/6 Bu.</td>
<td>Direct Ice</td>
</tr>
<tr>
<td>Beets, Bunched</td>
<td>24 Ct.</td>
<td>Leafy Greens Box</td>
<td>Direct Ice</td>
</tr>
<tr>
<td>Berries</td>
<td></td>
<td>Packed in Units of 12 per Berry Carton</td>
<td></td>
</tr>
<tr>
<td>Broccoli, Main Head</td>
<td>18 - 20#</td>
<td>Broccoli Box or 1 1/2 Bu.</td>
<td>Direct Ice</td>
</tr>
<tr>
<td>Broccoli, Bunched</td>
<td>14-18 Ct</td>
<td>Broccoli Box or 1 1/2 Bu.</td>
<td>Direct Ice</td>
</tr>
<tr>
<td>Broccoli, Crown Cut</td>
<td>20#</td>
<td>Broccoli Box or 1 1/2 Bu.</td>
<td>Direct Ice</td>
</tr>
<tr>
<td>Broccoli, Bulk Side Shoots</td>
<td>10#</td>
<td>Roots 5/8 Bu.</td>
<td>Plastic Liner, Direct Ice</td>
</tr>
<tr>
<td>Brussels Sprouts</td>
<td>20#</td>
<td>Root 5/8 Bu.</td>
<td>Paper, Top &amp; Bottom Or Plastic Liner</td>
</tr>
<tr>
<td>Cabbage</td>
<td>45 or 50#</td>
<td>Cabbage Box</td>
<td></td>
</tr>
<tr>
<td>Cantaloupe</td>
<td>40#</td>
<td>Cardboard Melon Carton</td>
<td></td>
</tr>
<tr>
<td>Carrot, Bulk</td>
<td>25#</td>
<td>Root 5/8 Bu.</td>
<td>Plastic Liner, Can Ice</td>
</tr>
<tr>
<td>Carrot, Bulk</td>
<td>50#</td>
<td>1 1/6 Bu.</td>
<td>Plastic Liner, Can Ice</td>
</tr>
<tr>
<td>Carrot, Bunched</td>
<td>24 Ct.</td>
<td>1 1/6 Bu.</td>
<td>Direct Ice</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>9 Ct.</td>
<td>Cauliflower Flat or if none available, Strawberry Flat</td>
<td>Ice</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>20#</td>
<td>1 1/6 Bu.</td>
<td>Leaf Wrap, Can Ice.</td>
</tr>
<tr>
<td>Celery Root, Bulk</td>
<td>12 Ct. (Approx)</td>
<td>Root 5/8 Bu. or Flat 5/9</td>
<td>No Paper Or Ice</td>
</tr>
<tr>
<td>Celery Root, Green Top</td>
<td>24 Ct.</td>
<td>1 1/6</td>
<td>No Paper Or Ice</td>
</tr>
<tr>
<td>Chard</td>
<td>24 Ct.</td>
<td>Greens Box</td>
<td>Paper Liner Bottom, Top, Ice</td>
</tr>
<tr>
<td>Cilantro</td>
<td>30 Ct.</td>
<td>1/2 Bu.</td>
<td>Paper Liner, Ice</td>
</tr>
<tr>
<td>Cucumbers</td>
<td>20#</td>
<td>Flat or Root 5/8 Bu.</td>
<td></td>
</tr>
<tr>
<td>Cucumbers</td>
<td>40#</td>
<td>1 1/6 Bu.</td>
<td></td>
</tr>
<tr>
<td>Daikon</td>
<td>25#</td>
<td>Flat 5/8 Bu.</td>
<td>Plastic Liner, Ice If Hot</td>
</tr>
<tr>
<td>Daikon</td>
<td>40#</td>
<td>1 1/6 Bu.</td>
<td>Plastic Liner, Ice If Hot</td>
</tr>
<tr>
<td>Daikon, Bunched</td>
<td>18 Ct.</td>
<td>Greens Box</td>
<td>Plastic Liner, Ice</td>
</tr>
<tr>
<td>Eggplant</td>
<td>25#</td>
<td>1 1/6 Bu.</td>
<td>Wipe And Pack In Field</td>
</tr>
<tr>
<td>Fennel</td>
<td>12 Ct.</td>
<td>Flat 5/8 Bu.</td>
<td>Paper, Ice</td>
</tr>
<tr>
<td>Ground Cherry</td>
<td>12 Pints</td>
<td>Pint Carton</td>
<td>Top Off Pints In Carton</td>
</tr>
<tr>
<td>Kale, All Kinds</td>
<td>24 Ct.</td>
<td>Greens Box or Cabbage Box</td>
<td>Paper Bottom And Top, Ice</td>
</tr>
<tr>
<td>Head Lettuce</td>
<td>24 Ct.</td>
<td>Greens Box or 1 3/4 Carton</td>
<td></td>
</tr>
<tr>
<td>Mint</td>
<td>12 Ct.</td>
<td>1/2 Bu.</td>
<td></td>
</tr>
</tbody>
</table>
## WHOLESALE SUCCESS  Section 6: Sorting and Packing

<table>
<thead>
<tr>
<th>Crop</th>
<th>Pack</th>
<th>Carton</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muskmelon</td>
<td>40#</td>
<td>Melon Carton</td>
<td></td>
</tr>
<tr>
<td>Nasturtium Blossom</td>
<td>50 Ct.</td>
<td>Clamshell with Damp Pad</td>
<td>Field Pack Is Best</td>
</tr>
<tr>
<td>Onions</td>
<td>25 or 50 #</td>
<td>Net Bags</td>
<td></td>
</tr>
<tr>
<td>Onions</td>
<td>20#</td>
<td>Onion Carton</td>
<td></td>
</tr>
<tr>
<td>Parsley, Curly</td>
<td>30 Ct.</td>
<td>⅛ Bu.</td>
<td>Ice</td>
</tr>
<tr>
<td>Parsley, Italian</td>
<td>30 Ct.</td>
<td>Root ⅗ Bu.</td>
<td>Ice</td>
</tr>
<tr>
<td>Parsnips</td>
<td>25#</td>
<td>Root ⅗ Bu.</td>
<td>Plastic Liner</td>
</tr>
<tr>
<td>Peas</td>
<td>10#</td>
<td>⅗ Bu.</td>
<td></td>
</tr>
<tr>
<td>Peppers, Bell</td>
<td>25#</td>
<td>1 ⅗ Bu.</td>
<td></td>
</tr>
<tr>
<td>Peppers, Colored</td>
<td>10#</td>
<td>Root ⅗ Bu.</td>
<td></td>
</tr>
<tr>
<td>Peppers, Hot</td>
<td>10#</td>
<td>⅓ Bu.</td>
<td>Bottom and Top Paper</td>
</tr>
<tr>
<td>Potatoes, Bulk</td>
<td>25#</td>
<td>Root ⅗ Bu.</td>
<td></td>
</tr>
<tr>
<td>Potatoes, Bulk</td>
<td>50#</td>
<td>1 ⅗ Bu.</td>
<td></td>
</tr>
<tr>
<td>Potatoes, Bagged</td>
<td>5-or 10-Lb</td>
<td>Packed 50# Total in 1 ⅗ Bu</td>
<td>Plastic Or Paper Bags</td>
</tr>
<tr>
<td>Potatoes, C-Or B-Sized</td>
<td>2#  Net Bags</td>
<td>Packed 12 in a ⅗ Bu</td>
<td></td>
</tr>
<tr>
<td>Raspberries</td>
<td>Pint or ⅓ Pint Clamshells</td>
<td>Packed 12 in a Berry Flat</td>
<td></td>
</tr>
<tr>
<td>Ramps, Bulk</td>
<td>10#</td>
<td>Flat ⅗ Bu.</td>
<td></td>
</tr>
<tr>
<td>Ramps, Bunched</td>
<td>20 Ct.</td>
<td>Flat ⅗ Bu.</td>
<td></td>
</tr>
<tr>
<td>Rose Blossom</td>
<td>20 Ct.</td>
<td>Clamshell with Damp Pad</td>
<td>Pack In Field</td>
</tr>
<tr>
<td>Rutabaga</td>
<td>25#</td>
<td>Root ⅗</td>
<td>No Liner</td>
</tr>
<tr>
<td>Salad Mix, Bulk</td>
<td>3#</td>
<td>Flat ⅗</td>
<td>Plastic Liner</td>
</tr>
<tr>
<td>Salad Mix, Bagged</td>
<td>8 – 6 Oz. Bags</td>
<td>Flat ⅗ Bu.</td>
<td></td>
</tr>
<tr>
<td>Sauté Mix, Bagged</td>
<td>8-8 Oz Bags</td>
<td>Flat ⅗ Bu.</td>
<td></td>
</tr>
<tr>
<td>Spinach, Bulk</td>
<td>10#</td>
<td>Greens Box</td>
<td>Plastic Liner</td>
</tr>
<tr>
<td>Spinach, Bagged</td>
<td>8 – 8 Oz.</td>
<td>Flat ⅗</td>
<td></td>
</tr>
<tr>
<td>Spinach, Bunched</td>
<td>24 Ct.</td>
<td>Greens Box</td>
<td>Paper On Bottom, Ice</td>
</tr>
<tr>
<td>Summer Squash</td>
<td>20#</td>
<td>Flat or Root ⅗ Bu.</td>
<td></td>
</tr>
<tr>
<td>Sweet Corn</td>
<td>48 Ct.</td>
<td>1 ⅗ Bu. or Corn Box</td>
<td>Can Ice</td>
</tr>
<tr>
<td>Sweet Potatoes</td>
<td>40#</td>
<td>1 ⅗ Bu.</td>
<td></td>
</tr>
<tr>
<td>Sweet Potatoes</td>
<td>20#</td>
<td>⅗ Bu</td>
<td></td>
</tr>
<tr>
<td>Tomato, Slicer Or Roma</td>
<td>20#</td>
<td>Flat ⅗ Bu. or</td>
<td>Flat ⅗ Bu or Cardboard Tomato Carton</td>
</tr>
<tr>
<td>Tomato, Heirloom</td>
<td>10#</td>
<td>One Layer Tomato Carton</td>
<td></td>
</tr>
<tr>
<td>Tomato, Cherry</td>
<td>12 – Pint Clamshells</td>
<td>Clamshell Flat</td>
<td></td>
</tr>
<tr>
<td>Turnip, Bulk</td>
<td>25#</td>
<td>Root ⅗ Bu.</td>
<td>No Liner</td>
</tr>
<tr>
<td>Turnip, Bunched</td>
<td>18 Ct.</td>
<td>Greens Box</td>
<td>Ice</td>
</tr>
<tr>
<td>Snow Peas</td>
<td>20#</td>
<td>Flat ⅗ Bu.</td>
<td>Line Bottom With Paper To Cover Handles</td>
</tr>
<tr>
<td>Watermelon</td>
<td>50-60#</td>
<td>1 ⅓ Bu</td>
<td></td>
</tr>
<tr>
<td>Watermelon</td>
<td>700#</td>
<td>Corrugated, Wood, or Plastic Bins</td>
<td></td>
</tr>
<tr>
<td>Winter Squash</td>
<td>35#</td>
<td>1 ⅗ Bu</td>
<td></td>
</tr>
</tbody>
</table>
### Storage and Humidity Information

<table>
<thead>
<tr>
<th>CROP</th>
<th>Ethylene Prod.</th>
<th>Ethylene sensitive</th>
<th>Chilling or Mishandling Injuries</th>
<th>Storage Temp F</th>
<th>% Relative humidity</th>
<th>Storage Life Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td>very high</td>
<td>high</td>
<td>browning, rot, soft</td>
<td>32-38</td>
<td>90-95</td>
<td>90-240</td>
</tr>
<tr>
<td>Asparagus</td>
<td>low</td>
<td>low</td>
<td>dull, limp</td>
<td>35</td>
<td>95-100</td>
<td>14</td>
</tr>
<tr>
<td>Basil</td>
<td>low</td>
<td>low</td>
<td>browning, limp</td>
<td>50</td>
<td>90</td>
<td>7</td>
</tr>
<tr>
<td>Beans, snap</td>
<td>low</td>
<td>moderate</td>
<td>surface pitting, brown streaks, dark tips</td>
<td>41-46</td>
<td>95-100</td>
<td>7-10</td>
</tr>
<tr>
<td>Beans, lima</td>
<td>low</td>
<td>moderate</td>
<td>yellow to brown lesions on tips and stalks</td>
<td>41-43</td>
<td>95</td>
<td>7-10</td>
</tr>
<tr>
<td>Beets, bunched</td>
<td>very low</td>
<td>low</td>
<td>limb tops, roots</td>
<td>32</td>
<td>98</td>
<td>14</td>
</tr>
<tr>
<td>Beets, root</td>
<td>very low</td>
<td>low</td>
<td>black root, brown spots on rot tips</td>
<td>33-36</td>
<td>98</td>
<td>90-150</td>
</tr>
<tr>
<td>Blackberries</td>
<td>low</td>
<td>low</td>
<td>mold</td>
<td>32</td>
<td>90-95</td>
<td>2-3</td>
</tr>
<tr>
<td>Blueberries</td>
<td>low</td>
<td>low</td>
<td>mold</td>
<td>32</td>
<td>90-95</td>
<td>10-18</td>
</tr>
<tr>
<td>Broccoli</td>
<td>very low</td>
<td>high</td>
<td>strong odor, yellowish, black rot spots</td>
<td>32</td>
<td>95-100</td>
<td>10-14</td>
</tr>
<tr>
<td>Brussel sprouts</td>
<td>very low</td>
<td>high</td>
<td>tipburn, black leaf speck, yellowing</td>
<td>32</td>
<td>95-100</td>
<td>21-35</td>
</tr>
<tr>
<td>Cabbage</td>
<td>very low</td>
<td>high</td>
<td>black spots, tipburn, soft</td>
<td>32</td>
<td>98-100</td>
<td>30-180</td>
</tr>
<tr>
<td>Cantaloupe</td>
<td>high</td>
<td>moderate</td>
<td>soft spots, fusarium rot</td>
<td>36-41</td>
<td>95</td>
<td>10-14</td>
</tr>
<tr>
<td>Carrots, topped</td>
<td>very low</td>
<td>high</td>
<td>rubbery, insect damage, brown lesions</td>
<td>32</td>
<td>98-100</td>
<td>28-180</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>very low</td>
<td>high</td>
<td>yellow or brown curds, riciness</td>
<td>32</td>
<td>95-98</td>
<td>20-30</td>
</tr>
<tr>
<td>Celery</td>
<td>very low</td>
<td>moderate</td>
<td>yellowing, limp, roots</td>
<td>32</td>
<td>98-100</td>
<td>14-28</td>
</tr>
<tr>
<td>Corn, sweet</td>
<td>very low</td>
<td>low</td>
<td>tough kernels, loss of sugar</td>
<td>32</td>
<td>90-98</td>
<td>4-6</td>
</tr>
<tr>
<td>Cucumbers</td>
<td>low</td>
<td>high</td>
<td>pitted, watersoaked, yellowing</td>
<td>50-55</td>
<td>95</td>
<td>10-14</td>
</tr>
<tr>
<td>Eggplant</td>
<td>low</td>
<td>moderate</td>
<td>browning, shriveling, decay, pitting</td>
<td>50-54</td>
<td>90-95</td>
<td>10-14</td>
</tr>
<tr>
<td>Endive</td>
<td>very low</td>
<td>moderate</td>
<td>wilting, yellowing, soft,rots</td>
<td>32</td>
<td>90-95</td>
<td>14-21</td>
</tr>
<tr>
<td>Garlic</td>
<td>very low</td>
<td>low</td>
<td>rots, soft neck, brown spots</td>
<td>32</td>
<td>60-70</td>
<td>90-210</td>
</tr>
<tr>
<td>Leafy greens</td>
<td>very low</td>
<td>moderate</td>
<td>wilting, yellowing, soft,rots</td>
<td>32</td>
<td>95-100</td>
<td>10-14</td>
</tr>
<tr>
<td>Herbs</td>
<td>very low</td>
<td>moderate</td>
<td>wilting, yellowing, soft,rots</td>
<td>32-41</td>
<td>95</td>
<td>10-14</td>
</tr>
<tr>
<td>Leeks</td>
<td>very low</td>
<td>moderate</td>
<td>rot around roots, limp</td>
<td>32</td>
<td>95-100</td>
<td>60-90</td>
</tr>
<tr>
<td>Head lettuce</td>
<td>very low</td>
<td>high</td>
<td>wilting, bolting, tipburn, discoloration</td>
<td>32</td>
<td>98-100</td>
<td>14-21</td>
</tr>
<tr>
<td>Mushrooms</td>
<td>low</td>
<td>moderate</td>
<td>browning, water spots</td>
<td>32</td>
<td>95</td>
<td>12-17</td>
</tr>
<tr>
<td>Onions, bulb</td>
<td>very low</td>
<td>low</td>
<td>soft neck, sprouting, root growth,rots</td>
<td>32</td>
<td>65-70</td>
<td>30-180</td>
</tr>
<tr>
<td>Onions, green</td>
<td>very low</td>
<td>moderate</td>
<td>limp, yellowing, roots</td>
<td>32</td>
<td>95-100</td>
<td>7-10</td>
</tr>
<tr>
<td>Parsley</td>
<td>very low</td>
<td>high</td>
<td>limp, yellowing, bad odor</td>
<td>32</td>
<td>95</td>
<td>21</td>
</tr>
<tr>
<td>Pear</td>
<td>high</td>
<td>high</td>
<td>mushy, soft, rots</td>
<td>32</td>
<td>90-95</td>
<td>60-90</td>
</tr>
<tr>
<td>Peas, in pods</td>
<td>very low</td>
<td>moderate</td>
<td>tough, yellowing, limp, yellow</td>
<td>32</td>
<td>95-98</td>
<td>7-10</td>
</tr>
<tr>
<td>Peppers, bell</td>
<td>low</td>
<td>low</td>
<td>pitting, wilting, rot, soft</td>
<td>45-50</td>
<td>90-95</td>
<td>12-18</td>
</tr>
<tr>
<td>Peppers, hot</td>
<td>low</td>
<td>low</td>
<td>pitting, wilting, rot, soft</td>
<td>41-50</td>
<td>85-95</td>
<td>14-21</td>
</tr>
<tr>
<td>Potatoes, early</td>
<td>very low</td>
<td>moderate</td>
<td>soft rot, scab, surface discoloration</td>
<td>50-59</td>
<td>90-95</td>
<td>56-140</td>
</tr>
<tr>
<td>Potatoes, late</td>
<td>very low</td>
<td>moderate</td>
<td>sprouting, soft rot, scab, discoloration</td>
<td>40-54</td>
<td>95-98</td>
<td>56-140</td>
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<tr>
<td>Pumpkins</td>
<td>low</td>
<td>low</td>
<td>rot, broken handles</td>
<td>54-59</td>
<td>60-70</td>
<td>84-160</td>
</tr>
<tr>
<td>Radishes w/tops</td>
<td>very low</td>
<td>moderate</td>
<td>color bleed, pithy, rots</td>
<td>32</td>
<td>95-100</td>
<td>14-21</td>
</tr>
<tr>
<td>Raspberries</td>
<td>low</td>
<td>low</td>
<td>mold</td>
<td>32</td>
<td>90-95</td>
<td>2-3</td>
</tr>
<tr>
<td>Rutabaga</td>
<td>very low</td>
<td>low</td>
<td>pitting, rots, water spots</td>
<td>32</td>
<td>98-100</td>
<td>120-180</td>
</tr>
<tr>
<td>Spinach</td>
<td>very low</td>
<td>high</td>
<td>wilting, yellowing, rots</td>
<td>32</td>
<td>95-100</td>
<td>10-14</td>
</tr>
<tr>
<td>Squash, summer</td>
<td>low</td>
<td>moderate</td>
<td>pitting, limp, rots</td>
<td>41-50</td>
<td>95</td>
<td>7-14</td>
</tr>
<tr>
<td>Squash, winter</td>
<td>low</td>
<td>low</td>
<td>rots, color loss</td>
<td>50-55</td>
<td>50-70</td>
<td>84-150</td>
</tr>
<tr>
<td>Strawberries</td>
<td>low</td>
<td>low</td>
<td>mold, water spots, limp</td>
<td>32</td>
<td>90-95</td>
<td>5-10</td>
</tr>
<tr>
<td>Sweet potatoes</td>
<td>very low</td>
<td>low</td>
<td>decay, pitting, discoloration</td>
<td>55-59</td>
<td>85-95</td>
<td>120-210</td>
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<tr>
<td>Tomatoes</td>
<td>moderate</td>
<td>high</td>
<td>decay, pitting, antracnose, cracking</td>
<td>45-55</td>
<td>85-95</td>
<td>7-28</td>
</tr>
<tr>
<td>Turnips</td>
<td>very low</td>
<td>low</td>
<td>pitting, water spots, rots</td>
<td>32</td>
<td>95</td>
<td>120-150</td>
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<tr>
<td>Watermelon</td>
<td>low</td>
<td>high</td>
<td>rots, antracnose</td>
<td>50-59</td>
<td>90</td>
<td>14-21</td>
</tr>
</tbody>
</table>

F = forced-air cooling, H = hydrocooling, I = package icing, R = room cooling, V = vacuum cooling, N = no prec-cooling needed.

Sources: USDA Agricultural Marketing Service, Kansas State University Extension, and Jim Waltrip at Petoskey

Increase Efficiency and Safety in your Washing Shed with these 10 Tips!

1. Get better light into your pack facility. Experts recommend that you be working with at least 70 Lumens per sq ft for washing and sorting produce. Install skylights or better fluorescent or LED lighting (which is significantly coming down in cost). An average 4 light is between 2700-4000 lumens. Any lights should be enclosed with a plastic shield to protect bulbs in case the glass were to shatter.

2. Think about using a sanitizer, not bleach. It is recommended to have a sanitizer in your greens wash water. There are a lot of different organic options out there including Sanidate, Tsunami and more. They are much safer than using bleach and more effective. You can buy a device called a “goat throat” to easily meter the product out of the jug.

3. Make your wash area just for washing. Declutter. You shouldn’t be storing tools, seeds, equipment, or your grandma’s lawn furniture in there. First off, it’s a food safety issue as well as a personal safety and workflow issue.

4. Map your product flow. Spend a day in there just watching your team work and making “spaghetti diagrams.” Google it, it’s a thing! Then spend a couple hours rearranging it for best flow. You want to avoid bottlenecks, pinch points and dead ends in the wash line. Typically, work should flow from left to right.

5. Cement your floor. It’s amazing how this can increase your efficiency. It’s easier to clean and sanitize and increases efficiency as you can now move product around on wheels. Buy some anti-fatigue mats as standing on concrete for long periods of time is tiring. Your floors should slope towards a central drain.

6. Install better drains. Getting good flow of water away from your pack area is very important. You do not want standing areas of water after you are done for the day. Your goal is for the area to be completely dried out between washing times. This helps reduce bacterial contamination and increases safety.

7. Use wheels! U-boats, handtrucks, pallet jacks, skate wheel tracks, all will drastically increase your efficiency in the area. Being able to load up a U-boat with product, wheel it into the cooler to pre-chill while you process other products will increase shelf life and save you money.

8. Increase your water flow and pressure. Having adequate, clean water for your facility is a must. Increasing your water system to full flow valves and upping your water pressure to 60-70 PSI can speed up your processing time and make your veggies shine!

9. Invest in standardizing your harvest and delivery containers. If all your harvest bins are the same size it allows you to standardize harvest counts much better; this reduces waste and speeds up production.

10. Increase your shelf life by investing in equipment to dry your greens better. A frequent problem we see is undersized or poor greens drying equipment which slows you down and degrades your product. Spend the money and upgrade to a system that will dry your greens faster, get them dryer, and increase your shelf life.

11. Bonus! Install a great sound system. You will be amazed at how fast the hours go when you are listening to some great tunes.
Wholesale Success  Appendix: Example Grower Agreement

Production and Marketing Agreement

Farm name here

This production and marketing agreement was agreed on between _(farmer name)_ of _(farm name)_ : and _(buyer name)_ of _(buyer business name)_.

1) Commitment:
_(buyer business name)_ agrees to purchase the commodities listed below; The 2008 Marketing Season document, at a price with the price ranges listed. _(buyer business name)_ will purchase these agreed upon commodities for the 2008 growing season.

_(buyer business name)_ agrees that _(farm name)_ is their main supply of these products during the marketing season.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Quantity</th>
<th>Quality</th>
<th># of Weeks</th>
<th>Price per box</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

2) Standards:
   a. _(farm name)_ agrees to maintain active organic certification on all items they sell to
      _(buyer business name)_.
   b. _(farm name)_ agrees to pack in containers that are acceptable to the organic
      industry and _(buyer business name)_.
      Containers will contain a farm label on it complete with a lot number.
   c. _(farm name)_ will deliver to _(buyer business name)_ , #1 quality.
   d. _(farm name)_ will not knowingly use genetically engineered organisms or food
      irradiation as part of their production or handling.
   e. _(farm name)_ will communicate via fax about projected availability 10 days in
      advance.

3) Transportation:
   _(farm name)_ agrees to deliver to _(buyer business name)_ on Tuesday, Thursday
   and Saturday by 7:00 A.M. If either party wishes to change delivery days or delivery times, that
   communication should occur with at least 1 day advance notice.
4) Financial Considerations:
   (buyer business name) agrees to pay 10 days net from written invoices that are signed
by (buyer business name) produce department employees. All credit requests will be
mutually agreed on. (farm name) will provide a credit memo to verify all credits.

5) Acts of Nature
   Both parties acknowledge that if (farm name); due to production problem of drought,
hail, or flood or other acts of nature, cannot fulfill this agreement, (farm name) will notify
(buyer business name) about the problems and expected result. In this event, (buyer business
name) will release (farm name) from any and all expectations to deliver product.

6) Marketing of Product
   a. (farm name) will provide (buyer business name) with point of purchase
      materials, such as product stickers and shelf signs.
   b. (farm name) will provide 5 farm photos with their negatives (if requested) and will
      allow (buyer business name) to reproduce, enlarge, and use as a consumer education project.
   c. (farm name) agrees to open their farm for a farm tour that would be set up by the
      (buyer business name) produce manager. (farmers names) will be available to give a farm
      tour to the registered participants. (farm name) reserves the right to set terms and condition
      of the tour.
   d. (buyer business name) agrees to promote and work to develop brand name
      recognition of (farm name) product.

7) Insurance
   (farm name) agrees to carry general liability insurance coverage of $1,000,000.

farmer name, farm name, date

buyer name, business name, date
WHOLESALE SUCCESS  Section 11: Crop Profiles

Arugula

HARVEST
Harvest maturity: Arugula, like lettuce, can be planted after the first frost and harvested in the spring.
Quality: Look for green, smooth, young leaves. Tough leaves with a bitter flavor and furry underside are too old.
Harvest tips:
- Harvest in the morning or the cool part of the day. It's okay if the arugula is still wet – in fact, this is desirable.
- Efficiency tip: harvest into field containers in the same proportions as you will be packing (e.g., Pick 24 at a time if you will be packing 24 to a box).
- Use a field knife to harvest.
- If bunching arugula, it should be bunched in the field. Use twist ties, and tie them high enough that leaves won't fall out and so that retailers can re-trim the bottoms. Trim the bottoms after bunching so they are uniform.
- Should be kept in the shade if not cooling immediately. Should be cooled within 1-2 hours. Having a refrigerated truck in the field or a tank of cold water can help on hot days.

HANDLING/PACKING
Grades: Arugula is not graded in the U.S.
Cooling: Hydrocool
Cleaning:
- Baby arugula: salad machine and spin dry
- Bunched arugula: run through the hydrocooler and drain upside-down

Materials: Packaging generally consists of fiberboard cartons lined with perforated polyethylene bags, small sealed plastic bags, clamshell containers, or trays. Arugula may also be packaged as a whole plant with roots attached, which can extend the postharvest life. Bunched arugula should be packaged with 24-30 bunches per box. A bunch is ¾-lb. on average. 1 ½ bushel box is generally used. Boxes can be iced (but keep a sheet of paper between ice and arugula). For loose baby arugula, generally 12 4-oz. bags are used.

STORAGE
- Temperature: 32-36° F (0-2° C)
- Humidity: 95-100%
- Respiration: 21 mL/kg hr at 32° F (0° C)
- Atmosphere composition: Controlled atmosphere generally not beneficial
- Ethylene producer: Very low ethylene production, but highly sensitive to ethylene exposure
- Damage potential: Not sensitive to chilling; should be stored as cold as possible without freezing. Sensitive to overheating.
- Shelf life: 7-10 days

PESTS/DISEASES
Bacterial soft rot and fungal decay: Arugula is prone to the same sorts of postharvest problems as lettuce.
- Postharvest and storage chilling must be maintained to minimize disorders.
- Avoid mechanical damage to leaves.
Basil

HARVEST
Quality: Uniformly sized fresh, green leaves with strong aroma and flavor. No yellowing, decay, or insect damage. Generally basil should be harvested before flowering, although a small amount of flowering is acceptable.
Harvest tips:
- Harvest when free of dew, so that dirt doesn’t adhere.
- Preferably harvest when clean, so that washing is not needed.
- Harvest into clean, sturdy field totes.
- Cut with scissors and bunch with a twist tie.
- Harvest regularly to inhibit flowering.
- Be gentle. Damage to the leaves at harvest can lead to discoloration and increased susceptibility to decay.

HANDLING/PACKING
Grades: Basil is not graded in the U.S.

Cooling: Basil should be cooled to no lower than 54°F (12°C).

Cleaning: Never ice. Generally basil is not washed. Basil can be washed if necessary. Be certain the water temperature is above 55°F or chilling injury can occur, and water should not be more than 10°F cooler than the basil. Handle gently. Basil bruises easily.

Materials: Bunch with rubber band, package in plastic bags or clamshells, pack in corrugated cartons. Perforated polyethylene liners will prevent dehydration and maintain quality. Use waxed boxes, lined with plastic. In the cooler, cover with a blanket to avoid overcooling. Bunch size should be 2-8-oz.; check with buyer. Use clamshells for a longer shelf life.

STORAGE
- Temperature: 54°F (12°C) is the lowest safe temperature
- Humidity: 95-100%
- Respiration: 37 mL/kg hr at 50°F (10°C)
- Atmosphere composition: 4-6% CO₂, 5-10% O₂
- Ethylene producer: Low. Very sensitive to ethylene exposure.
- Damage potential: Water loss can be a serious cause of quality loss. Basil is highly sensitive to loss of essential oils and aroma – critical components of fresh culinary herb quality – the visual shelf life is generally longer than culinary shelf life. Harvest basil as close to shipping as possible and avoid chilling temperatures, which reduce aroma quality.
- Shelf life: 7 days

PESTS/DISEASES
Mold and bacterial decay: Can occur especially where stems or leaves are mechanically cut.
- Low temperatures can prevent this, although this increases the risk of chilling-injury.
Beets

HARVEST
Harvest maturity: Fresh market bunched beets (with tops) are harvested as early as 50-70 days after planting whereas roots (without tops) are usually harvested later, but before they reach full maturity, especially when they are intended for long-term storage.

Quality: Quality criteria include root shape, root size (diameter), color, firmness (turgidity), smoothness, cleanliness, trimming of rootlets, and freedom from defects. Intense and uniform color with minimum zoning is the most important quality criteria.

Harvest tips:
- **Top and tail beets in the field with a field knife. Leave at least ½” of the long root.**
- **Bunched beets can be bunched in the field with twist ties. They should be 1-1 ¼ lb. per bunch, with 3-5 beets.**
- **Remove yellow leaves in the field.**
- **Leave bunched beets in tank of cold water or in refrigerated truck while waiting to be cooled.**
- **Bunched stems should fit between thumb and index finger held in a circle.**

HANDLING/PACKING
Grades: Aug. 1, 1955

- **U.S. No. 1:** Well trimmed, firm, fairly smooth, fairly well shaped, fairly clean, free from soft rot and from damage caused by cuts, freezing, growth cracks, disease, rodents or insects, or mechanical or other means. Bunched beets or beets with short-trimmed tops shall have tops that are fresh and free from decay and free from damage caused by discoloration, freezing, disease, insects, or mechanical or other means. No beet shall be less than 1 ½” long. Tolerance: 10% (5% for serious damage and 1% for soft rot).

- **U.S. No. 2:** Well trimmed, firm, not excessively rough, not seriously misshapen and free from soft rot and from serious damage caused by cuts, dirt, freezing, growth cracks, disease, rodents or insects, or mechanical or other means. Bunched beets or beets with short-trimmed tops shall have tops that are fresh and free from decay and from damage caused by discoloration, freezing, disease, insects, or mechanical or other means. No beet shall be less than 1 ½” long. Tolerance: 10% (5% for serious damage and 1% for soft rot).

Cooling:
Green top beets are highly perishable and must be cooled as quickly as possible. Bulk beets are not highly perishable.

Bunched green top beets
- **Hydrocool in water with sanitizer after roots have been spray cleaned.**
- **Top-ice**

Topped beets
- **Room cool**
Beets

Cleaning:
Bunched green top beets
- Wash bunched beets with sprayer on screen table. Pressure washer can be used on roots only. Can be packed damp.
Topped beets
- Barrel wash, or clean with a sprayer or pressure washer on screen table or in harvest tote.

Carton sizes:
Weights:
- Bulk Beet are packed in waxed boxes with polyethylene liners.
  - 25 lb. in a 5/9 carton
  - 40 lb. in a 11/9 carton
- Storage Beets: 44 lb. polyethylene lined crates, or bins of 1100-1320 lb. capacity
- Green-top bunched beets are packed in waxed boxes with waxed paper liners on top and bottom
  - 12 bunches in a 1 1/9 carton
  - 24 bunches per case in a leafy greens box

Sizes:
- Diameter of not less than 1 1/2”
- Bunches must weigh at least 1.1-lb. (0.5kg) and must contain at least 3 beets.

STORAGE
- Temperature: 32° F (0° C) for bunched beets; 32.9-35.6° F (1-2° C) for topped beets
- Humidity: 98%
- Respiration: 2-3 mL/kg hr at 32F (0° C)
- Atmosphere composition: None needed
- Ethylene producer: Very low. Not sensitive to ethylene exposure.
- Damage potential: Low for bulk beets. Green-top beets are sensitive to warm temperatures and loss of moisture.
- Shelf life: 10-14 days for bunched beets; 4-10 months for topped beets (with ventilation or refrigeration)

PESTS/DISEASES
Black rot:
- Maintain good air circulation.
- Promote optimal storage conditions.
Gray mold: The most commonly found decay in storage beets
**Brussels Sprouts**

**HARVEST**
Quality: Sprouts are 1-2" in diameter, stems < 2 1/2. Green outer leaves and white cut end. Inner leaves are slightly yellow and tightly arranged.

Harvest tips:
- Prune the top when lower sprouts are 1/2-1/4" in diameter; full stem of uniform-sized sprouts will develop in about four weeks.
- Cut off stalk with a knife.

**HANDLING/PACKING**

Grades:
- **U.S. No. 1:** Well-colored, firm, not withered or burst, free from soft decay and seedstems and from damage caused by discoloration, dirt or other foreign material, freezing, disease, insects, or mechanical or other means. Tolerance: 10% (2% for soft decay).
- **U.S. No. 2:** Fairly well colored, fairly firm, not withered or burst, free from soft decay and seedstems and from damage caused by insects, and free from serious damage caused by discoloration, dirt or other foreign material, freezing, disease or mechanical or other means. Tolerance: 10% (2% for soft decay).
- **Unclassified**

Cooling:
- Forced-air cooling – most effective when pre-moistened

Cleaning:
- Not recommended

Carton sizes:
- 25 lb. (11 kg) cartons

Sizes:
- Diameter should be 1-2.5".

Materials: Plastic liners are often used in cartons with loose sprouts to reduce moisture loss. In addition, polyethylene bags are sometimes used in place of the plastic containers for consumer units.

**STORAGE**
- Temperature: 32°F (0°C)
- Humidity: 95-100%
- Respiration: 10-20 mL/kg/hr at 32°F (0°C)
- Atmosphere composition: 5-10% CO2, 3-5% O2
- Ethylene producer: 0.25 μL/kg hr, increasing tenfold with prolonged storage. Very sensitive to ethylene exposure.
- Damage potential: Low
- Shelf life: 3-5 weeks (with recommended refrigeration)

**PESTS/DISEASES**
- Bacterial soft rot
- Bacterial, black or gray leaf spot
- Gray mold

**Cabbage**

**HARVEST**
Quality: Crisp, firm, compact head. Should be easy to harvest, and should not have loose leaves or a head that is cracked open.

Harvest tips:
- Stands up to heat; harvest any time of day.
- Field packing is a good idea, but cabbages must be kept clean.
- Harvest leaving 1-2 wrapper leaves.
- Wrapper leaves can have insect damage, but main head should not have damage.
- Don't ship cabbages that are full of worm excrement.
- Cut some cabbages open to check for internal problems.

**HANDLING/PACKING**

Grades:
- **U.S. No. 1:** One variety or similar varietal characteristics, which are of reasonable solidity, and are not withered, puffy, or burst and are free from soft rot, seedstems, and from damage caused by discoloration, freezing, disease, insects or mechanical or other means. Stems shall be cut so that they do not extend more than 1/2" beyond the point of attachment of the outermost leaves. Tolerance: 10%.
- **U.S. Commercial:** Meet the requirements for U.S. No. 1 grade except for an increased tolerance for defects, and the heads shall be reasonably firm. Tolerance: 25%.

Cooling:
- Forced-air cooling during storage

Cleaning:
- Not recommended

Carton sizes:
- 45 to 50 lb. in 1 1/2, or 1 1/4 bushel waxed cabbage containers
- Heavy fiberboard bulk pallet bins holding 500-1000 lb.

Sizes: (Classification optional)
- Pointed (oxheart) cabbage:
  - Small: < 1.5 lb.
  - Medium: 1.5-3 lb.
  - Large: > 3 lb.
- Domestic and Danish (green) types:
  - Small: < 2 lb.
  - Medium: 2-5 lb.
  - Large: > 5 lb.
Cabbage

STORAGE
- Temperature: 32° F (0° C)
- Humidity: 98-100%
- Respiration: 2-3 mL/kg hr at 32° F (0° C)
- Atmosphere composition: 4-5% CO₂, 2-3% O₂
- Ethylene producer: Low. Sensitive to ethylene exposure
- Damage potential: Low
- Shelf life: 1-6 months

PESTS/DISEASES
Gray mold fungus: A major cause of postharvest decay.
  - Use less susceptible cultivars.
  - Use preharvest fungicides.
  - Practice strict hygiene.
  - Avoid mechanical or frost damage.
  - Perform rapid cooling to 32° F (0° C).
  - Maintain a controlled atmosphere.
Alternaria rot (dark, black or gray leaf spot): Infects a wide range of cruciferous crops.
  - Use preharvest fungicides.
  - Destroy diseased material before storage.
  - Perform rapid cooling to 32° F (0° C).
  - Cabbage loopers, cabbageworms, and diamondback moth caterpillars can be controlled with the bacterium Bacillus Thuringiensis (BT) a microbial insecticide that can be very effective in controlling young larvae. Formulations are available for organic producers.
  - Boron deficient soils can cause water-soaked, brown heads – the pith may be hollow with a dark lining.
WHOLESALE SUCCESS  Section 11: Crop Profiles

Carrots

HARVEST
Quality: Partially mature; ½ - ¾" at shoulder. Firm, straight from shoulder to tip, smooth with little residual "hairiness," sweet with no bitter or harsh taste, and show no signs of cracking or sprouting.
Harvest tips:
• Loosen with a fork or a bed lifter before harvesting.
• Cull hairy carrots - these are bitter.
• Cull forked carrots.

HANDLING/PACKING
Grades – Bunched carrots: Sep. 18, 1954
• U.S. No. 1: Similar varietal characteristics, roots that are firm, fairly clean, fairly well colored, fairly smooth and well formed, and free from soft rot and from damage caused by freezing, growth cracks, sunburn, pithiness, woodiness, internal discoloration, oil spray, dry rot, other disease, insects, or mechanical or other means. Bunches shall have tops which are fresh and free from decay and free from damage caused by freezing, seedstems, yellowing or other discoloration, disease, insects or mechanical or other means. Unless otherwise specified, the bunches shall have full tops and the length of tops shall be not more than 20". Tolerances: 10% for defects, 25% for off-length tops, 5% for smaller-sized carrots, 10% for larger-sized carrots.
• U.S. Commercial: Same as U.S. No. 1, but with an increased (20%) tolerance for root defects.
• Unclassified

Grades – Topped carrots: Dec. 20, 1965
• U.S. Extra No. 1: Similar varietal characteristics and are well trimmed, firm, clean, fairly well colored, fairly smooth and well formed. Shall be free from secondary new top growth and soft rot and free from damage caused by freezing, growth cracks, sunburn, pithiness, woodiness, internal discoloration, oil spray, dry rot, other disease, insects, or other means. Tolerance: 10% (5% for serious damage and 1% for soft rot).
• U.S. No. 1: Similar varietal characteristics and are well trimmed, firm, fairly clean, fairly well colored, fairly smooth and fairly well formed. Shall be free from soft rot and from damage caused by freezing, growth cracks, sunburn, pithiness, woodiness, internal discoloration, oil spray, dry rot, other disease, insects, or other means. Tolerance: 10% (5% for serious damage and 2% for soft rot).
• U.S. No. 1 Jumbo: Same as U.S. No. 1 except for size.
• U.S. No. 2: Similar varietal characteristics which are well trimmed, firm, not excessively rough, and not seriously misshapen. Shall be free from soft rot and from serious damage caused by dirt, freezing, growth cracks, sunburn, pithiness, woodiness, internal discoloration, oil spray, dry rot, other disease, insects, or other means. Tolerance: 10% (2% for soft rot).
• Unclassified

Grades – Short trimmed tops: Sep. 18, 1954
• U.S. No. 1: Similar varietal characteristics, roots that are firm, fairly clean, fairly well colored, fairly smooth, well formed, and that are free from soft rot and free from damage caused by freezing, growth cracks, sunburn, pithiness, woodiness, internal discoloration, oil spray, dry rot, other disease, insects or mechanical or other means. The carrots shall have leaf stems that are free from decay and free from damage caused by freezing, seedstems, yellowing or other discoloration, disease, insects, or mechanical or other means. The leaf stems shall be cut back to not more than 4" in length. Tolerance: 10% for defects, 5% for smaller sized carrots, 10% for larger sized carrots.
• U.S. Commercial: Same as U.S. No. 1, but with an increased (20%) tolerance for root defects.
• Unclassified
Carrots

Cooling:
* Bunched green top carrots
  * Hydrocool in water with sanitizer after roots have been spray cleaned.
  * Crushed ice
  * Topped carrots
    * Room cool
    * Crushed ice optional

Cleaning:
* Bunched green top carrots
  * Wash bunched carrots with sprayer on screen table. Pressure washer can be used on roots only. Can be packed damp
  * Topped carrots
    * Barrel wash
    * Clean with a sprayer or pressure washer on screen table or in harvest tote.

Carton sizes:
Weights:
* 25-lb in 1/2 waxed carton with perforated polyethylene liner. Or 50 lb. in 1 1/2 bushel

Length:
* Topped: 5+” (U.S. No. 2: 3+”)

Diameters:
* Bunched: At least 3/4”
* Short trimmed tops: At least 1/2”
* Topped:
  * U.S. Extra No. 1: 3/4”-1/2”
  * U.S. No. 1: 3/4”-1 1/2”
  * U.S. No. 1 Jumbo: 1”-2 1/2”
  * U.S. No. 2: 1”-3”

STORAGE
* Temperature: 32-33.8°F (0-1°C)
* Humidity: 98-100%
* Respiration: 5-10 mL/kg hr at 32°F (0°C)
* Atmosphere composition: Not important. >5% CO₂ and <3% O₂ promotes decay
* Ethylene producer: Very low. Exposure to ethylene causes a bitter flavor
* Damage potential: Low
* Shelf life: 5-6 months

PESTS/DISEASES
* Various decay agents: Bacteria soft rot, gray mold rot, Rhizopus soft rot, watery scft rot, and sour rot.
  * Ozone is a fungistatic, but tissue damage and color loss occur after treatment.
  * Maintain good sanitation.
  * Keep storage temperature close to 32°F (0°C).
WHOLESALE SUCCESS  Section 11: Crop Profiles

Chard

HARVEST
Quality: Leaves must be turgid and dark green, with the midrib and petiole completely white or red depending on the variety. Leaves must not show any symptoms of yellowing or browning, or have soil residues. Harvested leaves with petioles can be 7.5-20" (20-50cm) long.

Harvest tips:
- Harvest early in the day.
- Bunch in the field, at least 4" up the stalk, where leaves start to fill out; 6-8 leaves per bunch.
- Don’t pick newest leaves – these won’t hold up in storage; conversely leaves that are too old are tough.
- Stem trimming may be required by some buyers.

HANDLING/PACKING
Grades: Chard is not graded in the U.S.

Cooling:
- Hydrocool in water with sanitizer
- Top-ice

Cleaning: Wash in water tank with sanitizer

Carton sizes: Leafy greens or cabbage box; 24 bunches to a box

Materials: Using plastic films to cover packaging reduces water loss.

STORAGE
- Temperature: 32° F (0° C)
- Humidity: 95-98%
- Respiration: 9-10 mL/kg hr at 36° F (2° C)
- Atmosphere composition: 2-3% CO₂, 10% O₂ (and temperature of 31° F [-0.5° C]) can increase storage to 1 month.
- Ethylene producer: Very low. Very high sensitivity to ethylene exposure.
- Damage potential: High. Sensitive to dehydration and warm temperatures.
- Shelf life: 1-2 weeks
Culinary Herbs (Excluding Basil)

HARVEST
Quality: Fresh Herbs are sensitive to the loss of essential oils and aroma – critical components of fresh culinary herb quality. Flavor quality will usually decline before marketable quality decreases. Harvest herbs as close to shipping as possible and avoid chilling temperatures, which reduce aroma quality. Herbs should appear fresh and green, with no yellowing, decay, insect damage or mechanical damage. Leaves should be uniform in size. Flavor and aroma should be strong and characteristic of the herb.
Harvest tips:
• Harvest with a knife or scissors.

HANDLING/PACKING
Grades: Perennial herbs are not graded in the U.S.

Cooling: Forced Air

Cleaning: Herbs should not be washed.

Materials: Herbs are bunched and tied with rubber bands or twist-ties. They are packaged in plastic bags or clamshell containers, and then packed in corrugated cartons. Perforated polyethylene liners should be used.

STORAGE
• Temperature: 32° F (0° C)
• Humidity: 90-95% (95-100% for chives)
• Respiration: 10-27 mL/kg hr at 32° F (0° C)
• Atmosphere composition: Not generally used
• Ethylene producer: Low. High sensitivity to ethylene exposure
• Damage potential: Low
• Shelf life: 1-2 weeks for marjoram, tarragon, and oregano; 2-3 weeks for most others.

PESTS/DISEASES
Various molds and decays
• Avoid mechanical damage to herbs.
• Maintain low temperatures during storage.
Garlic

HARVEST
Quality: Clean, white (or other color typical of the variety), and well-cured (dried neck and outer skins). The cloves should be firm to the touch.

Harvest tips:
- Loosen with a bed lifter or fork before harvesting.
- Roots should be left intact if dry, or they can be cut off with a field shears.

HANDLING/PACKING
Grades: Sep. 4, 1944
- **U.S. No. 1**: Similar varietal characteristics, mature and well cured, compact, with cloves well filled and fairly plump, free from mold, decay, and shattered cloves, and from damage caused by dirt or staining, sunburn, sunscald, cuts, sprouts, tops, roots, disease, insects, or mechanical or other means. Each bulb shall be fairly well enclosed in its outer sheath. Tolerance: 10% (2% for decay).
- **Unclassified**

Cooling: Not necessary

Curing: Cure in bundles of 10-12 heads in a warm ventilated environment for 10 days. Can be hung to cure or laid on a screen.

Cleaning: After curing, remove outer 1-2 layers of skin. Stem-end should be cut with at least 1" remaining.

Carton sizes:
Weights: Packed loose
- 5-, 10-, 22-, 30-lb. cartons
- Smaller bags or trays for retail

Sizes: Minimum diameter: 1.5"

STORAGE
- Temperature: 68-86°F for curing or short-term storage (<2 months); 30-32°F (-1-0°C) for long-term storage.
- Humidity: 60-70%
- Respiration: 2-6 mL/kg hr at 32°F (0°C)
- Modified atmosphere: 5-15% CO₂ (15% may cause a yellowing on some cloves after 6 months)
- Ethylene producer: Low. Not sensitive to ethylene exposure.
- Damage potential: Low
- Shelf life: 1-2 months for curing; 9+ months for long-term storage

PESTS/DISEASES
*Penicillium* roots: A common problem in stored garlic. Affected garlic bulbs may show little external evidence until decay is advanced. Affected bulbs are light in weight and individual cloves are soft, spongy and powdery dry. In an advanced stage of decay, the cloves break down in a green or gray powdery mass.
- Store in a low humidity environment.
WHOLESALE SUCCESS  Section 11: Crop Profiles

Greens – Cooking

HARVEST
Quality: Leaves should be of similar varietal characteristics, fresh, fairly tender and clean, well trimmed, of characteristic color for the variety or type of greens, free from decay, discoloration, freezing injury, foreign material, disease, insects, and damage caused by coarse stalks or other mechanical means.

Harvest tips:
- Harvest early in the day, keep cool and shaded.
- Snap leaves off the stalks, leaving long stalks on the leaves.
- Bunch in the field, at least 4” up the stalk, where leaves start to fill out.
  - 5-7 leaves per bunch for green kale and collards
  - 6-8 leaves per bunch for red kale
  - 8-12 leaves per bunch for lacinato kale
- Don’t pick newest leaves – these won’t hold up in storage; conversely leaves that are too old are tough.
- Stem trimming may be required by some buyers.
- Bunches must be tied tightly to avoid slipping apart. Apply tie about 1/4 up from the bottom – usually about an inch into where the leaves begin. If it is too close to the bottom, bunches will fall apart

HANDLING/PACKING
Grades – Kale: Jul. 21, 2005
- **U.S. No. 1**: Kale of one type that are well-trimmed, not stunted, free from decay and from damage caused by yellow or discolored leaves, seedstems, wilting, bud burn, freezing, dirt, disease, insects, or mechanical or other means. Tolerance: 10% (1% for wet decay).
- **U.S. Commercial**: Same as U.S. No. 1, except for a tolerance for slightly yellowed or bronze edges to leaves, provided the edges are not dried.

Grades – Collards or Broccoli Greens: Apr. 16, 1953
- **U.S. No. 1**: Collard greens or broccoli greens, of similar varietal characteristics that are fresh, fairly tender, fairly clean, well-trimmed, and of characteristic color for the variety or type; which are free from decay and from damage caused by coarse stalks and seedstems, discoloration, freezing, foreign material, disease, insects, or mechanical or other means. Tolerance: 10% (5% for serious damage and 2% for decay).
- **Unclassified**

Grades – Mustard or Turnip Greens: Mar. 8, 1953
- **U.S. No. 1**: Mustard greens or turnip greens of similar varietal characteristics that are fresh, fairly tender, fairly clean, and which are free from decay and free from damage caused by seedstems, discoloration, freezing, foreign material, disease, insects, or mechanical or other means. Tolerance: 10% (5% for serious damage and 2% for decay).
- **Unclassified**
Greens – Cooking

Cooling: Field heat should be removed as quickly as possible.
- Hydrocooling
- Liquid icing
- Package icing (2.2-lb. of ice per 4-lb. of product)
- Top-icing

Cleaning: Clean via hydrocooling

Carton sizes: 24 bunches packed in waxed leafy greens box or 1 3/4 bu. carton. Alternate side-to-side four groups of six.

Materials: Collard, kale, turnip and mustard greens are typically bunched with a twist tie or rubber band – approximately 1-lb. per bunch. Waxed fiberboard cartons are commonly used.

STORAGE
- Temperature: 32° F (0° C)
- Humidity: 95-98%
- Respiration: 9-11 mL/kg hr at 32° F (0° C)
- Atmosphere composition: 5-10% CO₂, 7-10% O₂
- Ethylene producer: Low. Very sensitive to ethylene exposure
- Damage potential: Sensitive to overheating
- Shelf life: 2 weeks (3 weeks for kale)

PESTS/DISEASES
Bacterial soft rots
- Implement appropriate disease control during production.
WHOLESALE SUCCESS  Section 11: Crop Profiles

Lettuce

HARVEST
Quality: Head lettuce should be solid, with no seed-stem, defects, or decay. In general, high-quality lettuce should be clean, free of browning, be crisp and turgid, and bright light green.

Harvest tips:
- Harvest early or when cool. Wetness is okay.
- Use a field knife to harvest.
- Harvest into a container holding 24 heads.
- Damaged or yellow leaves should be removed.
- Cut above ground to keep knife clean and remove only the good portion – a good picker will not have to retrim.
- Wipe field knife with cloth when soiled to keep cuts clean.
- Be careful not to handle roughly.
- Cut open several heads to make sure there is no tip burn (brown on edges of internal leaves)

HANDLING/PACKING
Grades: Dec. 1, 1975
- **U.S. Fancy**: Similar varietal characteristics, fresh, green, not soft, and not burst. Free from decay, russet spotting, and doubles. Free from injury by tip burn, downy mildew, field freezing, discoloration, and not damaged by any other cause. Each head shall be fairly well trimmed unless specified as closely trimmed. Tolerance at shipping point: 8% (5% for soft heads, 4% for serious damage, and 1% for decay on any part exclusive of the wrapper leaves).
- **U.S. No. 1**: Similar varietal characteristics, fresh, green, not soft, and not burst. Free from decay and doubles. Not damaged by any other cause. Each head shall be fairly well trimmed unless specified as closely trimmed. Tolerance at shipping point: 8% (5% for soft heads, 4% for serious damage, and 1% for decay on any part exclusive of the wrapper leaves).
- **U.S. No. 2**: Similar varietal characteristics, not burst, free from decay, and not seriously damaged by any other cause. Unless otherwise specified each head shall be reasonably trimmed. Tolerance at shipping point: 8% (3% for decay on any part exclusive of the wrapper leaves).

Cooling: **Hydrocool in water with sanitizer**; set heads upside-down to drip dry. **Water left in head lettuce fosters decay.**

Cleaning: Wash in water tank with sanitizer; set heads upside-down to drip dry. **Water left in head fosters decay.**

Carton sizes:
Pack 24 heads in waxed leafy greens or 1 3/4 bu. carton.
Lettuce

Weights:
- Crisphead: 24-count cartons
- Leaf lettuce: 20-25-lb. cartons
- Butterhead/Boston: 20-lb. cartons
- Bibb/greenhouse-grown: 10-lb. cartons

STORAGE
- Temperature: 32° F (0° C)
- Humidity: 98-100%
- Respiration: 3-8 mL/kg hr at 32° F (0° C) for head lettuce; 9-13 mL/kg hr for leaf lettuce
- Atmosphere composition: 1-3% O₂
- Modified atmospheres: lettuce is damaged by CO₂ >3%
- Ethylene producer: Low. Can be damaged by ethylene exposure
- Damage potential: Do not allow to overheat
- Shelf life: 2 weeks maximum

PESTS/DISEASES
Various rots: Bacterial soft rot, gray mold rot, and Sclerotinia. Causes slimy breakdown of tissue.
- Avoid bruising leaves.
- Trim heads properly.
- Store at 32° F (0° C).
Onions

HARVEST
Quality: Mature bulbs with good firmness and compactness of fleshy scales. The size, shape and color of the dry skin should be typical for the variety. They should be free of mechanical or insect damage, decay, sunscald injury, greening of fleshy scales, sprouting, bruising, doubles, bottlenecks (onions which have abnormally thick necks with only fairly well developed bulbs) and any other defects.

Harvest tips:
- Harvest when tops begin to dry naturally.

HANDLING/PACKING

Grades: Oct. 10, 1995

- **U.S. No. 1:** Similar varietal characteristics, mature, fairly firm, and fairly well shaped. Free from decay, wet sunscald, doubles, bottlenecks, and scallions. Free from damage caused by seedstems, splits, tops, roots, dry sunken areas, sunburn, sprouts, freezing, peeling, cracked fleshy scales, watery scales, dirt or staining, foreign matter, mechanical, translucent scales, disease, insects, and other means. Tolerance (Defects): 10% for damage by peeling, 5% for other grade requirements (2% for decay or wet sunscald). (Off-size): 5% may be below the specified minimum size, and not more than 10% may be above any specified maximum size, as outlined in the standard.

- **U.S. Commercial:** Similar varietal characteristics, mature, not soft or spongy, and not badly misshapen. Free from decay, wet sunscald, doubles, bottlenecks, and scallions. Free from damage caused by seedstems, tops, roots, dry sunken areas, sunburn, sprouts, freezing, cracked fleshy scales, watery scales, mechanical, translucent scales, disease, insects, and other means. Free from serious damage caused by staining, dirt, and other foreign matter. Tolerance (Defects): 5% for grade requirements (2% for decay or wet sunscald). (Off-size): As for U.S. No. 1.

- **U.S. No. 1 Boilers:** Same as U.S. No. 1 except for size. Tolerance (Defects): As for U.S. No. 1. (Offsize): As for U.S. No. 1.

- **U.S. No. 1 Picklers:** Same as U.S. No. 1 except for size. Tolerance (Defects): As for U.S. No. 1. (Offsize): 10% may be above the maximum size specified for this grade.

- **U.S. No. 2:** One type, mature, and not soft or spongy. Free from decay, wet sunscald, and scallions. Free from serious damage caused by watery scales, dirt or staining, foreign matter, seedstems, sprouts, mechanical, dry sunken areas, disease, freezing, insects, and other means. Tolerance (Defects): As for U.S. Commercial. (Offsize): As for U.S. No. 1.

Curing: Field cure for 3-5 days as long as it doesn't rain, then put in a warm ventilated area to finish curing. Curing in the greenhouse works well.

Cooling: Dry onion bulbs for long-term storage should be pre-cooled to 32° F (0° C) immediately after curing.

Cleaning: Dry brushing before or after storage. Trim roots and stems after curing.
Onions

Carton sizes:
Weights:
- 20-lb. cartons
- 25-lb. or 50-lb. net bags
- Retail pack in 3# net bags with a brand label. Packout is 16/3lb. packed in cabbage boxes or large mesh bags.

Sizes:
- Small: 1 - 2 1/4" 
- Prepacker: 1 1/2 - 3" 
- Medium: 2" - 3 1/4" 
- Large: 3" - 3 3/4" 
- Colossal: >3 3/4"

STORAGE
- Temperature: Store at 68-86F for curing and short-term storage (<1 month). 32°F (0°C) for long-term storage
- Humidity: 65-75%
- Respiration: 1.5 mL/kg hr at 32°F (0°C)
- Atmosphere composition: 5% CO₂, 3% O₂ can be used
- Ethylene producer: Very low. Not very sensitive to ethylene exposure, although high concentrations can induce sprouting.
- Damage potential: Low
- Shelf life: 6-9 months

PESTS/DISEASES
Botrytis neck rot: Gray mold covers neck first, then the whole bulb.
- Dry onions properly.

Black mold rot
- Store at 32°F (0°C).
- Store with moderate humidity.

Blue mold rot
- Harvest only mature bulbs.
- Dry onions properly.
- Store at 32°F (0°C).
- Store with moderate humidity.

Bacterial soft rot
- Harvest only mature bulbs.
- Dry onions properly.
- Minimize bruising.
- Maintain optimum storage conditions.
Potatoes

HARVEST
Quality: A high quality fresh-market potato tuber will be turgid, well shaped, uniform, brightly colored (especially reds, whites and yellows), as well as free from adhering soil, mechanical damage, greening, sprouts, diseases, and physiological defects.
Harvest tips:
• New potatoes have thin skins. Extra care should be taken when harvesting and washing to not damage the skin. May need to be hand-dug and gently washed.

HANDLING/PACKING
Grades: Nov. 21, 2008
• U.S. No. 1: Similar varietal characteristics, firm, fairly clean, and fairly well shaped. Free from freezing damage, blackheart, late blight, southern bacterial wilt, ring rot, soft rot, and wet breakdown. Free from damage by any other cause. Should be Size A. Tolerance: (Defects): At shipping point: 8% (5% for external defects, 5% for internal defects, and 1% for frozen, soft rot or wet breakdown). Defects en route or at destination: 10% (7% for external defects, 7% for internal defects, and 2% for frozen, soft rot or wet breakdown). (Off-size): Not more than 3% in any lot may be smaller than the required or specified minimum size except that a tolerance of 5% shall be allowed for potatoes packed to meet a minimum size of 2 1/2" in diameter or 5-oz. or more in weight. Not more than 10% may be larger than any required or specified maximum size. When specified to be of a certain size and larger, individual samples shall have not less than 1/2 of the percentage specified, provided, that the average for the entire lot is not less than the percentage specified.
• U.S. Commercial: Same as U.S. No. 1, except shall be free from serious damage caused by dirt or other foreign matter, russet scab, and rhizoctonia. Tolerance (Defects): 20% (10% for potatoes not meeting U.S. No. 2 standards, 6% for external defects, 6% for internal defects, 1% for frozen, soft rot or wet breakdown). (Off-size): As for U.S. No. 1.
• U.S. No. 2: Similar varietal characteristics and not seriously misshapen. Free from freezing, blackheart, late blight, southern bacterial wilt, ring rot, soft rot, and wet breakdown. Free from serious damage by any other cause. Should not be less than 1.5" in diameter. Tolerance: (Defects): At shipping point: 10% (6% for external defects, 6% for internal defects, 1% for frozen, soft rot or wet breakdown). En route or at destination: 12% (8% for external defects, 8% for internal defects, and 2% for frozen, soft rot or wet breakdown). (Off-size): As for U.S. No. 1.
• Unclassified

Cooling: Potatoes which are to be kept in long-term storage should be cured for 1-2 weeks at 68°F (20°C), (or 59° F [15° C] to minimize decay) with a RH of 80-100%. After curing, temperature should be lowered by 1-2°C each day until storage temperature is reached.

Cleaning: Hand wash, or brush wash if skins are tough enough.
Potatoes

Carton sizes:
Weights:
- Bulk 50-lb 1 7/8 bu. carton
- Bulk 25-lb 3/4 bu. carton
- "Count" 50-lb. boxes
- 5-or 10-lb. plastic or paper bags
- 2-lb. net bags B-sized tubers

Sizes: (Diameters)
- Size A: 1 7/8”+
- Size B: 1 1/2” - 2 3/4”
- Small: 1 3/4” - 2 1/2”
- Medium: 2 1/4” - 3 1/4”
- Large: 3 - 4 1/4”

STORAGE
- Temperature: 45-50° F (7-10° C)
- Humidity: 95-99%
- Respiration: 7-10 mL/kg hr at 50° F (10° C)
- Atmosphere composition: Minimal usefulness
- Ethylene producer: Very low. Not sensitive to ethylene exposure
- Damage potential: Chilling-sensitive; store potatoes in the dark as they are sensitive to light.
- Shelf life: 2-12 months

PESTS/DISEASES
Many bacterial and fungal pathogens
- Carefully sort potatoes before putting into storage.
- Manage RH and temperature during storage.
Radishes

**HARVEST**
Harvest maturity: Based on size and market demand. The diameter of oval types should be between 0.75-1.25” (2-3 cm). Bunched radishes are harvested in either regular or big bunch size and roots for cello packages are pulled at regular or jumbo sizes.
Quality: Roots shall be fresh, well-colored, tender, firm, crisp and not be stringy or woody, soft, flabby or wilted. Bunched radishes should have fully intact tops that are dark-green with no yellowing.

**HANDLING/PACKING**
Grades: Oct. 01, 1968
- **U.S. No. 1:** Similar varietal characteristics, with roots that are clean, well formed, smooth, firm, where the root is crisp and not soft, flabby or wilted. Shall be tender, free from decay and free from damage caused by freezing, growth or air cracks, cuts, pitthiness, disease, insects, or other means. Bunched radishes have tops which are fresh with normal green color and not more than slightly wilted. Shall be free from decay and free from damage caused by freezing, seedstems, yellowing or other discoloration, disease, insects or other means. Unless otherwise specified, the diameter of each root shall be not less than 3/8”-Tolerances (Defects): Roots: 10% (1% for decay). For tops of bunched radishes: 10% (5% for decay). For off-size roots: 10% for roots which fail to meet the specified minimum diameter, provided that when both minimum and maximum diameters are specified, an additional tolerance of 10% shall be allowed for roots which are larger than the maximum diameter specified. For excess length of tops of topped radishes: 5% for tops more than 3/4” long.
- **U.S. Commercial:** Same as for U.S. No. 1 except for increased tolerances. Tolerances (Defects): Roots: 20% fail to meet the grade requirements (10% for serious damage and 1% for decay). For tops of bunched radishes: 10% (5% for decay). For off-size roots: 10% for roots which fail to meet the specified minimum diameter, provided that when both minimum and maximum diameters are specified, an additional tolerance of 10% shall be allowed for roots which are larger than the maximum diameter specified. For excess length of tops of topped radishes: 10% for tops more than 3/4” long.

**Cooling:**
Bunched green top radishes
- Hydrocool in water with sanitizer after roots have been spray cleaned.
- Top-ice
Topped radishes
- Room cool
- Ice
- Hydrocool in water with sanitizer after roots have been spray cleaned.

**Cleaning:**
Bunched green top radishes
- Clean bunched radishes with sprayer on screen table. Pressure washer can be used on roots portion only. After cleaning, bunched radishes can be soaked in water with sanitizer to hydro-crisp. Radishes can be packed damp.
Topped radishes
- Clean with a sprayer or pressure washer in harvest tote.
Radishes

Carton sizes: Topped radishes are packed in 6-oz. (168g), 8-oz. (224g), 1-lb. (454g), 5-lb. (2.3kg), 25-lb. (11kg) and 40-lb. (1 kg) perforated plastic bags. Commonly, thirty 6-oz., twenty-four 8-oz. or fourteen 1-lb. bags are boxed together for retail, while 25-lb. (11kg) bags are used for the foodservice industry. Standard bunches of radishes shall be fairly uniform in size and radishes in the individual bunches shall not vary more than \(\frac{1}{2}\)" in diameter. Not more than 10% of the bunches in any lot may fail to meet the requirements for standard bunching.

Sizes:
- Small: <\(\frac{3}{4}\)" in diameter
- Medium: \(\frac{3}{4}-1\)" in diameter
- Large: > 1-1 \(\frac{1}{4}\)" in diameter
- Very large/jumbo: >1 \(\frac{1}{4}\)" in diameter

STORAGE
- Temperature: 32° F (0° C)
- Humidity: 90-95%
- Respiration: Topped Roots: 7-8.5 mL/kg hr at 32° F (0° C). Bunched Roots with Tops: 1.5-4.5 mL/kg hr at 32° F (0° C)
- Atmosphere composition: 1 to 2% O₂ and 2-3% CO₂
- Ethylene producer: Low. Not particularly sensitive to ethylene exposure
- Damage potential: Not chilling-sensitive and should be stored as cold as possible without freezing. Freezing injury causes softening, shriveling and leakage of pigment for red radishes.
- Shelf life: 3-4 weeks for topped radishes. 1-2 weeks for bunch radishes (addition of top ice may help keep tops fresh). 2-4 months for winter or black radishes.

PESTS/DISEASES
Black spot (Xanthomonas vesicatoria): Brown lesions which turn black and coalesce.
- Wash in water with 100-200 ppm of chlorine.
Downy mildew (Peronospora parasitica): Produces purplish-red to brown surface lesions that become rough and cracked. Internal tissue can become grayish brown to black.
- Avoid bruising.
- Hydrocool to 40° F (4.4° C) and store at recommend temperature.
Rhizoctonia root rot (Rhizoctonia solani): Produces lesions that are initially round and light brown that become slightly sunken. Tissue can become spongy. Favors high RH.
- As for Downy mildew.
Salad Greens

HARVEST
Quality: Fresh, tender and turgid, with no yellowing, decay, or insect or mechanical damage. Whole plants of rocket and lamb's lettuce are sometimes sold with roots attached, which lengthens postharvest life.

Harvest tips:
- Harvest in the morning or the cool part of the day. It's okay if the greens are still wet – in fact this is desirable.
- Use a field knife, scissors, or a mechanical salad cutter.
- Should be kept in the shade if not cooled immediately. Should be cooled within 1-2 hours. Having a refrigerated truck in the field, or a tank of cold water can help on hot days.

HANDLING/PACKING
Grades: Salad greens are not graded in the U.S.

Cooling and Cleaning: Greens for salads should be cooled to 32°F (0°C) as soon as possible after harvest.

The cooling and cleaning process are combined for baby salad greens. Double tank wash in water with sanitizer and spin dry. Water should not be more than 10°F colder than greens. Use multiple tanks to "step-down" temperature. Use mesh bags to minimize handling and reduce bruising. Spin dry.

Materials: Salad greens may be packed in fiberboard cartons lined with perforated polyethylene bags, 6-oz. sealed plastic bags, trays or clamshell containers.

STORAGE
- Temperature: 32-36°F (0-2°C)
- Humidity: 95-100%
- Respiration: 6-21 mL/kg hr at 32°F (0°C)
- Atmosphere composition: Generally not beneficial
- Ethylene producer: Low. Very sensitive to ethylene exposure
- Damage potential: Extremely high – must be maintained at consistent cold temperatures
- Shelf life: 7-14 days

PESTS/DISEASES
Bacterial soft rot and fungal decay: Similar to that of lettuce.
- Maintain low temperatures.
Spinach

HARVEST

Quality: Leaves should be of similar varietal characteristics, fresh, fairly tender and clean, well trimmed, of characteristic color for the variety, free from decay, discoloration, freezing injury, foreign material, disease, insects, and damage caused by coarse stalks or other mechanical means.

Harvest tips:
- Harvest with a field knife, cutting just under ground level and keeping the root intact.
- Bunch in the field: 4-6 plants per bunch (about 3/4 lb.).
- Harvest into 24 count field totes.

HANDLING/PACKING

Grades – Spinach: Dec. 27, 1946
- **U.S. Extra No. 1**: Leaves of similar varietal characteristics that are fairly clean, well trimmed, free from coarse stalks, seedstems, seedbuds, crowns and roots, sandburs or other kinds of burs, decay, and free from damage caused by clusters of leaves, wilting, discoloration, freezing, foreign material, disease, insects, mechanical or other means. Tolerance: 5% (1% for decay).
- **U.S. No. 1**: Leaves of similar varietal characteristics that are well trimmed, free from coarse stalks, seedstems, seedbuds, crowns and roots, sandburs, or other kinds of burs, decay, and free from damage caused by clusters of leaves, wilting, discoloration, freezing, dirt, or other foreign material, disease, insects, mechanical or other means. Tolerance: 10% (1% for decay).
- **U.S. Commercial**: Leaves of similar varietal characteristics that are well trimmed, free from coarse stalks, seedstems, seedbuds, crowns and roots, sandburs, or other kinds of burs, decay, and free from damage caused by clusters of leaves, wilting, discoloration, freezing, dirt or other foreign material, disease, insects, mechanical or other means. Tolerance: 20% (1% for decay).
Spinach

Cooling and Cleaning: Spinach should be cooled to 32° F (0° C) as quickly as possible after harvest.

Baby Spinach
• The cooling and cleaning process are combined for baby spinach. Double tank wash in water with sanitizer and spin dry. Water should not be more than 10° F colder than greens. Use multiple tanks to “step-down” temperature. Use mesh bags to minimize handling and reduce bruising. Spin dry.

Bunched Spinach
• Wash and cool in water tank with sanitizer; set heads upside-down to drip-dry.

Cold Chain: Can be topped with crushed ice for further cooling and cold chain in storage and transportation.
• Package icing (2.2-lb. of ice per 4-lb. of product)
• Top-icing

Materials: 24 count waxed carton with perforated polyethylene liner.

STORAGE
• Temperature: 32° F (0° C)
• Humidity: 95-98%
• Respiration: 9-11 mL/kg hr at 32° F (0° C)
• Atmosphere composition: 5-10% CO₂, 7-10% O₂
• Ethylene producer: Low. Very sensitive to ethylene exposure
• Damage potential: Sensitive to overheating. Spinach is sensitive to bruising during handling.
• Shelf life: 2 weeks (3 weeks for kale)

PESTS/DISEASES
Bacterial soft rot:
• Implement appropriate disease control during production.
Summer Squash

HARVEST

Quality: Tenderness and firmness are the major quality characteristics. The surface of summer squash should be shiny; dullness is a sign of senescence. Fruit should be firm and free of physical injury. Dark green types should be entirely green; yellowish areas are a sign of senescence. Water loss results in a dull surface and loss of firmness.

Harvest tips:
- Harvest with a field knife.
- Wear clean cotton gloves, and be careful not to scratch the squash.
- Wipe squash with gloves to remove dirt, and remove blossom if still attached.
- Zucchini, yellow squash, and crookneck should be 5-7"; patty pan should be 3-4" in diameter.
- Harvest every other day.

HANDLING/PACKING

Grades: Jan. 6, 1984
- U.S. No. 1: Of one variety or have similar varietal characteristics, with stems or portions of stems attached, that are fairly young and fairly tender, fairly well formed, firm, free from decay and breakdown, and from damage caused by discoloration, cuts, bruises and scars, freezing, dirt or other foreign material, disease, insects, mechanical or other means. Tolerance: 10% (5% for serious damage and 1% for decay or breakdown).
- U.S. No. 2: Of one variety or have similar varietal characteristics that are not old and tough, but are firm, free from decay and breakdown, and damage caused by freezing, and free from serious damage caused by discoloration, cuts, bruises, scars, dirt or other foreign material, disease, insects, mechanical or other means. Tolerance: 10% (1% for decay or breakdown).

Cooling:
- Room cooling
- Forced-air cooling

Cleaning: No washing required other than wiping clean.

Materials: 20-lb. 1/2 bu. waxed carton. Pack like sardines, with stem-end facing the carton walls to avoid damaging other fruits.

STORAGE
- Temperature: 41-50°F (5-10°C)
- Humidity: 95%
- Respiration: 12-13 mL/kg hr at 32°F (0°C)
- Atmosphere composition: Not commonly used
- Ethylene producer: 0.1-1.0 μL/kg hr. Moderately sensitive to ethylene exposure
- Damage potential: Chilling-injury, bruising and scratching
- Shelf life: <2 weeks

PESTS/DISEASES

Various fungal and bacterial pathogens: Alternaria rot, bacterial soft rot, cottony leak, Fusarium rot, Phytophthora rot, and Rhizopus rot.
- Avoid chilling-injury.
Tomatoes

HARVEST

Quality: High quality fruit have a firm, turgid appearance, uniform and shiny color, without signs of mechanical injuries, shriveling or decay.

Harvest tips:

- Turners/breakers are generally preferred by wholesalers; communicate with your buyer on the maturity desired.
- Twist the tomato in a downward motion to leave the stem behind. For some varieties, stem can be flicked off if still remaining; the stem should stay on for some heirloom varieties (you should use pruners to harvest these).
- Do not squeeze the tomatoes – they can bruise.
- Pack tomatoes stem-side down.
- Avoid harvesting when wet.
- Wear cotton field gloves and use them to brush dirt off tomatoes in the field.
- Unusable tomatoes should be placed in the center aisle for compost.
- Tomatoes are commonly field packed.
- Tomatoes should be seen and not heard. Handle with care.
- Harvest every other day, at least.

Maturity stages:

- Stage 1: Mature green. Common in commercial and long-distance production chains. Firm, mature, color change from green to light green, no pink on blossom end. 1-2 weeks in refrigerator. If the seeds are tan and gel is forming in at least two locules, these may ripen to moderate quality. If the seeds are pushed aside when the tomato is sliced and/or when red color appears in the gel and tissue, the tomato will ripen to high quality (provided proper storage).
- Stage 2: Pink. Most desirable for local wholesale markets. Pink on blossom end about the size of a dime. Will ripen in 3 days at room temperature. This stage is physiologically mature, and ripening on or off the vine will produce the same level of quality.
- Stage 3: Ripe: full red but still firm. Use immediately. These are not suitable for wholesale and are more appropriate for direct marketing, CSAs, and farmers’ markets.

HANDLING/PACKING

Grades: Oct. 1, 1991

- U.S. No. 1: Similar varietal characteristics, mature, not overripe or soft, clean, well developed, fairly well formed, and fairly smooth. Free from decay, freezing injury, and sunscald. Not damaged by any other cause. Tolerance: Defects at shipping point: 10% for grade requirements (5% for defects causing very serious damage and 1% for being soft or affected by decay). Defects en route or at destination: 15% for grade requirements (5% for being soft or affected by decay, 10% for shoulder bruises or discolored or sunken scars, 10% for being otherwise defective and 5% for very serious damage by any cause, exclusive of soft or decayed tomatoes).
Tomatoes

- **U.S. Combination**: Consists of a combination of U.S. No. 1 and U.S. No. 2 tomatoes, provided that at least 60%, by count, meet the requirements of the U.S. No. 1 grade. Tolerance: Defects at shipping point: 10% for U.S. No. 2 grade requirements (5% for defects causing very serious damage and 1% for being soft or affected by decay). Defects en route or at destination: 15% for U.S. No. 2 grade requirements (5% for being soft or affected by decay, 10% for serious damage by shoulder bruises or by discolored or sunken scars, 10% for being otherwise defective and 5% for very serious damage by any cause, exclusive of soft or decayed tomatoes).

- **U.S. No. 2**: Same as U.S. No. 1, but may be reasonably well formed, no more than slightly rough, and not seriously damaged by any other cause. Tolerance: Defects at shipping point: 10% for grade requirements (5% for defects causing very serious damage and 1% for being soft or affected by decay). For defects en route or at destination: 15% for grade requirements (5% for being soft or affected by decay, 10% for serious damage by shoulder bruises or by discolored or sunken scars, 10% for being otherwise defective and 5% for very serious damage by any cause, exclusive of soft or decayed tomatoes).

- **U.S. No. 3**: Same as U.S. No. 2, but may be misshapen, and may by slightly damaged by sunscald, but should not be very seriously damaged by causes other than decay and freezing injury. Tolerance: Defects at shipping point: 10% for grade requirements (5% for very serious damage by insects, 1% for being soft or affected by decay). Defects en route or at destination: 15% for grade requirements (5% for being soft or affected by decay, 10% for very serious damage by shoulder bruises or by discolored or sunken scars, 10% for being otherwise defective and 5% for very serious damage by insects).

Tolerance (All grades): Off-size: 10% may be smaller than the specified minimum diameter, or larger than the specified maximum diameter. Off color: 10% may fail to meet the color specified and 5% for tomatoes which are green in color, when any term other than "Green" is specified.

**Cooling:**
- Room cooling
- Forced-air cooling produces best results

**Cleaning:** Clean with cotton gloves in field.

**Carton sizes:**

**Weights:** Lidded, 25-lb. cartons (12"x16"x9 1/2") that stack 10 cartons per layer on a 40"x 48" pallet.
- 20-lb. 2-layer
- 10-lb. one layer
- 12 pints in flat cherry carton

**Diameter:**
- Small: 2.13-2.28" (5.40-5.79cm)
- Medium: 2.25-2.53" (5.72-6.43cm)
- Large: 2.5-2.78" (6.35-7.06cm)
- Extra-large: at least 2.76" (7cm)
Tomatoes

Color:
- Green: 100% green
- Breaker: Tan, yellow, pink, or red on <10% of the surface
- Turning: 10-30% of the surface is not green
- Pink: 30-60% is not green
- Light red: 60-90% is not green. Shows pinkish-red or red
- Red: >90% not green. Red color overall

Materials: Containers should be padded, clean, shallow, and have smooth bottoms. Tomatoes can be packed in one or two layers.

STORAGE
- Temperature: 66-70° F (19-21° C) for ripening; <55.4° F (13° C) retards ripening (use only for red tomatoes; can lead to chilling-injury in tomatoes that are not fully ripe); below 55.4° F (13° C) taste is adversely affected.
- Humidity: 90-95%
- Respiration: 15.5-22.8 mL/kg hr at 68° F (20° C)
- Atmosphere composition: 2-3% CO₂ for green-ripe and 3-5% CO₂ for red tomatoes; 3-5% O₂ for all types.
- Ethylene producer: 1-10 μL/kg hr. Exposure to 50 μL/L will help green tomatoes ripen. Breaker stage tomatoes do not need introduced ethylene.
- Damage potential: Sensitive to chilling, bruising
- Shelf life: Dependent on maturity when picked

PESTS/DISEASES
Various decay mechanisms: Soft rot, lactic acid decays, black rot, gray mold rot, Fusarium rot, Mucor rot, Phoma rot, Phomopsis rot, Buckeye rot, Pleospora rot, Rhizopus rot, Ring rot, Sclerotium rot, Sour rot, Target spot, Watery soft rot.
- Avoid bruising or damaging fruit.
- Maintain good standards of hygiene and sanitation.
- Remove and destroy infected fruit.
Winter Squash

HARVEST
Quality: Fully mature, with hard rinds and, except for some striped varieties, solid external color. Flesh of good quality winter squash is bright yellow or orange with a fine, moist texture and high solids, sugars, and starch.

Harvest tips:
• Should be cut with pruning clippers.
• Leave a short stem.
• Place in container with care not to scratch neighboring squash.
• Avoid wounding squash flesh.

HANDLING/PACKING
Grades: Oct. 13, 1983
• U.S. No. 1: Similar varietal characteristics, well matured, and not broken or cracked. Free from soft rot or wet breakdown. Free from damage by scars, dry rot, freezing, dirt, disease, insects, and mechanical or other means. Tolerance: 10% (2% for soft rot or wet breakdown or serious damage by dry rot).
• U.S. No. 2: Similar varietal characteristics, fairly well matured, and not broken or cracked. Free from soft rot or wet breakdown. Free from serious damage by scars, dry rot, freezing, dirt, disease, insects, and mechanical or other means. Tolerance: 10% (2% for soft rot or wet breakdown or serious damage by dry rot).

Cooling: No cooling necessary.

Curing: Can be sold immediately without curing, or can be cured for longer storage. To cure, place in a warm, ventilated, dry area - greenhouses work well. Bring temperature up to 85-95°F for 8-10 days.

Cleaning: Brush off majority of soil in field at harvest. It is generally considered best to store winter squash unwashed and wash at time of shipment to avoid disturbing the outer wax. Some farms wash at harvest in water tanks with sanitizer and then cure and store clean. Watch for future research on which is best.
• Hand brush wash in a tank of water with sanitizer.
• Wash with a mechanical wet brush washer.

Carton sizes:
Weights:
• 35-lb. 1/2 bu. box
• 800-900 lb. bulk containers

STORAGE
• Temperature: 50-55°F (10-13°C)
• Humidity: 50-70%
• Atmosphere composition: Unknown.
• Ethylene producer: Very low. Somewhat sensitive to ethylene exposure
• Damage potential: Moderately chilling-sensitive
• Shelf life: 2-3 months
References


Information regarding Leeks:
Resources

GENERAL POST-HARVEST HANDLING RESOURCES

Wholesale Success - Comprehensive guide on post-harvest best practices
http://www.familyfarmed.org/publications/wholesalesuccess/

Post-harvest handling decision tool - Post-harvest equipment, packing facility and handling procedures
http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1042&context=leopold_pubspapers

Post-harvest food safety and sanitation- Resources on increasing shelf life, safety, & quality of produce
http://www.caff.org/programs/foodsafety/postharvest/

USDA Commercial Storage- In-depth info on storing best practices & efficiencies

CROP SPECIFIC INFO

Wholesale Success - Detailed crop specific info on quality, grades, post-harvest, and packaging
http://www.familyfarmed.org/publications/wholesalesuccess/

UC Davis Post-harvest Crop Fact Sheets - Fact sheets on maturity, quality, diseases, storage & ethylene
http://postharvest.ucdavis.edu/Commodity_Resources/Fact_Sheets/

Roxbury Farm Harvest Manual - Harvest, cleaning, & packing procedures/efficiencies by crop

USDA Grades and Standards - USDA defined grades of produce
https://www.ams.usda.gov/grades-standards/vegetables
POST-HARVEST STATION DESIGNS & EFFICIENCIES

Washing Shed Systems & Specifications - Detailed info on how to set up efficient washing systems and what you’ll need:

Washing Station Design- How to build and layout your own.
http://www.leopold.iastate.edu/cool_tools/wash_stations1

Efficient wash line for salad greens:
https://www.youtube.com/watch?v=10hgeQWCtkw

How to make a bubbler for greens:
https://www.youtube.com/watch?v=CoF70EBTBwU

How to convert a washing machine into a high efficiency salad spinner:
https://www.youtube.com/watch?v=gAAEXXTxGao

How to make a barrel washer for roots:
https://www.youtube.com/watch?v=h_YI4DIBmqQ&t=34s

How to make a screen washing table:
https://www.youtube.com/watch?v=aMr-0e6orKq

How to make a walk-in cooler on a budget
https://www.youtube.com/watch?v=1DYrLOXUFqs&t=399shttps://www.youtube.com/watch?v=1DYrLOXUFqs&t=399s
QUALITY CONTROL:

Keepers: Fresh, uniformly sized, green leaves with strong aroma and flavor
Cullers: Yellowing, insect damaged, wilted or dark frost damaged leaves

HARVEST

- Harvest when clean and dry so that washing is not needed.
- Harvest regularly to inhibit flowering. Be gentle.
- Harvest as close to shipping time as possible to prevent aroma loss.
- Bunches should be 2-8 oz. depending on buyer.

CLEANING

- Basil is generally not washed but it can be if necessary.
- Use water no more than 10° cooler than basil to avoid chilling injury.

COOLING

- Do not cool any lower than 54 °F.
- Never ice.

STORAGE

- Temperature: 54 °F is the lowest safe temp.
- Shelf life: 1 week
- Damage potential: Sensitive to water to loss and chilling injury.

Farmer Notes:
**QUALITY CONTROL:**

**Keepers:** Firm, smooth, and clean with trimmed rootlets. Intense color w/ minimum zoning (white rings in root)

**Cullers:** Soft, cracked, damaged, tough or light in color from maturing in heat, or < 1 1/2 “ long

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<thead>
<tr>
<th>HARVEST ⚗</th>
<th>COOLING ❄</th>
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| • Top and tail in the field, leaving 1/2” of root.  
• Discard yellow leaves.  
• Bunch beets in the field with 3-5 beets at 1-1.5 lbs. | • Bunched: *Cool immediately* (highly perishable). After spray cleaning, dunk in clean water bath with sanitizer or top-ice.  
• Topped: Room cool. |

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<tr>
<th>CLEANING 🔫</th>
<th>STORAGE 🔒</th>
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| • Bunched: Spray on screen table, pressure wash roots only. Can be packed damp.  
• Topped: Wash as above on screen table or harvest tote, or root washer. | • **Temperature:** 32-36° F  
• **Shelf life:** 10-14 days for bunched beets, 4-10 months for topped beets with refrigeration & airflow  
• **Damage potential:** sensitive to warm temperatures and moisture loss |

**Farmer Notes:**
QUALITY CONTROL:
Keepers: Fresh, tender, clean, well trimmed, brightly colored
Cullers: Discolored, tough, or damaged due to insects, freezing, disease, etc.

HARVEST
- Harvest early in the day, when wet if possible.
- Bunch in field tightly, at least 4” up the stalk.
- Bunches should be 1 lbs. each (5-8 leaves, up to 12 for lacinato kale).

CLEANING
- Tank wash with sanitizer.

COOLING
- Remove field heat as quickly as possible!
- Top-ice and/or water bath cool with sanitizer after washing

STORAGE
- Temperature: 32 °F
- Shelf life: 2 weeks, 3 weeks for kale
- Damage potential: Sensitive to overheating
- Store: large plastic bags to prevent greens from drying out

Farmer Notes:
QUALITY CONTROL:
Keepers: Crisp, firm, compact head
Cullers: Has loose leaves or is cracked open, discolored, withered or damaged from freezing, disease, or insects

HARVEST
• Harvest at any time of day. Can harvest wet.
• Cut some open to check for internal problems
• Pack in field (keep clean)
• Cut stems to no more than 1/2”
• Leave 1-2 wrapper leaves but remove any damaged outer leaves

CLEANING
• Not recommended.

COOLING
• Room cool or forced air

STORAGE
• Temperature: 32 °F
• Shelf life: 1-6 months

Farmer Notes:
QUALITY CONTROL:

Keepers: Firm, straight, hairless, 3+” long, green & clean tops. Topped should have no amount of green.

Cullers: Split, hairy, or rotten, < 3” length, < 3/4” diameter, or green shoulders.

HARVEST

- Loosen with fork before harvest.
- Bunch in field - at least 4 carrots or 1 lbs./bunch.
- Trim tops to < 20” length.
- If topping carrots, leave no amount of green. This will allow carrots to store much longer for wholesale.

CLEANING

- Bunched: Wash with sprayer on screen table. Pressure washer is for roots only.
- Topped: Wash as above or barrel wash.
- Can be packed damp.

COOLING

- Bunched: Crushed ice or water bath cool with sanitizer after washing.
- Topped: Room cool, crushed ice is optional.

STORAGE

- Temperature: 32-35 °F
- Shelf life: 5-6 months
- Store: in large plastic bags to avoid drying out

Farmer Notes:
QUALITY CONTROL:
Keepers: Clean, white (or color typical of variety), firm cloves, and well cured
Cullers: Sun-scalded, sprouted, molded, decayed, has shattered or loose cloves

HARVEST
- Harvest when dry.
- Loosen with a bed lifter or fork before harvesting.
- Roots should be left intact only if dry or cut off with field shears.

CLEANING
- After curing, remove outer 1-2 layers of skin.
- Stem-end should be cut with at least 1” remaining.

CURING & COOLING
- Cure in bundles of 10-12 heads.
- Cure in warm ventilated environment for 10 days.
- Can be hung to cure or laid on a screen.
- Cooling not necessary. Never ice or use water.

STORAGE
- Temperature:
  68-86 °F for curing/short-term storage
  30-32 °F for long-term storage
- Shelf life: 1-2 months for curing, 9+ months for long-term storage

Farmer Notes:
**QUALITY CONTROL:**

**Keepers:** Green, smooth, young leaves, uniform stem length

**Cullers:** Tough or yellow leaves with bitter flavor or furry underside

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**HARVEST**

- Harvest in morning during the coolest part of the day. Harvest wet if possible.
- If bunching, do so in the field at 3/4 lb (4-6 plants)/bunch. Trim the bottoms to be uniform.
- Bunches & heads: If you are packing 24/box, count 24 into each harvest tote to save time.

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**CLEANING**

- Double tank wash in cool water with sanitizer.
- Use mesh bags to minimize handling.
- Spin dry loose greens, hang bunched arugula and head lettuce upside down to prevent decay.
- Remove as much water from the surface of greens as possible to increase shelf life.

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**COOLING**

- Cooling and Cleaning Combined.
- For salad greens, water should be no more than 10 °F colder than the greens - use multiple tanks to “step down the temperature”.

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**STORAGE**

- **Temperature:** 32-36 °F
- **Shelf life:** 7-10 days (head lettuce: up to 2 weeks )
- **Damage potential:** Sensitive to overheating. Store arugula as cold as possible without freezing.
- **Store:** in large plastic bags to prevent greens from drying out.

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**Farmer Notes:**
QUALITY CONTROL:

**Keepers:** Firm, white shaft, longer than 3”, with bright green leaves

**Cullers:** Wilted, yellow, cracked, bruised, or overly large (sign that it could be old and tough)

### HARVEST 🌾
- Harvest early in the day, when wet if possible. Lift plants with fork.
- Trim tops, roots, and peel outer leaves in field if possible, otherwise after cleaning.
- Place in containers that allow free circulation of air inside. Do not overload.

### CLEANING 🌿
- Pressure spray to remove big clods.
- Dunk in wash tank w/ sanitizer.

### COOLING 🍃
- Remove field heat immediately via ice and/or dunk in clean water after washing.
- Refrigerate leeks at the lowest temperature possible.

### STORAGE 🏡
- **Temperature:** 32 °F
- **Humidity:** As close to 100% as possible - essential to preventing wilting. Can wrap loosely in large plastic bag to keep in moisture.
- **Shelf life:** 2-3 months under correct conditions
- **Damage potential:** Sensitive to moisture loss and sunlight.

**Farmer Notes:**

QUALITY CONTROL:
Keepers: Mature bulbs that are firm, compact
Cullers: Soft, decayed, insect damaged, sun-scalded, sprouted, bruised, bottlenecked, or translucent or green scales

HARVEST
• Harvest when tops begin to dry and yellow naturally

CLEANING
• Dry brush roots free of mud clods before or after storage.
• Trim roots and stems (to an inch or so) after curing.

CURING & COOLING
• Field cure for 3-5 days if there's no rain, then finish curing in warm ventilated area such as a greenhouse or barn.
• Cool to 32 °F immediately after curing for long-term storage.
• Never ice or use water.

STORAGE
• Temperature:
  68-86 °F for curing and short term storage
  32 °F for long-term storage (> 1 month).
• Shelf life: 6-9 months

Farmer Notes:
QUALITY CONTROL:

Keepers: Firm, well shaped, uniform, brightly colored, and clean
Cullers: Green, sprouting, split, damaged from freezing or disease, has residual dirt

HARVEST

- New potatoes have thin skins. May need to be hand-dug and gently washed so as to not damage skin.
- Harvest when dry.

CLEANING

- Hand wash if skins are sensitive,
- Brush wash or root barrel wash if skins are tough enough.

STORAGE

- Temperature: 45-50 °F
- Shelf life: 2-12 months
- Damage potential: Chilling-sensitive, store potatoes in the dark with good airflow.

CURING & COOLING

- Long-term storage: cure for 1-2 weeks at 59-68 °F with a relative humidity of 80-100%.
- After curing, temp should be lowered by 1-2 °F each day until storage temp is reached.
- Never ice.
QUALITY CONTROL:
Keepers: Firm, uniform, shiny, clean, correct maturity discussed with customer
Cullers: Soft, shriveled, decayed, overripe

HARVEST
• Harvest when dry, at least every other day.
• Twist down tomato to remove stem or use pruners to keep it on.
• Wear cotton gloves to wipe off dirt on tomatoes.
• Pack in field, stem side down. Handle with care.
• Single layer is ideal. Do not over pack.

COOLING
• Forced-air is best, or room cool.
• Never ice.

CLEANING
• No washing required. Just wipe clean.

STORAGE
• Temperature: 66-70 °F for ripening, 55.4 °F for already ripe (anything colder will affect taste)
• Shelf life: Depends on maturity when picked.
• Damage potential: Sensitive to chilling and bruising.

Farmer Notes:
QUALITY CONTROL:

Keepers: Fully mature with hard rinds, brightly colored, solid external color (unless striped)
Cullers: Cracked, has rot or wet breakdown

HARVEST

- Harvest when dry.
- Use clippers and leave a short stem.
- Brush off majority of dirt in the field.

CURING & COOLING

- Can be sold immediately without curing. Cure longer for storage.
- Cure for To cure, place in warm, dry, ventilated area like a greenhouse. Bring up to 85-95° F for 8-10 days.
- No cooling required.

CLEANING

- Can clean before or after storage.
- Hand brush wash in a water tank w/ sanitizer.

STORAGE

- Temperature: 50-55 °F
- Humidity: 50-70% - above this is prone to decay, below is prone to dehydration
- Shelf life: 2-3 months
- Damage potential: Somewhat sensitive to chilling

Farmer Notes: