



# Postharvest Handling for Advanced Shelf Life

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http://www.ncgrowingtogether.org

#### Introduction

Consumers are demanding local product and wholesalers are trying to meet this demand, while supporting small farms.



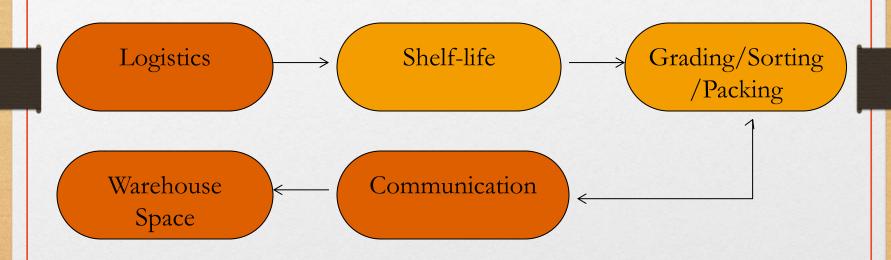








# Wholesaler Challenges





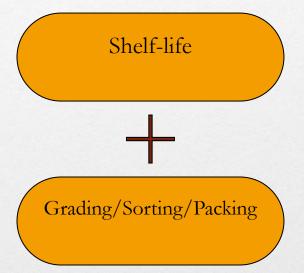
# What is Quality Control (QC) Looking For?

- Appearance
   (color, size,
   shape, free from
   defects)
- Firmness
- Flavor





# How does this impact what they buy?



- More flexibility on how much product they will buy from small farms.
- Ability to pack product out into conventional product if local does not sell or before the shelf-life expires
  - Less Waste
- Customer Satisfaction



# Why Postharvest Handling is Important

- Premium Price
- Protect Food Safety
- Reduce Losses
- Increased shelf life and marketing opportunities





# **Product Specification Manual**



Wholesale and Retail Product Specifications: Guidance and Best Practices for Fresh Produce

For Small Farms and Food Hubs



www.ncgrowingtogether.org

# **Product Specification Manual**

#### Asparagus - Green



General	Quality asparagus will be dark green with a tightly closed and
Characteristics:	compact tip. Early season asparagus can exhibit more of a purple
	tinged tip and a paler, apple green stalk. The asparagus should be
	sized fairly consistently within the case.

#### Harvest Guidance:

- Daily, early morning harvest is recommended.
- Use a serrated knife to cut the stalk cleanly 1"-4" below the soil surface, taking care to not cut the crown of the plant buried beneath the spear.
- Harvested stalks should be 8-11" in length with a stem diameter that should be over 1/4"; It is recommended that you avoid woody stems.
- Harvest into sturdy clean containers placing the cut end of the spears in 1" of cool water.
- · Keep in shaded area.

Post-Harvest Guidance:	
Pre-Cooling	Rapid hydro-cooling is recommended; Keep stalks standing upright in 1" of water; Keep shaded
Washing/Processing	Trim spears to uniform height; gently rinse with potable water as needed
Size/Appearance	8"-11" stalks with closed bracts; grade by stem diameter into 2 distinct sizes
Packing	Wholesale: 24 x 1 lb. banded bunches 1 1/9 bushel box with bag liner Retail: 24 x 1 lb. banded bunches 1 1/9 bushel box with bag liner
Optimal Storage	Temp 32 – 35 F; Humidity 95-99%

# Top Causes of Reduced Shelf-Life

- Temperature
- Physical Damage
- Pathogens (causing decay)
- Relative Humidity
- Contamination



aportant.

# How can we increase shelf-life? Temperature Management

- Harvest early in the morning
- Once harvested, keep produce out of direct sunlight or extreme temperatures.
- Provide shade while transporting product.
- Maintain a 100% cold supply chain whenever possible (Pre-cool immediately) Marketing tool



# Pre-Cooling Methods

- Room Cooling
- Forced-air cooling
- Hydro-cooling
- Top icing or liquid method
- Vacuum cooling





### Sanitation

- Pre-Wash handling
- Water Disinfectant Options
  - Chlorine (organic considerations)
  - Ozone
  - Hydrogen peroxide





# CAUTION...Chilling Injury

#### **Highly Sensitive**

- Basil
- Cucumbers
- Eggplants
- Pumpkins
- Summer squash
- Sweet Potatoes

#### **Moderately Sensitive**

- Snap Beans
- Peppers
- Winter squash
- Tomatoes
- Watermelon



### Postharvest Refrigeration

- Coolers
- Refrigerator
- Refrigerator Truck
- Walk-in Cooler
- Porta-Cooler with CoolBot Technology





# How can we increase shelf-life? Relative Humidity

- Relative humidity is the recommended % of moisture in the air during storage.
- Raise humidity by using a humidifier, or placing wet burlap sacs in the storage area.
- Decrease humidity by using fans.
- Temperature + Humidity = Extended shelf-life.



# Ethylene

#### **Ethylene Producers**

- Apples
- Cantaloupes
- Honeydew
- Peaches
- Pears
- Tomatoes

### Consider for Storage

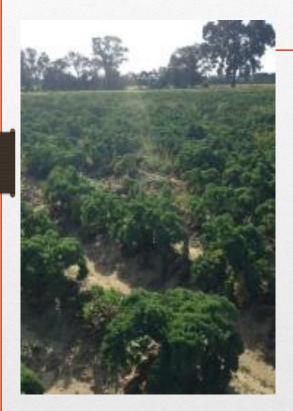
#### **Ethylene Sensitive**

- Snap Beans
- Lettuce
- Cabbage
- Cucumbers
- Eggplant
- Peas
- Potatoes
- Broccoli



### How can we increase shelf-life?

### **Physical Damage**



- Handle product with care to prevent any physical damage of the product.
- Train employees on how to handle certain commodities;
   Some are more fragile than others.



# Packing

- Clamshells
- Boxes
- Crates
- Plastic Bags

Carefully pack to avoid damage during transport.





# How can we increase shelf-life? Avoid Contamination

- Poor Employee Hygiene.
- Improperly cleaning harvesting tools/containers.
- Reuse of cardboard boxes (not allowed by most wholesalers or GAP certified farms.



### Strawberries - Rejected by Buyer

The result of what a wholesaler experienced within 24 hours of receiving local strawberries that have not been cooled properly.





### Botrytis Rot – a.k.a Grey Mold

- Caused by the fungus, Botrytis cinerea
- The greatest cause of postharvest strawberry losses.
- To avoid, store strawberries at 32° F within one (1) hour of harvest.
- The pathogenic fungus continues to grow even at 32° F, however growth is very slow at this temperature.



#### Strawberries



General Quality strawberries have a bright red color, firm, flavorful, and free Characteristics: from defect and decay.

#### Harvest Guidance:

- · Early morning harvest is recommended
- Harvest when dry
- · Harvest when fully ripe for best flavor
- Keep in shaded area
- · Field packing is recommended (do not over handle)

Postharvest Guidance	H:
Pre-Cooling	Forced air, room cooling, no later than 1 hour after harvest.
Washing/Processing	Washing is not recommended.
U.S. #1	Fairly uniform shape, minimum 'K" in diameter, free of
Size/Appearance	damage, mold and decay; shall be firm and not overripe; Each strawberry must have not less than % of its surface
	showing a pink or red color. Tolerance is 10% (5% for serious damage and 2% for decay; 0% for mold)
Packing	Wholesole: 8 - 1# clamshells packed in corrugated flat.
	Retail: 8 - 14 clamshells packed in corrugated flat.
Optimal Storage	Temp 32 F; Humidity 80-85%
Shelf Life	7 days

### NCGT Product Specification Manual:

# Guidance for Strawberries



### Respiration and Shelf-Life

- Respiration / release of heat
- Respiration and shelf-life are inversely related.
- The higher the respiration rate, the shorter the shelf-life of a commodity.
- Example: Strawberries

Temperature	32 °F	50° F	68° F
ml CO <sub>2</sub> /kg-hr	6-10	25-50	50-100

### Crop Respiration Rates

#### High Respiration

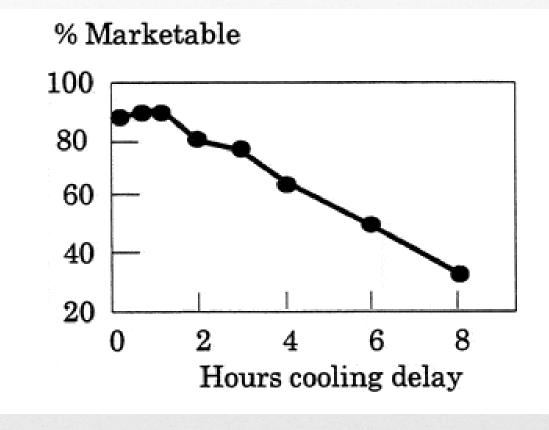
- Green Onions
- Snap Beans
- Asparagus
- Broccoli
- Peas
- Corn

#### Zero Low Respiration

- **7** Apples
- **7** Grapes
- 7 Garlic
- Onions
- Potatoes
- Sweet Potatoes



### Cooling & Deterioration of Strawberries



Source: UC Davis, Perishables Handling #87, August 1996.

# NCGT Product Specification Manual: Guidance for Summer Squash

Postharvest Guidance	:
Pre-Cooling	Forced-air, room cooling
Washing/Processing	Gently wipe clean with single use towels (if necessary)
U.S. #1	5-7" in length for green and yellow squash and crookneck;
Size/Appearance	patty pan should be 3-4" in diameter; Well formed, free of
	damage (cuts, bruises, scars) and decay, and firm with stems
	or portions of the stems attached. Should be fairly young and tender. Dark green types should be entirely green. A dull
	surface and loss of firmness is due to water loss. Tolerance is
	10% (5% for serious damage and 1% for decay or breakdown)
Packing	Wholesale: 20 lb. 5/9 bushel wax box – preferred size is
	market determinate. Pack with stem ends facing the walls.
	Retail: 20 lb. 5/9 bushel wax box – preferred size is market
	determinate. Pack with stem ends facing the walls. If shrink
	wrap is requested, a PLU label is required.
Optimal Storage	Temp 41° F – 50° F; Humidity 95% (chill sensitive)
Shelf Life	< 2 weeks

# Grading, Sorting, & Packing



### What USDA Grade do I grade on?

# USDA US #1 Grade

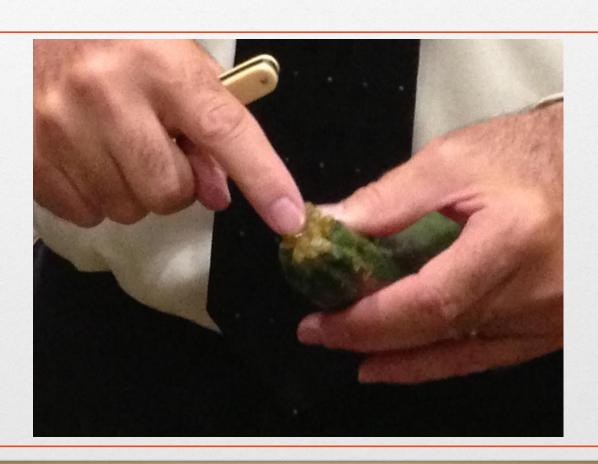
- Higher Value
- Prime Vendor Contract requirements



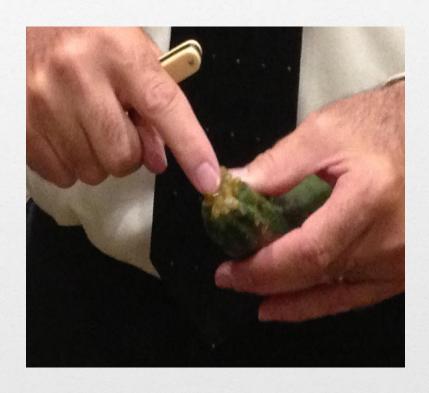
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Shelf Life	< 2 weeks

# Quality Control - Green Squash



### US #1 Size/Appearance: Green Squash





YES



NO



# Quality (Grade)

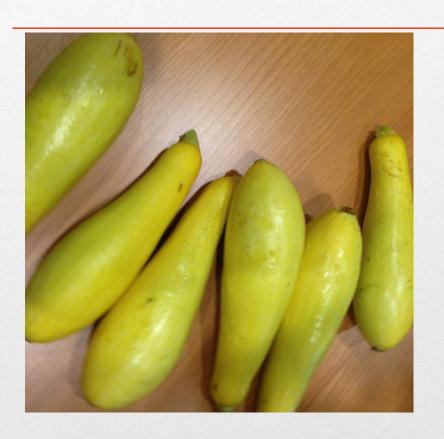








# Quality (Grade)









# Product Specification Manual: Guidance for Strawberries

Postharvest Guidance	
Pre-Cooling	Forced air, room cooling, no later than 1 hour after harvest.
Washing/Processing	Washing is not recommended.
U.S. #1	Fairly uniform shape, minimum ¾" in diameter, free of
Size/Appearance	damage, mold and decay; shall be firm and not overripe;
	Each strawberry must have not less than ¾ of its surface
	showing a pink or red color. Tolerance is 10% (5% for serious
	damage and 2% for decay; 0% for mold)
Packing	Wholesale: 8 – 1# clamshells packed in corrugated flat.
	Retail: 8 – 1# clamshells packed in corrugated flat.
Optimal Storage	Temp 32° F; Humidity 80-85%
Shelf Life	7 days

# US #1 Size/Appearance: Strawberries





YES



NO



# Product Specification Manual: Guidance for Lettuce

Postharvest Guidance	:
Pre-Cooling	Hydro-cooling
Washing/Processing	Wash to remove debris (hydro-cooling)
U.S. #1	Must have similar varietal characteristics, fresh, green, and
Size/Appearance	free from decay, russet spotting and doubles. Free from tip
	burn, downy mildew, freezing, and discoloration. 4-6" in
	length, free of damage, firm, straight
Packing	Wholesale: Leaf Lettuce: 24-28 lb. (24 ct.) cartons; Iceburg:
	24 count cartons; Butterhead/Boston: 24 ct., cartons;
	Bibb/greenhouse grown: 12 ct. (in clamshell).
	Retail: Leaf Lettuce: 24-28 lb. (24 ct.) cartons; Jceburg: 24
	count cartons; Butterhead/Boston: 24 ct. cartons;
	Bibb/greenhouse grown: 12 ct. cartons (in clamshell).
Optimal Storage	Temp 32° F; Humidity 98% - 100%
Shelf Life	1-2 weeks (3 weeks for 'living' Bibb lettuce)

### LETTUCE - US #1?









### LETTUCE - US#1?









### QC of Sweet Corn



## Product Specification Manual: Guidance for Sweet Corn

Postharvest Guidance	:
Pre-Cooling	Icing or rapid hydro-cooling  Note: Avoid dehydration; wetting down husks can assist with this if forced air must be used.
Washing/Processing	Wash only if needed.
Size/Appearance	Well trimmed and well developed for variety; Husks should be fresh and green; Kernels should be well filled, plump and milky with the stalks trimmed. Free from damage or decay. Cob must be at least 5" in length and stalk must be less than 6" (most markets prefer shorter stalk). Tolerance is 10% (2% for decay)
Packing	Wholesale: 1 bushel wood crate 48 ears per crate  Retail: 1 bushel wood crate 48 ears per crate
Optimal Storage	Temp 32°F – 35°F; Humidity 95-99%
Shelf Life	4-6 days

### Sweet Corn - US#1?









### Sweet Corn - US#1?









## Pack-Sizes





## Product Specification Manual: Guidance for Strawberries

Postharvest Guidance	Y:
Pre-Cooling	Forced air, room cooling, no later than 1 hour after harvest.
Washing/Processing	Washing is not recommended.
U.S. #1	Fairly uniform shape, minimum %" in diameter, free of
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	Retail: 8 – 1# clamshells packed in corrugated flat.
Optimal Storage	Temp 32° F; Humidity 80-85%
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## Preferred Pack-Size of Strawberries



8 – 1# Clamshells in corrugated flat.



### NCGT Product Specification Manual: Guidance for Summer Squash

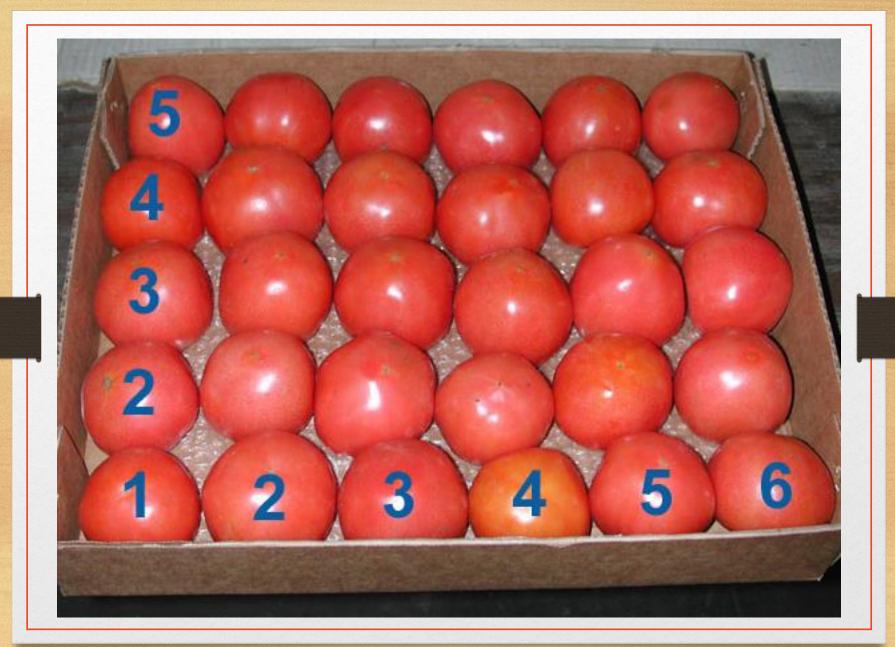
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Shelf Life	< 2 weeks

## Let's use your manual

### **Tomatoes**



Tomatoes are usually packed in a box with the sixe printed on the box.





How do you compete with this?







**NC STATE** UNIVERSITY

### QUESTIONS?

### www.ncgrowingtogether.org



### PLU and UPC Codes

Product Look Up / Universal Product Code

- Two widely used systems retailers use to efficiently ring produce into the register in the check-out lane, track sales, control inventory, as well as to market products on shelves.
- Being knowledge about these systems will help you get your foot in the door with a retailer.

### PLU Code

- A PLU code, or price
   Produce Marketing look up code, is a 4 or 5 Association digit identification code, which is unique to a particular produce item.
  - Typically appear on a small sticker that is applied to the individual piece of fresh produce.



### **PLU Codes**

- It is based upon:
  - Commodity
  - Variety
  - Size
- For example, with tomatoes, there are several PLU codes used based on fruit size, color, and production origin (greenhouse, field, etc.).

Example: Large Greenhouse Tomato packed '5x6' – PLU 4799

versus

Large Field-Grown Tomato packed '5x6' – PLU 4064



### Why Do Retailers Use PLUs?

- PLU codes are used by the retailer to classify specific kinds of produce so that different prices can be coded to each PLU.
- Reduce confusion between items that are charged by the each or the pound, since the PLU coding in the register will prompt the cashier for the quantity or weight, as appropriate. EFFICIENCY!

### Do I need a PLU on my Produce?

- Highly likely (loose, bulk or 'by the each' items). Examples: tomatoes, winter squashes and apples.
- Some easily identified varieties or single variety products, such as yellow squash and cucumbers, may not require a PLU sticker.



### PLU...Not Required

### MARKETING OPPORTUNITY!



# Case Study: Bogue Sound Watermelon Growers Association

Sweet Bogue Sound

Watermelons grow

in the sandy soil

around Bogue Sound

and its tributaries.





Photo Source: Carteret CountyTimes News

# Case Study: Gary Thomas Farms & Lowes Foods, LLC





## Where can I find the codes and order stickers?

- Search PLU codes here:

  <u>www.producemarketguide.com/article/guide/commodity-info</u>
- There are sources for preprinted PLU tags, and sources for custom-printed PLU tag. Approximate cost is \$9.00 for a roll of 2,500.
  - Agri Label & Tag, LLC <a href="http://agrilabeltag.com/">http://agrilabeltag.com/</a>
  - Sinclair International <a href="http://www.sinclair-intl.com/index.html">http://www.sinclair-intl.com/index.html</a>

Note: Additional print companies may be found with an online search for "PLU Code Label Companies." This list is not meant to be exhaustive. The inclusion or exclusion of these names on this list is not meant to imply endorsement.

### **UPC** Codes

- A Universal Product Code (UPC) is a 12-digit international standard bar code which has many uses for retailers.
  - Scan items through their cash registers, to identify products, to track sales, and to manage product inventory.
  - By connecting your UPC to their inventory system for that particular item stored at their warehouse, retailers can track quantity on hand.



## When would I need a UPC code instead of a PLU?

- Products that need a UPC include fixed-weight or fixed-count produce items.
  - Examples include a 3-pound bagged Gala apple or 5-pound bagged red potato, blueberry pint or grape tomato clamshells, 12-count radish, and value-added products, such as honey.



#### How do I order a code?

- UPCs can be
  - unique to your item and/or company
  - a generic code for standard commodity-type items, such as 3pound bagged apples, blueberries or muscadine grapes.
  - Generic UPCs use a generic company prefix (033383), along with an item number assigned by the Produce Marketing Association (PMA), to serve as the UPC number (033383 xxxxxx).

Note: Access to standardized, generic UPCs for fruits and vegetables is available via online subscription of \$200/year for non- PMA members. Your packaging distributor may be a PMA member who will resell you the packaging with these generic UPCs on the packages.

### Where can I order UPC stickers?

- UPCs that are *unique* to your company and/or your product.
- Can be used for a specialty variety item, such as mixed color cherry tomatoes, or other items packaged in a special manner, such as a three-pack tomato.
- Unique UPCs can be obtained in two ways: (1). Through a reseller; (2) Byy joining the GS1 system, an international not-for-profit association which assures globally recognized bar codes.

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Connecting Local Foods
to Mainstream Markets

- Some retailers may require you to join the GS1 system.,
  - \$250 membership fee (for 1-10 items needing a barcode); or
  - \$750 membership fee (for 1-100 items needing a barcode) plus an annual renewal fee of \$50 (1-10 items) or \$150 (1-100 items), plus the print cost of the code(s).
- UPC reseller is much less expensive..
  - No membership fee applies.
  - The cost is about \$7 for one UPC, you must assure this is acceptable for your buyer. Some major retailers will not accept resold UPCs because the third party seller may not be able to assure no other company in the world has used that pre-fix.
- Before speaking with your buyer, learn more about GS1 versus barcode resellers by viewing this

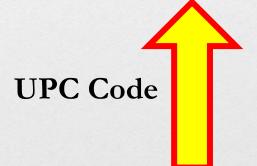
### Ordering from a UPC Reseller

- •If you ordered from a UPC reseller:
  - •Request UPC image as a jpeg file (a very common image file format).
  - •Add barcode to your custom farm labels (rolls or stickers).
- •Resellers include:
  - Barcodes Talk <a href="http://www.barcodestalk.com">http://www.barcodestalk.com</a>
  - Quick and Easy Barcodes <a href="http://www.quickandeasybarcodes.com/">http://www.quickandeasybarcodes.com/</a>
- •Note: Additional resellers may be found with an online search for "UPC Reseller Companies." This list is not meant to be exhaustive. The inclusion or exclusion of these names on this list is not meant to imply endorsement.

# Case Study: Dew Drop Farm & Lowes Foods, LLC









Note: UPC labeled products will also need a Country of Origin Label to satisfy the COOL law for packaged produce. More information: <a href="http://www.ams.usda.gov/AMSv1.0/COOLOutreach">http://www.ams.usda.gov/AMSv1.0/COOLOutreach</a>

### Case Study: Harmony Ridge Farms



**GS1** Label



## Label Companies Who will Design Labels

Acclaim ID – Omaha, NE

http://www.acclaimid.com/

East West Label Co.

http://www.ewlabel.com/

Grower's Discount Labels

http://www.growersdiscountlabels.com/

Wayne Trademark

http://www.waynetrademark.com/



#### References

- Produce Marketing Association: PLU Code Frequently Asked Questions <a href="http://www.pma.com/~/media/pma-files/supply-chain-standards/plu-site-faqs-june-2013.pdf?la=en">http://www.pma.com/~/media/pma-files/supply-chain-standards/plu-site-faqs-june-2013.pdf?la=en</a>
- The Produce Traceability Initiative <a href="http://www.producetraceability.org">http://www.producetraceability.org</a>
- International Federation for Produce Standards <a href="http://www.plucodes.com/faqs.aspx#q3">http://www.plucodes.com/faqs.aspx#q3</a>
- NC Department of Agriculture and Consumer Services *Got To Be NC* Video: "Do I need a UPC Code?" <a href="http://www.youtube.com/watch?v=tNnGzwBH-104">http://www.youtube.com/watch?v=tNnGzwBH-104</a>

- Produce begins to deteriorate the second it is harvested.
- Maintain cold-chain logistics to insure that the product is kept in optimum storage conditions so that shelf life, and therefore commercial potential, is maximized.



- Once harvested, fruits and vegetables are still living and therefore generating chemical reactions that consume oxygen and release carbon dioxide and water. Treat them like they are living – Handle with Care.
- Remember that each product is unique, which alters many attributes affecting the commercial value such as color, flavor and texture.



- Always keep US#1 grade standards in mind when packing produce. You will eliminate having product returned by a Buyer.
- Always communicate with your Buyer to confirm their product specifications at the beginning of the season. Buyers can changes the specifications sporadically to meet current consumer demand.

Connecting Local Foods

 Utilize buyer labeling and pack-size requirements as a marketing tool.

Premium Product



Premium Price



### Most Importantly

- Don't give up if you have a shipment rejected by a Buyer. Learn from this making sure that you understand why the shipment was rejected and work on correcting the problem.
- Continue communicating with this Buyer and ensure him you have corrected the problem!

BE PERSISTENT. CEFS



### Questions?



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