Lecture 3:
Minimizing Produce Injury During Harvest & Handling

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Adding Value by Improving Fresh Produce Quality

1. Principles for handling perishables
2. Strategies for harvest and packing
3. General packinghouse layout
4. Examples of handling system components
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FRESH PRODUCE

ALIVE

BREATHES

RELEASES HEAT

LOSES MOISTURE

CAN GET SICK

CAN EVEN DIE
Postharvest losses: 10 to 80%
Challenges to Marketing Fresh Vegetables

- Harvest: when, container type
- Transport to market: time delays
- Pulp temperature: time to reach final temp.
- Food safety & security
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Harvest & handling: reducing impacts = less mechanical damage
Types of Mechanical Injury

• Bruises
  – Impact: Drops during harvest and handling
  – Compression: Excessive weight during shipping

• Cuts, Punctures, Abrasion
Mechanical damage = lower prices
Mechanical damage: at harvest

Skinning

External Shatter
Bell peppers are fragile

Internal cracking from impact
Latent bruises
Injuries Cause Accelerated Ripening
Mature-green tomatoes were dropped 12 inches.

Respiration and ethylene production increased and remained higher throughout ripening.
Mechanical damage

- Two types of damage in potato:
  - Internal shatter
    - Impact fractures between cells
  - Black spot bruise
    - Impact ruptures cells below periderm
Inoculation → Infection → Decay
One way to reduce the problem

- Immobilize the product
Sale in Distant Markets: more than 3 days

- **HARVEST**
- **Field Pack**
- **TRANSPORT**
- **Packinghouse**
- Cleaning, Sorting, Grading, Sizing, Packing
- **PALLETIZING**
- **COOLING**
- **SHIPPING**
After harvest, minimize exposure to the sun (transport quickly from field)
Field pack: Challenges to clean the crop

Wiping will transfer microbes from fruit-to-fruit
Harvest into buckets, transfer to field bins
Harvest into wagons
Worker hygiene is critical for food safety

- In Florida, one for every 20 employees
- Must be less than 10 min. walking distance

- Must have potable water source for hand washing
- Use disposable paper towels; recapture water
Mechanical Harvest – fresh radish
Mechanical harvest of juice oranges

Continuous canopy shaker
Field washing: Requires sanitized water to minimize cross-contamination.

Two tanks: 1) washing; 2) rinsing.
Transport and unloading

Cabbage transported in bulk wagons
Unloading

Side-tilt wagons for unloading cabbage
Packing stations
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Sale in Distant Markets: more than 3 days

- HARVEST
  - Field Pack
  - Cleaning, Sorting, Grading, Sizing, Packing
  - Packinghouse

- TRANSPORT
  - PALLETIZING
  - COOLING
  - SHIPPING
Suggested floor plan of packinghouse.

Packinghouses should be designed for unrestricted flow.
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Unloading: dry transfer

Bell pepper
Bulk unloading: potato
Transport & unloading with crates: sensitive crops like pepper, tomato
Automated unloading
Manual unloading onto packing line
Worker hygiene: handwashing station at packinghouse
Washing with rotating brush rollers and overhead spray with sanitized water
Rinsing cucumber
Chlorine injection system
Exit washer to sponge rolls
Drying tunnel
Minimize drop heights
Grading & Sizing

Manual sizing: potential for severe impacts
Manual sizing, grading and packing
Sizing methods: dimensional sizers

Chain sizer

Perforated belt sizer
Sizing methods: dimensional
Sizing methods: dimensional

Roll sizing
Type 1: Spreading roll sizer (side view)

Direction of travel
Type 2: drop roll sizer

Direction of travel
Roll sizer
The drop to conveyor must be short
Choosing a Sizer

- Determine the capacity
  - e.g., tons per hour
- Evaluate the sizer types available
  - Costs: initial, operational and maintenance
  - Does it handle the crop delicately?
- Availability of technical service
1. Packing stations: manual

2. Mechanized systems: combinations of automated and manual
Packing: delicate, fresh herbs

Not washed; trimmed & packed
Packing

Tray pack assembly
Packing table: offers flexibility

Crop can be unwashed or prewashed
Packing: manual stations
Automatic potato bagger: 2 kg (5 lb) plastic bags
Sanitation is Critical: Celery slices

Rinsed with *Erwinia* soft rot bacteria.

Held at 10°C for 5 days

No Chlorine  With Chlorine
Hygiene: washing and rinsing harvest containers

Abrasions caused by harvest into dirty field container
Automatic crate cleaning/sanitizing
Reducing Injuries During Harvest and Handling of Fresh Produce

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Florida Postharvest Horticulture Tour
Class of 2015

Port of Miami