Horticultural Chain Management: Managing Quality and Reducing Post-harvest Losses

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Overview

- General context and rationale
- Methodology
- Identification of critical loss points
- Identification of solutions
- Piloting of solutions in modern and traditional chains
- Conclusion
Horticultural Chain Management for Countries of Asia and the Pacific Region
A Training Package
Characteristics of Fruit and Vegetable Supply Chains in Asia

**Modern Supply Chains**
- Consumer/demand driven
- Logistics and cold chain systems
- Make use of post-harvest technology
- Highly efficient
- **Good quality packaging**

**Traditional Supply Chains**
- Production oriented
- Fragmented production units
- Multi-layered channels
- Limited use of post-harvest technology
- High level of inefficiency
- Absence of Poor quality bulk packaging
Methodology

- **Stakeholder sensitization** and KAP surveys
- **Market** surveys
- **Training** of trainers
- **Mapping the supply chain and identification of critical loss points**
- **Pilot demonstration** of good practice, measurement and assessment
- Documentation and **analysis of results**
- **Training of stakeholders**
- **Dissemination of results**
- **Policy** recommendations for Governments
<table>
<thead>
<tr>
<th>Supply Chain Level</th>
<th>Operation</th>
<th>Loss (%)</th>
<th>Cause/s of Loss</th>
<th>Recommended Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm</td>
<td>Harvesting</td>
<td>0.04</td>
<td>Preharvest (insect damage, blossom end rot, undersize)</td>
<td>Inadequate pest and nutrient management following the recommendations of the company</td>
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<tr>
<td></td>
<td></td>
<td>0.10</td>
<td>Compression</td>
<td>Use of plastic pail as harvesting container</td>
</tr>
<tr>
<td></td>
<td>Washing, sorting, and packing in plastic crate</td>
<td>0.04</td>
<td>Bruising</td>
<td>Addition of disinfectant to the wash water to control decay at retail level</td>
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<tr>
<td>GIFTA collection center</td>
<td>Sorting; Transfer to Company plastic crate</td>
<td>0.44</td>
<td>Mechanical damage</td>
<td>Exchange of plastic crates between to reduce handling steps and occurrence of damage</td>
</tr>
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</tr>
<tr>
<td>Organic Options packinghouse</td>
<td>Sorting and retail packing</td>
<td>0.5</td>
<td>Stem puncture, skin tearing, scratches on peel</td>
<td>Reduce multiple handling</td>
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</tr>
<tr>
<td>Retail</td>
<td>Display</td>
<td>6.8</td>
<td>Decay, mechanical damage</td>
<td>Reduced multiple handling; addition of disinfectant during field washing</td>
</tr>
</tbody>
</table>
Causes of Rejection of Organic Produce

Blossom end rot
Fruit worm
Deformation
Soft rot
Immature & undersize
Compression
Sampling of tomatoes

Sampling: 10% by weight or count
Assessment: Daily
## Flow of Operations in the Supply Chains

<table>
<thead>
<tr>
<th>Operation</th>
<th>Traditional Practice</th>
<th>Improved Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Harvesting</td>
<td>Time: 8:50 - 11:45 am (August 14, 2018)</td>
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</tr>
<tr>
<td></td>
<td>&gt; Harvested when brine of red is seen in tomato</td>
<td>&gt; Harvested when brine of red is seen in tomato</td>
</tr>
<tr>
<td></td>
<td>&gt; Traditional: 8-10 mins to fill plastic sack (~10 kg)</td>
<td>&gt; Improved: 6-8 mins to fill 2 pcs. plastic pallets (~25 kg/pallet)</td>
</tr>
<tr>
<td>(2) Transfer to crates</td>
<td>Time: 9:00 am - 11:45 pm (August 14, 2018)</td>
<td>&gt; 20-22 kg tomatoes per crate</td>
</tr>
<tr>
<td></td>
<td>&gt; Traditional: 1 crate = 3 sack of tomatoes (3 picking cycle)</td>
<td>&gt; Improved: 1 crate = 4 flats of tomatoes (2 picking cycles)</td>
</tr>
<tr>
<td>(3) Transfer to sorting area via wooden cart</td>
<td>Start: 11:45 am - 12:18 pm (August 14, 2018)</td>
<td>&gt; Steep, muddy road</td>
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<tr>
<td></td>
<td>&gt; 12 crates capacity (23 kg per crate)</td>
<td>&gt; Drained with tarpsaulin to prevent tomatoes from spilling out</td>
</tr>
<tr>
<td></td>
<td>&gt; 15 minutes travel time</td>
<td>&gt; 10 minutes travel time</td>
</tr>
<tr>
<td>(4) Sorting of tomatoes at field</td>
<td>Start: 1:50 pm – 2:05 pm (August 14, 2018)</td>
<td>&gt; Traditional: 5 persons sorting 5 crates on tarpsaulin (20 mins)</td>
</tr>
<tr>
<td></td>
<td>&gt; Improved: 1 person sorting 2 crates on walled matting with cushion (20 mins)</td>
<td>&gt; 1 person sorting 2 crates on walled matting with cushion (20 mins)</td>
</tr>
<tr>
<td>(5) Hauling of GIFTA</td>
<td>Start: 3:10 – 5:00 pm (August 14, 2018)</td>
<td>&gt; 45 mins from field to GIFTA on road with about 50% cemented and 50% under construction</td>
</tr>
<tr>
<td></td>
<td>&gt; Stopover at GIFTA on cemented road</td>
<td>&gt; 1 hour from D to GIFTA on cemented road</td>
</tr>
<tr>
<td>(6) Turnover of tomatoes between GIFTA and packinghouse</td>
<td>Start: 5:00 – 6:00 pm (August 14, 2018)</td>
<td>&gt; Tomatoes unloaded from open truck</td>
</tr>
<tr>
<td></td>
<td>&gt; Traditional – transferred to different crate</td>
<td>&gt; Improved – no change in container or crate</td>
</tr>
<tr>
<td></td>
<td>&gt; Tomatoes loaded to 6-wheeler closed</td>
<td></td>
</tr>
<tr>
<td>(7) Shipment!</td>
<td>Start: 6:00 pm (August 14, 2018) to 2:00 am (August 15, 2018)</td>
<td>&gt; Actual distance travelled – 323 km</td>
</tr>
<tr>
<td></td>
<td>&gt; A non-refrigerated</td>
<td>&gt; Cemented road condition</td>
</tr>
<tr>
<td></td>
<td>&gt; Van doors opened upon arrival at Organic Options, Inc.</td>
<td></td>
</tr>
<tr>
<td>(8) Unloading of crates to packinghouse</td>
<td>Start: 8:30 am – 8:40 am (August 15, 2018)</td>
<td>&gt; Crates placed in packinghouse at room temperature (28°C)</td>
</tr>
<tr>
<td></td>
<td>&gt; Natural ventilation in packinghouse</td>
<td></td>
</tr>
<tr>
<td>(9) Packing of tomatoes</td>
<td>Start: 3:00 pm – 6:10 pm (August 15, 2018)</td>
<td>&gt; Deur polypropylene (PP) bags with 4 x 0.5 cm² hole area</td>
</tr>
<tr>
<td></td>
<td>&gt; 2 packers per crate</td>
<td></td>
</tr>
<tr>
<td>(10) Delivery and retail display in supermarket simulation</td>
<td>Start: August 16 - 21, 2018 (Day 0 to 5)</td>
<td>&gt; Tomatoes transported to PHTRC for supermarket simulation</td>
</tr>
<tr>
<td></td>
<td>&gt; Room temperature 18-20°C</td>
<td>&gt; Daily monitoring of weight loss and quality rejects</td>
</tr>
<tr>
<td></td>
<td>&gt; Unmailable rejects removed and disposed of</td>
<td></td>
</tr>
</tbody>
</table>

Consider time Level of handling Resource efficiency
Supply Chain Map and Losses Incurred at Each Step in the Chain

TRADITIONAL PRACTICE:

Preharvest Loss = 6.14%
Postharvest Loss = 3.36%
Moisture Loss = 2.67%
Total Losses = 12.17%

FARMER
Preharvest losses = 1.94%
Postharvest losses = 0.76%
Moisture loss = 0.00%
TOTAL LOSSES = 2.71%

ASSEMBLER / CONSOLIDATOR
Preharvest losses = 0.00%
Postharvest losses = 0.00%
Moisture loss = 0.17%
TOTAL LOSSES = 0.17%

PACKINGHOUSE / MARKETING COMPANY
Preharvest losses = 4.20%
Postharvest losses = 1.42%
Moisture loss = 1.04%
TOTAL LOSSES = 6.67%

RETAILER (SUPERMARKETS)
Postharvest losses = 1.18%
Moisture loss = 1.46%
TOTAL LOSSES = 2.65%

IMPROVED PRACTICE:

Preharvest Loss = 5.11%
Postharvest Loss = 1.59%
Moisture Loss = 1.59%
Total Losses = 7.51%

FARMER
Preharvest losses = 1.94%
Postharvest losses = 0.00%
Moisture loss = 0.00%
TOTAL LOSSES = 1.94%

ASSEMBLER / CONSOLIDATOR
Preharvest losses = 0.00%
Postharvest losses = 0.00%
Moisture loss = 0.00%
TOTAL LOSSES = 0.00%

PACKINGHOUSE / MARKETING COMPANY
Preharvest losses = 3.17%
Postharvest losses = 0.33%
Moisture loss = 0.43%
TOTAL LOSSES = 3.93%

RETAILER (SUPERMARKETS)
Postharvest losses = 0.48%
Moisture loss = 1.16%
TOTAL LOSSES = 1.64%
The traditional winter tomato supply chain in Bangladesh

Field level activities

- Harvesting
- Packaging in mesh sacks
Improvements introduced in the tomato supply chain

Improved post-harvest handling and packaging
Causes of loss during transportation

- **Moderate compression**
  - Qualitative: Cracks (non-marketable)
  - Quantitative: Decay, cracks (non-marketable)
Recovery of sound fruit at the wholesale level

<table>
<thead>
<tr>
<th>Layer</th>
<th>Top</th>
<th>Middle</th>
<th>Bottom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovery</td>
<td>97.8%</td>
<td>96.7%</td>
<td>90.0%</td>
</tr>
<tr>
<td>Grade</td>
<td>66.7%</td>
<td>61.1%</td>
<td>30.0%</td>
</tr>
</tbody>
</table>
Bulk Packaging – A Solution to Transport Losses in Traditional Supply Chains

<table>
<thead>
<tr>
<th>Country</th>
<th>Plastic Crate</th>
<th>Traditional Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timor Leste</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>Cambodia</td>
<td>5</td>
<td>34</td>
</tr>
</tbody>
</table>

Traditional Method
In better organized systems, the levels of losses are low.

Simple and appropriate solutions can greatly impact loss reduction.

How can this be scaled up?

What is needed?
Thank You