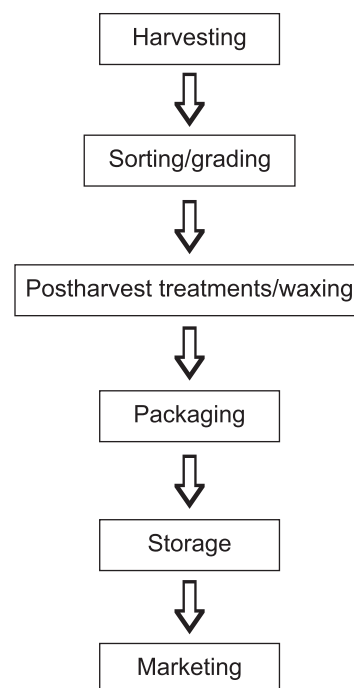


INTEGRATED APPROACH FOR REDUCING THE POSTHARVEST LOSSES OF HORTICULTURAL CROPS

Introduction and Background: Horticultural sector has emerged as a best option for diversification of agriculture to meet the need for food, nutrition and healthcare. It plays an important role in generating employment, improving economic conditions of the farmers and entrepreneurs. Losses during post-harvest operations are enormous and are matter of great concern. Growers are forced to make distress sale and substantial quantity of the produce goes waste during the period of glut. The important sites where postharvest losses are noticed are farmers' field, packaging area, transportation, storage and wholesale or retail markets. The major contributory factors for post-harvest losses of fruits and vegetables are:

- Lack of awareness about harvesting techniques for fruits and vegetables
- Improper packaging & transportation techniques
- Gaps in cold chain
- Insufficient cold storage capacity
- Unavailability of cold storages in close proximity to farms
- Poor marketing infrastructure etc.
- Inadequate infrastructure for processing of fruits & vegetables

These factors result in instability in prices and monetary losses to farmers. Therefore, concept of using integrated approach to manage horticultural crops after harvest is gaining importance in the commercial sectors to reduce the losses. Integrated approach combines the activities that are interconnected with each other starting from the time of harvest of fruits and vegetables till purchase by the consumers.



Flow-sheet showing integrated approach in horticultural crops

- 1. Harvesting:** Growers often do not understand the effect of harvesting and handling on the quality of produce. Ideally, harvesting should take place when the crop and climate is cool and plant has highest moisture content. The shelf life of the crop and its suitability for long term storage is affected by the maturity of the crop at harvest with no physical damage or bruise. The fruits should be harvested with clippers or scateurs and they should not be harvested by pulling, which leads to injury in the stem end. However, vegetables can be harvested with hands but gentle picking will help to reduce crop losses.



Harvesting techniques

2. **Grading:** Systematic grading is pre-requisite for efficient marketing of fruits and vegetables as they fetch better price in the market. The fruits or vegetables can be graded in extra fancy, superior and standard grades or class I, II and III, respectively. Grading can be done by hands or using machinery at pack house. Rural women can be trained for performing sorting and grading operations of horticultural produce at farm level.



Sorting and grading of fruits and vegetables

3. **Waxing (Food grade):** The application of edible films and coatings to fruits represents a new approach to reduce post-harvest losses to some extent by use of various food grade waxes. Certain edible coatings like shellac, carnauba and beeswax approved by PFA help to improve the shelf life of fruits and vegetables. The waxing of fruits can be done manually or through mechanical waxing machines.



Mechanical Waxing of Kinnow fruits

4. **Packaging:** The main functions of packaging are to help prevent mechanical damage and enhance the

attractiveness of the produce. Proper packing of produce will ensure safe transportation from the farm to the storage and consumer centre, while reducing the damage during transportation. The produce should be packed in such a way that they do not collide with each other during transportation. A wide variety of containers such as wooden boxes, plastic crates, and corrugated fibre board boxes are important package used in the transportation and distribution of fruits in most of the developing countries. All the packages must have some amount of ventilation in order to prevent physiological break down.



Bulk and consumer packaging of fruits & vegetables

5. **Storage:** The primary purpose of storage is to control the rate of respiration, transpiration, ripening and also undesirable biochemical changes and disease infection. Proper temperature management can be very effective tool in ensuring that produce remains in good condition throughout the storage and transportation. Cold chain technology plays a vital role in establishing controlled low temperature conditions to maintain quality of produce during transportation. Efforts are being made to make this technology available throughout the country so as to reduce the losses caused by high temperature conditions.
6. **Marketing:** It is quite apparent that marketing plays a key role in the postharvest operation of fruit. Marketing of perishable fruits presents more problems as compared with other durable agricultural commodities. Due to the presence of middleman, the price of the fruits is 50-100% higher in mandis than growing areas. The co-operatives can play a very important role in the marketing of fresh fruits. Himachal Pradesh Horticultural Produce Marketing & Processing Corporation

Limited (HPMC) in Himachal Pradesh is a successful attempt, which has become landmark for apple industry in India. Concept of Apni Mandi is another good example, where producer sell their produce directly to consumers without chain of commission agent.

Potential benefits to farmers using integrated approach

The integrated approach such as harvesting, grading, waxing, packaging and storage not only help in reducing the postharvest losses but farmers can get better price for their produce in the market and consumers will get better quality produce. Small marginalized farmers can gain extensively using this approach by initiating self help group programs. In this case, farmers could engage themselves in different activities as per their expertise and create a final product fit for marketing. Collective use of resources will help save lot of money required for generating post harvest management infrastructure, e.g. some farmers can engage themselves in harvesting operations while other can engage them in sorting and grading activity and so on till the final produce is ready for marketing.

Successful packhouses in Punjab

- Namdhari's Fresh, Kohara, Machhiwara road, Distt. Ludhiana
- Patiala Horticultures Private Limited, 169, Ajit Nagar, Patiala has its packhouse at Vill. Lalgarh, Asarpur-Chupki road.
- Jai Kisan Welfare Society, Hoshiarpur.
- Grading and waxing units for kinnow established by PAGREXCO at Abohar, Fazilka and Hoshiarpur.

PHPTC Activities

- **Training of farmers:** Punjab Horticultural Postharvest Technology Centre (PHPTC) organized 10 training programmes in collaboration with Directorate of Horticulture, Punjab and Skill Development Centre, PAU, Ludhiana for farmers of district Amritsar & Taran Tarn; Faridkot & Sri Muktsar Sahib; Ludhiana; Hoshiarpur; Ropar & Nawanshahar; Pathankot & Gurdapur; Patiala; Bathinda; Sangrur & Barnala; Moga & Mansa from October to December, 2019. A group of 25-30

farmers in each batch attended the training programmes. These training programmes covered wider aspects of different techniques involved in harvesting, precooling, grading, packaging, storage, marketing and food safety regulations of perishable produce.

- **Exposure visit of farmers:** The farmers from Gujarat, Rajasthan, Jammu & Kashmir, Mizoram and Maharashtra visited PHPTC and learned about packaging, storage and drying techniques for fruits and vegetables.
- **Training of PHPTC scientists:**
 - Dr Swati Kapoor, Assistant Food Technologist has undergone Training of Trainers at ICAR-ATARI, Ludhiana on Dec,2-4, 2019 under Agricultural Skill Council of India with the motive to provide training and developing skill of farmers and entrepreneurs on packhouse aspects of fruits and vegetables .
 - Dr Ritu Tandon, Asstt Chemist and Dr Pooja, Asstt Microbiologist attended training on 11-12-2019 Food Safety, Quality and Authenticity Testing at New Delhi
- **Invited lecture:** Dr BVC Mahajan was invited by Navsari Agriculture University, Navsari, Gujarat to deliver a key note lecture on safe ripening and waxing techniques for fruit and vegetables in a training programme on Secondary Agriculture held on Dec 5, 2019.





Customized Food Processing Solutions



Dairy Farming & Processing Plants

- Bulk Milk Coolers
- Pouch Milk Plants
- Flavoured Milk Plants
- Evaporating & Drying Plants
- Soya Milk Plants
- Road Milk Tankers & Storage Tanks
- Indigenous Dairy Product Plants
- Dairy Valves, Fittings & Pumps



Fruit & Vegetable Processing Plant

- Canning Lines
- Mushroom Processing Plants
- Juice / RTS Bottling Lines
- Pickle Lines
- Evaporators & Concentrators
- Dry & Wet Grinders
- Fruit Mills & Pulpers
- Citrus Peel Shredders
- Hydraulic Juice Presses
- Juice Pasteurizers
- Frozen Pea / Vegetable Processing Lines



Herbal & Pharmaceutical Plants

- Aloe Vera Processing Plants
- Moss Mixers
- Octagonal Blenders
- Double Cone Blenders
- Sugar Syrup & Manufacturing Vessels
- Packing Conveyors & Membrane Filters
- Tray Drier and Autoclaves



Post Harvest Pack Houses & Cold Chains

- Pre-coolers
- Washing & Brushing Lines
- Waxing & Polishing Lines
- Grading & Sorting Lines
- Bagging & Filling Lines
- Cold Storages
- Refrigerated Vans
- Display Cabinets
- Walk-in Cold Chambers
- Freezers
- Ripening Chambers



Material Handling Equipments

- Elevators, Conveyers, Turn Tables
- Platform & Tank Trolleys
- Roller & Belt Conveyors
- Water & Milk Road Tankers
- Magnetic Elevators
- Bottle, Can & Crate Conveyors
- Packing Conveyors
- Dumpers & Hoppers



Screen Grader for Potato, Garlic, Onion & Amla

- Capacity Range From 500 Kg / hr to 40,000 Kg / hr.
- Rigid Construction With Laser Cut Parts.
- Short Change Over Time Suitable For any Fruit & Vegetable.
- Low Grading Cost & Low Maintenance.
- Custom Made.



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