Postharvest Management of Fruit and Vegetables

By Jenny Jobling

After they are harvested, the value of fruits and vegetables is added in successive stages up to the point when someone eats them. The aim of postharvest management is to maximise this added value. This ultimately should benefit the whole community, whether through increased export earnings or extending the availability of fresh produce through the year.

Conversely losses hurt everyone. Kader (1992) has estimated that from 5 to 25 percent of fruit and vegetables leaving the farm gate is never consumed, but has to be thrown away. Obviously, disease and oversupply contribute to this, but there are many other reasons for the losses. Postharvest management can influence all them, with the two most important areas being temperature management and packaging.

The Impact of Postharvest Losses

Postharvest disorders or losses in quality have economic impacts vastly greater than the actual losses caused by frequency and intensity of their occurrence. For example there are direct financial losses incurred by the grower from batches of fruit expressing the disorder. Direct losses can also cause financial losses for postharvest operators and marketers. If the problem arises more than once then there is increased quality compliance costs that arise from systems being put in place to monitor all lines and isolate problem batches. An intermittent and unpredictable disorder occurring in the market is a real problem, as it will increasingly undermine trade confidence in the product causing downward price pressure.

Another point to remember is that the loss of value of a down graded product is likely to be substantially greater for highly differentiated branded products which sell at a premium in the market. All the hard work that has gone into promoting and raising the profile of a branded product can be quickly eroded if there are postharvest quality problems with some lines of that product.

The Nature of Postharvest Management

Horticultural produce is alive and has to stay alive long after harvest. Like other living material it uses up oxygen and gives out carbon dioxide. It also means that it has to receive intensive care. For a plant, harvesting is a kind of amputation. In the field it is connected to roots that give it water and leaves which provide it with the food energy it needs to live. Once harvested and separated from its sources of water and nourishment it must inevitably die. The role of postharvest handling is to delay that death for as long as possible.

Horticultural managers must posses many skills to succeed in this. They need a keen appreciation of horticultural diversity. For example, spinach and apples, bananas and potatoes each have their own requirements. The optimum

postharvest management of horticultural products is not the same for all products. Growers, wholesalers, exporters and retailers must all be aware of the specific needs of a product if the postharvest shelf life and quality is to be maximised.

Understanding Product Maturity

The stage of development at which a product is regarded as mature depends on its final use. Fruit and vegetables are eaten at all stages of development. We eat sprouted seeds, vegetative leaves and flowers, whole fruit as well as seeds and nuts. There are no general rules when it comes to defining horticultural maturity. A lot of research has been done to establish maturity parameters for a whole range of specific horticultural products. Maturity must be defined for each product in some cases for each variety of a particular product.

The use of maturity standards provides consumers with a minimum level of quality assurance. Another reason for establishing maturity standards is that most horticultural products are harvested by hand. A simple colour guide and size can help pickers harvest produce at the correct stage of development.

Harvest Handling

The care taken during harvesting is repaid later, because fewer bruises and other injuries mean less disease and enhanced value. Good managers train their pickers so that they select the product at the correct stage of maturity with adequate care. It is worthwhile reducing the amount of hard physical work required in picking fruit and vegetables as far as possible. In recent years conveyors have been introduced for vegetable crops such as lettuce or celery and "cherry pickers" for tree crops. Such as increase the comfort and speed of harvesting and hep the pickers to devote more energy to the care of the product.

Pre-Cooling

The harvested produce has to be transported to the packing shed without delay. In the field the heat of the sun and the respiration of the produce combine to heat up the produce, especially in the centre of field bins. This accumulation of "field heat" reduces the postharvest life of the product and has to be removed quickly.

Even under the best conditions, when the harvest is in the cool of the morning and the bins are placed in the shade, heat production can only be controlled by active refrigeration. Strawberries for example, respire nearly eight times faster at a field temperature of 25^{o}C as they do in a storage temperature of 0^{o}C. In other words, one day left warm in the field sacrifices as much as eight days of storage life.

Pre-cooling requires a greater refrigeration capacity than does cool storage and is often best done as a separate step. Hydro-cooling with cold water drenches, forced air cooling through stacks that ensure proper air distribution and packing with ice are the systems most commonly used, with the choice depending on the individual requirements of the commodity.

Refrigeration

Refrigeration is the most important tool for extending the life of fruit and vegetables. Whatever else is available to give additional storage life, good temperature control is critical to all of them.

In a typical cool store. Fans circulate air over the refrigerator coils. To maintain a storage temperature of 0^{o}C the temperature of the coils will have to be appreciably below 0^{o}C. Moisture is therefore removed from the air and this accumulates as ice on the coils. The lower the average temperature of the cooling coils, the more moisture will be removed. The drier and cooler air then circulates around the room where it warms and picks up moisture. Sources of heat are through the walls, air exchange with the outside air and the heat produced in the room, for instance by the respiration of the produce and the fans themselves. Unless a plastic film or some other vapour barrier protects the product, water evaporates from it. Another important source of moisture is outside air exchanging with that in the room. The more moisture that freezes on the refrigerator coils, the greater the frequency of defrost cycles and these make good temperature management control more difficult to attain.

It is also important to maintain a uniform temperature in all parts of the cool room. Only if this is done is it possible to use the lowest and most effective storage temperatures. If one part of the cool room is warmer than another then the out turn of the produce will be mixed as produce stored in the warm area may ripen faster. It is important that the core temperatures of the packages in the room be checked at several places as well as at the floor and ceiling levels.

A good deal of skill is required to maintain good air circulation when the arrangement of bulk bins or pallet loads is being continually changed with produce coming in and out of the store. An even distribution of air produces a room with a consistent temperature, but if the flow of cooled air is “short circuited” back to the coiling coils, the areas starved of circulation will become warmer.

Quality Control

Most consumers have been disappointed with the quality of fresh produce they have purchased at one time or another. They may say that tomatoes no longer taste like they used to and plums are tasteless at times. The loss of quality is often the price we pay for being able to buy these products out of season. Fruit and vegetables that are to be stored or transported over long distances may have to be picked in an immature state so that the fruit are firm and store or travel well.

In recent years, much work has been done to improve the quality of fruit and vegetables. New varieties have been introduced which gives consumers a wider choice and some, such as new varieties of nectarine have improved flavour. Many growers also have accreditation for product quality and handling and so this improves the consistency of quality of products on the market. However, despite the best efforts to handle fresh produce in the optimum way there will always be compromises to be made which affect the final quality of the product.

Much of the fresh produce we eat must travel many kilometres to reach the central or wholesale market or distribution centre and from there it travels to local or distant retail outlets. Postharvest handling should go as far as it can to maintain the freshness and quality of a product. Good handling will ensure that the final consumers are satisfied and so will return again to buy that product.

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