

# Handling fresh vegetable produce from urban gardens

Up to 40 per cent of households in cities in developing countries grow vegetables in urban gardens for food and income. These valuable crops grown in small spaces contribute to the nutritional quality of diets; the surplus can be sold, providing income for poor families. However, great care has to be taken when harvesting and transporting these perishable crops to ensure that healthy, attractive and nutritious food reaches local markets and household tables.

Due to high levels of unemployment in cities, many families depend on growing their own produce, especially vegetables, on small plots for home consumption and for sale. Poorer families spend a larger proportion of their income on food. Thus the ability to grow their own vegetables contributes significantly to household food and income security. Nutrition security is enhanced as well; vegetables diversify diets and, more importantly, are a source of micronutrients, vitamins and minerals vital for good health (see Box on page 23).

AVRDC – The World Vegetable Center – develops and promotes a range of vegetables, from tropical tomatoes to traditional leafy crops, which can be grown in urban and peri-urban environments. Simple, low-cost methods to handle these valuable crops after the harvest can help urban and peri-urban vegetable growers reduce post-harvest losses and provide more and better quality vegetables at home and to local markets.

### ■ Post-harvest problems

Vegetable quality needs to be maintained from the moment of harvest. Even when the distance from the farm gate to the consumer is relatively short, as in urban and often in peri-urban horticulture, growers must take care when harvesting, storing, packing and transporting fresh produce to prevent damage and maintain quality. Harvested vegetables release heat from respiration and lose moisture, which detracts from their appearance and weight. A study conducted in Rwanda on amaranths packed for the market showed they had eleven per cent weight loss within half an hour, while in Benin, 89 per cent of the leafy greens that were packed for the wholesale market had mechanical damage (see: <http://ucce.ucdavis.edu/files/datastore/234-1848.pdf>). Leafy vegeta-

bles have a large surface area over which they lose a lot of moisture; even a five per cent loss will result in visible wilting. Not only do bruised, damaged, or over-mature vegetables appear unattractive and fetch lower prices on the market, they are also less nutritious. Poor handling and storage methods cause the nutrients in vegetables to deteriorate rapidly.

Water quality is another concern for vegetable production in urban settings. The source of water used to produce and clean the crop may be polluted by industrial and domestic waste. If pesticides are used on crops, pesticide residue may contaminate produce, and the local water supply, if producers are not adequately trained

*Field trial in Shanhuan, Taiwan: a quality check for freshly harvested sweet pepper.*

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Photo: AVRDC

and willing to follow proper use of the chemicals. Growers should avoid using polluted water to wash vegetables after harvest to prevent contamination from microorganisms, pesticide residues and heavy metals harmful to human health. Urban producers need a good understanding of the risks of using contaminated water. Simple solutions such as taking the produce to be cleaned at a site where the quality of water is not in doubt may be necessary.

## ■ Simple techniques, big effects

By following post-harvest handling methods best suited to their situations, urban and peri-urban vegetable growers can harvest and deliver produce of good quality to the point of sale. Technologies for resource-poor vegetable growers are available, and AVRDC continues to develop and improve recommendations for growers in urban, peri-urban and rural environments.

The first step to deliver a good-quality crop to the market is to harvest at the optimum stage of maturity. Leafy vegetables should be harvested when they reach full size and before they start losing color and becoming fibrous. Tomato is ready to harvest when its fruit is physiologically mature – that is, when the pink or red color first becomes noticeable on the fruit. Vegetables destined for the market should be graded to remove damaged or diseased material (which will also reduce spoilage) and packed into uniform lots so that they are attractive to consumers and fetch a higher price.

A simple way to reduce post-harvest losses is to harvest before temperatures are high, such as in the early morning or late afternoon, and to keep produce in the shade once it has been harvested. Leafy vegetables kept in the shade will maintain their quality longer than those exposed to full sun. Ice can reduce the temperature of harvested vegetables. Covering produce

## Advantages of vegetable production in urban and peri-urban settings

Vegetables are particularly well-suited to urban and peri-urban farming because only a small land area is needed to produce an ample crop. For example, a home garden model developed by AVRDC – The World Vegetable Center – for a 6 m x 6 m plot can produce approximately 250 to 500 kilograms of fresh vegetables per year. Vegetables produced from AVRDC's home garden model can supply a family of four to six with 200 g of vegetables per person per day – the amount recommended by the World Health Organization for overall health and to decrease the risk of chronic diseases.

Many vegetable crops can be harvested within a short time from planting. Amaranths (*Amaranth spp.*) and water spinach or kangkong (*Ipomoea aquatica*) are ready to harvest in 30 days, and can be harvested up to ten times per crop cycle, providing a steady supply of fresh greens during the growing season. Vegetables such as amaranth, African nightshade (*Solanum aethiopicum*) or sweet potato (*Ipomoea batatas*) leaves are rich in nutrients, often surpassing more familiar crops such as cabbage in nutritional quality (see Table).

Vegetable production in urban and peri-urban settings means that the distance from the field to the consumer is much shorter. Home gardeners have fresh vegetables at their doorstep, and small-scale urban growers who sell their crops have the advantage of lower transportation costs. These growers may not have to deal with middlemen or brokers as rural farmers usually do, and thus are able to respond quickly to price fluctuations.

### Nutritional value of selected vegetable crops

	Tomato ( <i>Solanum lycopersicum</i> )	Cabbage ( <i>Brassica oleracea</i> )	Moringa ( <i>Moringa oleifera</i> )	Amaranth ( <i>Amaranthus spp.</i> )	African nightshade ( <i>Solanum aethiopicum</i> )	Sweet potato leaf ( <i>Ipomoea batatas</i> )
β-carotene (mg)	0.40	0.00	15.28	9.23	4.84	6.82
Vitamin C (mg)	19	22	459	113	132	81
Vitamin E (mg)	1.16	0.05	25.25	3.44	2.08	4.69
Iron (mg)	0.54	0.30	10.09	5.54	3.89	1.88
Folates (µg)	5	ND	93	78	58	39
Antioxidant activity (Trolox* Equivalent)	323	496	2,858	394	683	870

Source: Yang & Keding 2009 (from: *African Indigenous Vegetables in Urban Agriculture*, edited by C.M. Shackleton, M.W. Pasquini, & A.W. Drescher: London).

\*Trolox is Hoffman-LaRoche's trade name for 6-hydroxy-2,5,7,8-tetramethylchroman-2-carboxylic acid, a water-soluble derivative of vitamin E.

with a moist material, such as damp sacking or straw (taking care to keep the vegetables dry), is also effective in reducing the temperature by taking advantage of evaporative cooling principles.

Another simple technique is to use good-quality packaging that will protect the crop after harvest. Many growers put their newly harvested leafy greens in large polyethylene bags; during transport the leaves may be bruised or crushed. Bamboo baskets are not suitable for packing soft fruit vegetables such as tomato because the rough surface may damage the produce. Rigid containers

with smooth surfaces reduce crushing, bruising and damage.

Training urban growers in proper handling methods and disseminating information to show the economic benefits of good post-harvest handling can help ensure that more vegetables of better quality reach the market. Recommended techniques and technologies should not be time-consuming to apply or expensive, as the lack of capital is often a major barrier to adoption. Improved post-harvest handling results in a higher quality product which is more nutritious and should fetch a higher price – an important incentive for growers to adopt these techniques.