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Nutrition security: Mass plantation drive for fruit crops

Growing demand for fresh fruits, driven by changing food habits and awareness of nutritional benefits, can be met through large-scale fruit plantation drives in villages, towns, cities, institutions, parks, and along roads or canals. In urban areas, compact fruit plants are suitable for limited spaces, while rural households can establish fruit nutrition gardens to improve food and nutrition security. These gardens provide year-round, naturally ripened, pesticide-free fruits for family consumption. NGOs, CSR initiatives, and public and private institutions are promoting fruit plantations by distributing saplings, creating green belts, and enhancing nutrition security among low-income and urban populations.

PUNJAB, in undivided India, was considered the most progressive state for fruit crop cultivation due to the established canal colonies in the tracts of Western Punjab. The fruit industry of Eastern Punjab (India) suffered a severe setback after the partition, as most of the cultivated area was rainfed and the orchards were generally established from seedlings. Consequently, the State Government made efforts to expand the area and production of fruit crops in select regions. As a result, cooperative garden colonies were established at 27 locations, covering over 20,000 acres during the early 1950s across Punjab, including Haryana and Himachal Pradesh.

The Government of India has since launched various schemes for the holistic development of the horticulture sector. Over time, Punjab regained its lost glory, earning an important place on India's fruit map, particularly for the cultivation of *Kinnow* mandarin and low-chilling varieties of pear, plum, and peach. Although India ranks second globally in fruit and vegetable production, a section of the population remains undernourished.

Horticulture for nutrition

Horticulture is a key agricultural enterprise that provides nutrient security to rural, semi-urban, and urban populations. Fruits are rich sources of naturally available vitamins (A, B1, B12, C, E), minerals, dietary fibre, phytonutrients, carbohydrates, and antioxidants–often referred to as protective foods. The nutraceutical properties of coloured fruits also help reduce the risk of heart disease, anaemia, diabetes, and chronic ailments. Fruit crops supply essential micronutrients that are often missing in the diets of economically weaker populations.

According to the Indian Council of Medical Research (ICMR), the daily requirement of fruit is 120 g per capita, but only about 83 g per capita is available. Despite technological advancements in horticultural production, meeting the nutritional needs of an ever-growing population remains a major challenge. To bridge the gap between fruit availability and consumption, it is essential to establish fruit plants in backyard kitchen gardens, village common lands, schools, community and government areas, roadside plantations, and industrial zones.

While space availability is often not a limitation, the lack of knowledge about proper planning, planting, and selection of geographically suitable cultivars is a significant drawback. In recent years, trends have been changing–both rural and urban populations are increasingly utilizing available space to grow fruit crops in kitchen gardens. The successful establishment of fruit trees in kitchen or nutrition gardens, ensuring year-round fresh and nutritious produce, ultimately depends on the size of the available plot.

Fruit plant distribution and terrace gardening promotion

Punjab Agricultural University (PAU) provide fruit plants to farmers for the establishment of commercial orchards and to meet other specific requirements throughout the year. Distribution takes place during February–March and July–September for evergreen fruit plants, and in January–February for deciduous fruit plants. Fruit plants are also made available during the *kisan melas* held annually in March and September at the PAU main campus in Ludhiana, as well as at Regional Research Stations in Bathinda, Faridkot, and Ballowal Saukhri (SAS Nagar), and at Krishi Vigyan Kendras in Rauni (Patiala) and Nag Kalan (Amritsar). Similarly, krishi vigyan Kendras (KVKs) and Farmers Advisory Service Centres (FASCs) distribute fruit plant seedlings. Scientists also deliver lectures during field days, block- and district-level

State level Pear show: To promote crop diversification and mass plantation

camps, and other events to promote kitchen gardening, tube-well plantation, and commercial orchards.

Fruit crops such as papaya, strawberry, cape gooseberry, grapes, and other short-stature plants can also be grown in terrace gardens. Hanging baskets, boxes, and tubs are suitable for strawberries due to their small plant size. Grape vines can be grown on rooftops in large pots, boxes, or drums using basal spur–pruned varieties. In some cases, grapes are planted in backyard or roadside spaces, with the vine trained to grow onto rooftops, allowing for proper canopy development using the Bower or Y-trellis system.

Fruit availability in kitchen garden during the year

Month	Availability of fruits (all around year)
January	*Kinnow*, W. Murcott, strawberry
February	*Kinnow*, W. Murcott, strawberry
March	Strawberry, *ber*, loquat, cape gooseberry
April	*Ber*, loquat, peach
May	Peach, plum, sapota, fig, *phalsa*
June	Litchi, grapes, sapota, fig, apple
July	Guava, mango, jamun, pear, baramasi lemon
August	Guava, pomegranate, baramasi lemon, dragon fruit
September	Sweet lime, *karonda*, dragon fruit, papaya
October	Daisy, *karonda*, papaya
November	Daisy, grapefruit, sweet oranges, baramasi lemon, guava, banana, *amla*
December	Grapefruit, sweet oranges, baramasi lemon, guava, *amla*

The selection of fruit cultivars depends on the climate, soil type, availability of free space, and the needs of the family. Fruit plants thrive in well-drained, fertile soils, provided the subsoil is suitable, free from hardpan, and the water table is below 3 m from ground level. The list of recommended fruit cultivars is given below:

Recommended fruit varieties for kitchen garden in Punjab province

Fruits	Recommended cultivars	Planting distance (Row to Row and Plant to Plant) (m)
Citrus fruits		
Mandarin	PAU *Kinnow*-1, Daisy, W. Murcott, *Kinnow*	6.0 × 6.0
Sweet orange	Valencia Sanguano, Early Gold, Valencia, Musambi, Jaffa and Blood Red	6.0 × 6.0
Grapefruit	Star Ruby, Red Blush, Marsh Seedless, Duncan, Foster, Flame	6.0 × 6.0
Lemon	Punjab Baramasi lemon, Punjab *Galgal*, PAU Baramasi Lemon-1, Eureka	6.0 × 6.0
Lime	*Kagzi*	6.0 × 6.0
Guava	Punjab Apple Guava, Punjab Safeda, Punjab *Kiran*, *Shweta*, *Arka Amulya*, Punjab Pink, L-49, Allahabad *Sufeda*	6.0 × 6.0
Mango	Alphonso, *Dusehri*, *Langra*, *Gangian Sandhuri*, GN-1, GN-2, GN-3, GN-4, GN-5, GN-6, GN-7	9.0 × 9.0
Pear	Punjab *Nakh*, *Patharnakh*; Semi-soft pear: Punjab Nectar, Punjab Gold, Punjab Beauty, Baggugosha; Soft pear: Nijisseiki, Punjab Soft	7.5 × 7.5
Ber	*Wallati*, *Umran*, Sanaur-2	7.5 × 7.5
Litchi	Dehradun, *Calcuttia*, Seedless Late	7.5 × 7.5
Peach	Yellow flesh cultivars: *Partap*, Florida Prince, *Shan-i*-Punjab, Early Grande; White flesh cultivars: *Prabhat*, *Sharbati*, Punjab Nectarine	6.5 × 6.5
Plum	*Satluj* Purple, *Kala Amritsari*	6.0 × 6.0
Grapes	Punjab MACS Purple, Flame Seedless, Beauty Seedless, Perlette, Superior Seedless	3.0 × 3.0
Karonda	Local	3.0 × 3.0
Phalsa	Local	3.0 × 3.0
Amla	*Balwant*, *Neelum*, *Kanchan*	7.5 × 7.5
Apple	*Anna*, Dorsett Golden	4.0 × 4.0
Banana	Grand *Naine*	1.8 × 1.8
Sapota	*Kali Patti*, Cricket Ball	9.0 × 9.0
Papaya	Red lady 786	1.5 × 1.5
Pomegranate	*Bhagwa*, *Ganesh* (3m), *Kandhari*	4.0 × 4.0
Loquat	California Advance, Golden Yellow, Pale Yellow	6.5 × 6.5
Fig	Black Fig 1, Brown Turkey	6.0 × 6.0
Date palm	Hillawi, Barhee	8.0 × 8.0
Jamun	Goma *Priyanka*, *Konkan Bahadoli*	8.0 × 8.0
Dragon fruit	Red Dragon 1, White Dragon 1	3.0 × 3.0
Strawberry	Winter Dawn, Chandler	0.30 × 0.30
Cape gooseberry	Punjab *Rasbhari* 1 and Punjab *Rasbhari* 2	0.75 × 0.60

Layout plan for fruit/kitchen nutrition garden

- Fruit Nutrition Garden can be established on an area of 625 m^2 (25 m × 25 m), with the number of fruit plants adjusted according to plot size.
- Fruit plants should be planted at the recommended distance to ensure appropriate sunlight and proper air drainage.
- Vigorous fruit crops such as mango, litchi, pear, *ber*, sapota, and fig should be planted in the northern direction of the garden, while the middle portion is planted with short-statured fruit plants like citrus, pomegranate, and guava.
- Deciduous fruits such as fig, plum, pear, and peach are best suited for the southwestern side, where they can be trained and pruned annually to maintain proper tree architecture.
- Dragon fruit can be planted on a single-pole system along the boundary of the garden, accommodating four plants per pole.
- Fruits are available from July to November in two to three main flushes, maturing within 30–35 days after flowering and ready for harvest three to four days after the peel changes from green to red or pink.
- Banana and papaya plants are primarily grown in the southern direction of the garden, where they should be protected from low-temperature injury.
- The eastern side can be used to grow grape varieties on the Y-trellis system, *karonda* and *phalsa* should be planted on the western side, and sweet lime can be used for boundary plantation on the northern side.

Guidelines for planting and managing a fruit nutrition garden

Evergreen fruit plants such as citrus, sapota, *ber*, *jamun*, and guava are planted during February to March (spring season) and August to September (rainy season), while deciduous fruit plants are usually planted before the dormancy period ends or before the onset of new growth. Proper planning regarding irrigation channels, planting distance, and garden demarcation is essential before plantation.

Hands on training for 'Fruit Nutrition Garden' and training and pruning techniques in fruit crops

Pits measuring 1 m × 1 m × 1 m should be dug and filled with a mixture of equal parts topsoil and dry farmyard manure, along with 15 ml Chloropyriphos 20 EC in each pit to protect against white ants. After refilling, the pits should be irrigated to allow the soil to settle. The budded portion of the fruit plant should remain 6 to 9 inches above ground level, and plants should be supported with sticks for upright growth.

Planting material must be procured from reliable nurseries of SAU/ICAR institutes, the state horticulture department, or accredited private nurseries, ensuring that the plants are budded or grafted on suitable rootstocks and free from pests, nematodes, and diseases. The trunks of young plants should be whitewashed with a mixture of 25 kg slaked lime, 500 g $CuSO_4$, and 500 g gum or *suresh* and dissolved in 100 l of water.

Eco-friendly measures such as non-woven bags, fruit fly traps, slippery bands for mealy bug control, and neem-based formulations should be adopted for pest and disease management. To conserve moisture and suppress weeds, paddy straw or plastic sheets may be used around plant basins.

A fruit nutrition garden not only provides fresh produce and nutritional security but also helps save the expenses a family would otherwise incur on purchasing fruits from the market. During the pre-bearing stages, the

vacant space between rows and plants can be used for growing annual fruit crops such as Cape gooseberry and strawberry, along with seasonal pulses and vegetables.

Strawberries can be planted between rows at a spacing of 30 cm × 30 cm in September–October, with harvesting from December to March when fruits reach the pink or three-fourths coloured stage, ensuring they are picked with the cap or calyx and a small stalk of one to two inches.

Way forward

Young plants should be irrigated as needed, depending on soil and climatic conditions, with a preference for using a drip irrigation system for efficient water management. It is advisable to remove dead wood, diseased branches, and intermingling shoots to promote healthy growth.

Water shoots or suckers emerging below the bud union should be removed immediately. In deciduous fruit plants, training and pruning are essential to develop a strong framework. Branches should be oriented evenly in all directions, with the main stem headed back at a height of 75–90 cm from the ground. In the following year, 3–4 well-spaced shoots should be selected in different directions, maintaining a gap of 15–20 cm between them. The first shoot should be positioned about 45 cm above the ground.

Phalsa plants should be trained in a bush form and pruned annually in January–February to a height of around 1 m from the ground level. Fruits should be ripened using indigenous, safe, and eco-friendly ripening technologies to ensure quality and consumer safety.

CONCLUSION

A fruit nutrition garden provides fresh fruits that fulfill the daily nutritional needs of the family. With growing health awareness, many people now prefer cultivating organic fruits in residential plots or agricultural fields for their own use. Beyond health benefits, it serves as a recreational activity that encourages physical exercise and overall well-being. Such gardens allow individuals to grow fruit plants according to the available space–whether in a backyard, near a tube well, or on part of their farmland–ensuring a steady supply of fresh fruits while contributing to nutritional security and a healthier population.

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SUSTAINABLE DEVELOPMENT GOALS RELATED TO FRUITS AND VEGETABLES

SDGs 2 3

Health benefits of fruit and vegetables

Harness the goodness

Fruit and vegetables have multiple health benefits. They strengthen the immune system, combat malnutrition and help prevent non-communicable diseases.

SDGs 2 3

Diversified diet and a healthy lifestyle

Live by it, a diverse diet

Adequate amounts of fruit and vegetables should be consumed daily as part of a diversified and healthy diet.

SDGs 2 8 12 13 14 15

Food loss and waste

Respect food from farm to table

Fruit and vegetables are worth more than their price. Maintaining their quality and assuring their safety across the supply chain, from production to consumption, reduces losses and waste and increases their availability for consumption.

Innovate, cultivate, reduce food loss and waste

Innovation, improved technologies and infrastructure are critical to increase the efficiency and productivity within fruit and vegetable supply chains to reduce loss and waste.

SDGs 1 2 12 15

Sustainable value chains

Foster sustainability

Sustainable and inclusive value chains can help increase production, and help to enhance the availability, safety, affordability and equitable access to fruit and vegetables to foster economic, social, and environmental sustainability.

SDGs 1 2 3 4 5 8 11 12 15

Highlighting the role of family farmers

Growing prosperity

Cultivating fruit and vegetables contributes to a better quality of life for family farmers and their communities. It generates income, creates livelihoods, improves food security and nutrition, and enhances resilience through sustainably managed local resources and increased agrobiodiversity.

Source: *Fruit and vegetables – your dietary essentials, FAO background paper, FAO, Rome*