

Diversifying mango orchards with compatible understorey crops for enhanced profitability

Mango orchards occupy 6.5 million ha area in our country. Monoculture of agricultural crops poses several problems pertaining to productivity and profitability. Mango orchards offer unique scope for integration of compatible intercrops for enhancing orchard productivity and farmers' income. Diversifying agriculture and horticulture is the only alternative left for enhanced productivity and profitability under the burgeoning population pressure as there is little scope for expanding area due to declining man to land ratio.

MANGO is an evergreen tree which bears on mature shoots. In northern India, commercial cultivars like Dashehari, Langra and Chausa have excessive vegetative growth, often with a tendency to bear heavily in alternate years. Research work done during the last few decades has proved that mango trees, if pruned and managed properly, ensure higher productivity and fruit quality in addition to ensuring light for growing under-storey crops. For this purpose, old and unproductive orchards of 40 years and above need rejuvenation, while mid-age orchards with an age ranging from 15 to 35 years are managed through centre openings. As mango growing belts offer unique scope for integration of various shade tolerant tuber crops like turmeric and elephant foot yam, growing these crops in mango orchards is a source of additional income if managed properly.

Centre opening

The term 'centre opening' refers to thinning out or removal of a centrally located, top most, upright growing branch or portion of branches in the center of the tree to facilitate light penetration inside the canopy. This is recommended for mid-aged orchards, i.e. in the age group of 20-35 years. The best time for the operation is between December and January. It not only facilitates light penetration into the tree canopy, but also reduces tree height, improves fruit size, the quality of fruits and facilitates the growing of intercrops successfully. In the initial years of orchard establishment, it is easy to

grow crops in the interspaces as there is no competition for light, but in later stages, tree canopies are managed with a centre opening in such a way that it facilitates the growth of intercrops.

Orchard preparation for inter-cropping

If we wish to grow intercrops in a mango orchard, first of all, efforts are made to level the orchard area by ploughing and levelling the field. Provision of drainage by making drainage lines is a must for the success of intercrops as water stagnation and high humidity lead to the incidence of various diseases, resulting in a huge loss to the farmers. Well rotten farm yard manure @ 25 to 30 MT/hectare should be applied invariably before sowing of any tuber crops like turmeric, elephant foot yam during summer. FYM is also applied to standing crops before weeding and earthing them during the rainy season. As stated earlier, mid-aged trees are pruned in such a way that they are centrally opened to facilitate sufficient solar radiation for the success of both the main crop as well as the intercrop. While sowing or planting, care is taken to avoid any sowing or planting in



Elephant foot yam crop harvest from mango orchard

the tree basin area up to 2-2.5 m away from and around the tree trunk. A basin is prepared around the tree trunk for irrigation and other purposes. Thus, approximately 70-80% area of the orchard is available for intercropping depending upon the age of orchard. The cultivation practices for these crops are given below.



Turmeric grown in mango orchard at ICAR-CISH

Growing turmeric (*Curcuma longa* L.) in a mango orchard

Turmeric has immense potential for growing as an intercrop in mango orchards as it tolerates shade to a great extent. Sandy loam soil is considered the best as it facilitates the growth of the rhizomes.

Turmeric varieties, viz. Rajendra Sonia, Narendra Turmeric-1, Narendra Turmeric-2, Narendra Turmeric-3, are popular in Uttar Pradesh. Other varieties, like Suvarna, Suguna, Sudarsana, IISR Prabha, IISR Prathibha, IISR Alleppey Supreme and IISR Kedaram from ICAR-IISR, Kozhikode, Kerala; Co-1, BSR-1, BSR-2 from TNAU, Coimbatore; Roma, Suroma, Ranga, Rasmi and Surangi from OUAT, Odisha; Mega Turmeric-1 from ICAR Complex, NEH region Meghalaya; Kanti, Sohba, Sona and Varna from KAU, Thrissur and Sugandham from Sardarmkrushinagar Dantiwada Agriculture University, Jagudan have also been recommended for cultivation in different parts of the country. Varieties recommended for the region should only be selected for intercropping.

The soil is brought to a fine tilth by ploughing and planking. Fertilizers should be applied based on soil test. In general, a dose of 100-120 kg nitrogen, 60 kg phosphorus and 60 kg potash is sufficient for one hectare of orchard area. Full dose of phosphorus, potash and half dose of nitrogen is given as basal dose at the time of sowing while rest nitrogen is applied as top dressing in two split doses, first at 35-40 days and second 75-90 days after sowing.

Planting should be done in orchard by making furrows and ridges. Well developed, healthy, disease free, split mother or finger rhizomes are used for planting. A seed rhizome of around 20-30 g weight and with at least 3 nodes is ideal for sowing. These rhizomes should be treated with mancozeb 0.3% (3 g/liter of water) for 30 minutes, shade dried for 3-4 hrs and planted. A seed rate of 1500 kg/ha is sufficient for intercropping in an orchard. Ideal time of sowing in the orchard is April-June. Seed rhizomes are placed 5 cm deep in the soil and covered. Crop should be mulched immediately after planting with leaves.

Weeds should be removed by regular weeding as and when they appear. Three to four weedings are sufficient. Regular irrigations are given at 10-20 days interval depending upon soil moisture content and weather conditions. Turmeric is ready for harvest in 6-9 months depending upon variety and time of sowing. On maturity, the leaves turn yellowish to light brown in colour and dry. Harvesting is often done manually using pick axe. For manual harvesting, land can also be ploughed, the clumps carefully lifted with spade and rhizomes are gathered by hand picking. Rhizomes are collected removing all the extraneous material adhering to it. Turmeric when grown in a mango orchard if managed properly give an average yield of 10 to 15 tonnes/ha.

Farmers in the demonstrations conducted at their field in Malihabad mango belt obtained an average yield of 12-15 tonnes with Narendra Turmeric-2 while the yield was



Elephant foot yam in mango orchard



Turmeric grown in mango orchard at farmer's field

higher and up to 20-30 tonnes/ha with Sudarsan variety of turmeric. Economic analysis of mango+turmeric farmers gave a B:C ratio of 3.96.

Elephant foot yam (*Amorphophallus paeoniifolius*)

Elephant foot yam is also known as suran, zimikand or ole in different parts of country. It gives high productivity and is a very remunerative intercrop as it tolerates shade very well. It has lot of medicinal uses though corms are mainly used for vegetable purpose or for pickle making. It has great demand in markets especially in Bihar, West Bengal and north eastern states besides northern India. It grows very well in tropical and sub-tropical regions. Well drained sandy loam soils are preferred for it.

'Sree Padma' from CTCRI and 'Gajendra' from ANGRAU are most commonly grown varieties in different parts of country. After preparing the land to a fine soil tilth, vertically cut corm pieces, each with a portion of apical bud are planted during February–March or April–May. Before planting, corms are field dried for 40-45 days. Whole corm size of 500 to 750 gram is generally recommended for use as seed for commercial cultivation but in case of non-availability, bigger size corms of 2-3 kg are cut vertically into 4-6 pieces, retaining a portion of central apical bud for sowing.

Generally, a seed rate of 2500 to 4000 kg/ha is sufficient for a mango orchard. Mini-sett transplanting planting using vertically cut pieces of 100 g has also been standardized which cuts down the requirement of seed corms drastically, reducing the cost of cultivation. One corm of around 1.5 kg can be cut vertically into as many as 15 vertical pieces/mini-sets of 100 g retaining a portion of apical bud. Sets after treating with fungicide or trichoderma enriched cow dung slurry are kept for drying for 24 hours before planting. The treatment helps

in protecting the crop from collar rot. Ideal spacing for planting in a mango orchard is 60 cm (row-to-row) × 45 cm (plant-to-plant).

Sowing can be done either in pits or on ridges and furrows. Cut pieces of planting material are buried vertically in prepared pits or furrows, compacted and covered with soil and organic mulch. Earthing up is done after emergence of new shoots. As regards to nutrient management, a dose of 40 kg, 60 kg and 50 kg of NPK is applied 45 days after planting, while another dose of 40 kg N and 50 kg K is top dressed after one month of the first dose. Fertilizer application is followed by shallow inter-cultural operations like weeding, light digging and earthing up.

Crop is ready for harvest in 7-9 months after planting, however crop can be harvested after 6 months, looking to the better market price. There is great demand of elephant foot yam during Diwali festival season. Underground corms are harvested with pick-axe or by digging when the top leaves are completely withered and fallen. An average yield of 20 to 30 tonnes/ha can easily be obtained by intercropping it in a mango orchard depending upon the age of orchard and management.

Elephant foot yam was found more remunerative than turmeric in the demonstrations conducted at farmers' field in Malihabad mango belt. Farmers obtained a corm yield of 20-25 tonnes/ha. Farmers were able to sell their produce in the local market at a price of ₹ 25-30/kg.

For further interaction please write to:

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**Flowers always make people better, happier, and more helpful;
they are sunshine, food and medicine for the soul.**

– Luther Burbank