

Rejuvenating old and unproductive mango orchards for enhanced farmers' income

India is a leading mango producer, producing 21.80 million MT from 2.25 million ha, accounting for 45% of total fruit production in India. Though India is a major mango producer, exports are extremely limited due to quality factors. The main concern about mango export is poor quality standards, which limit India's share of the international market. Old and unproductive orchards with huge tree size and without proper canopy management is the major reason responsible for poor mango productivity and quality, especially the fruit size. Such orchards account for 35-40% of total area in mango growing belts.

FRUIT trees, invariably, after a certain period of successful production, have a tendency to lose their productivity and quality, making the orchards unproductive and non-remunerative. Replacing the old and senile orchards through replanting is a long term strategy which requires many years to reach the desired level of productivity. Rejuvenation technology for such unproductive trees offers many benefits, such as early and quality production from such trees through better light penetration and efficient utilization of available space and inputs. Keeping this in view, a technology for rejuvenating old and unproductive mango orchards has been developed at ICAR-CISH, Lucknow, refining the old rejuvenation technology, developed around 20 years back.

Identification of unproductive mango orchards for rejuvenation

If yield records show that trees have consistently performed poorly over the last five years. Besides this, trees which have grown over-size, become dense with branches crossing each other, allowing little sunlight to

penetrate inside the canopy and fruiting limited only to the outer periphery. Such orchards, at around 45 to 60 years of age, are ideal for rejuvenation. Very old trees with low vigour, or with hollow stem, heavily infested with pests and diseases or poorly performing trees due to poor soil and climatic conditions may not be suitable for rejuvenation.

Constraints faced in old mango rejuvenation technology

The technology developed by ICAR-CISH, Lucknow was disseminated widely in various mango growing belts of the country through State Horticulture Departments, besides the National Horticulture Board and the National and State Horticulture Missions. Mango tree mortality rates of up to 40-50% have been reported in many areas due to a heavy infestation of stem borers. The study of such cases revealed a lack of proper after-care of orchards, especially after the cutting of primary branches for the induction of new shoots. The farmers with relatively small land holdings who could manage the infestation of stem



Fruiting on rejuvenated plant



Fruiting on remaining branch



Fruiting on remaining branches



Ideal canopy development

borer with the recommended measures were successful, while, the farmers, who neglected the orchards after hard pruning suffered. Many times, it is not possible to manage the stem borer infestation on a large scale in big orchards. Besides, when we go for such rejuvenation, farmers lose the crop in the initial 2-3 years due to shoot growth and canopy development. Keeping this in view, efforts were made to further refine the technology for enhanced success and profitability.

Refined mango rejuvenation technology

Work done at ICAR-CISH, Lucknow during recent years has helped in understanding the problem and further refining the technology without any mortality of plants due to stem borer infestation. Besides that, technology has also ensured continuous income from the orchard without losing the crop completely. The following are the technological steps:

1. The orchards are identified on the basis of their consistent performance and growth of the canopy, as stated earlier.
2. First of all, the centrally located upright growing branch of the tree, if present, is thinned out completely. This branch will be removed from the point of its origin without leaving any portion of it. Thus, efforts are made to have a canopy open in the centre, which facilitates light penetration inside the canopy. In north India, the best time to prune mango trees is between December and mid-January.
3. Three to five wide-angle primary branches well distributed on all sides are selected for the development of the canopy in the years to come. All other branches growing very low in height and interfering with the cultural operations or intermingling with the selected branches will also be removed from the point of their origin.
4. After thinning out the central leader in the first year of operation, two primary branches opposite to each other and located on the top are headed back, leaving a stump of 1-1.5 m for secondary branch regeneration. All of the remaining selected branches will be kept for fruiting. The cut portions will be smeared with a fungicidal paste/Bordeaux paste which facilitates the healing of cut portions without any further infection.

The trees are well fed with recommended doses of manure, fertilizers and other after-care. The fruit from the remaining branches yielded 50 to 150 kg of quality fruit with improved size grades in the first year. The excessive shoots arising from the stump will be thinned out, leaving only the ideal ones for canopy development.

5. In the second year, the next two branches are headed back in a similar fashion, leaving the stump behind them. Only healthy shoots growing in the proper direction are allowed for canopy development, while others are thinned out. The remaining branches are headed back in the third year, and the plant is ready for fruiting in the third year. In the first year, fruit yield of 100 to 150 kg while in second year 20-50 kg/tree was obtained. In the third year, a fruit yield of 20-30 kg was obtained from the newly developed canopy after the removal of all the old primary branches. The fruit yield increases thereafter with an increase in the canopy size.
6. Fertilizer application, viz. 2.5 kg urea, 3.0 kg single super phosphate and 1.5 kg muriate of potash along with 50-100 kg of well rotten farm yard manure (FYM) should, as recommended for mango orchards, be applied. A full dose of FYM is applied just after harvesting during the rainy season. Half dose of nitrogen, full dose of phosphorus and half dose of potash is applied in September while remaining



New shoot growth on headed back limbs



Orchard before rejuvenation



Refined rejuvenation technique demonstrated at Sitapur

dose of nitrogen and potash is recommended for application just after fruit setting.

7. Thinning of excessive shoots arising from cut stumps is done during April and June to allow only 5-8 healthy shoots per branch for ideal canopy development. Monitoring and management of stem borer, leaf eating insect pests or fungal diseases is a must for success. During the summer, irrigation is applied at 15-day intervals from fruit setting to fruit maturity.
8. No mortality of trees/primary branches was observed due to stem borer infestation in case of this rejuvenation technology. Farmers' fields have been used to test the technology.

Demonstration of technology-An experience

This new refined mango rejuvenation technology was also demonstrated in a farmer's field in Udhwapur village, Sitapur district, Uttar Pradesh. The farmer had more than 60 years old 85 mango trees of cultivar Dashehari, which had a huge canopy with poor productivity. After obtaining permission from the state department, the rejuvenation work started in December 2018 with the heading back of selected two branches and the removal of the top upright growing branch. A total of 85 trees were subject to the rejuvenation. After cutting the branch, anti-fungal paste was smeared as recommended. Stem borer infestation

was easily managed with cleaning of holes and localized application of dichlorvos/kerosene/petrol soaked cotton in the holes wherever observed. There was no tree/primary branch mortality, so the success rate was 100%.

The fruit yield recorded in the first year (2019) was in the range of 118-160 kg/tree, while it was between 80-142 kg/tree in the second year (2020). The third and final cutting of remaining primary branches was done in December 2020 and a fruit yield of 18-26 kg/tree was observed in 2021 from ten trees out of 85 trees as all the old primary branches were removed for shoot development. For nutrient management, a fertilizer dose of 1 kg urea, 4 kg SSP and 1.0 kg MOP is applied every year by the farmer in the month of September and 1 kg each of urea and MOP is also applied in March–April just after fruit setting. Farmers also use organic liquid manure and bioagents such as *Beauveria bassiana* and *Trichoderma* on a regular basis.

For further interaction please write to:

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Small tractor mounted hydraulic platform

The development of suitable matching equipment for small tractor is of prime importance due to small fragmented land holdings, hill agriculture, shifting cultivation and lack of mechanization for leading horticultural sector. The operating height of the machine is 3 m (10 feet approx.). Overall dimension of the system is 3,000 × 1,500 × 1,450 mm, it weighs 700 kg and its load carrying capacity is 150 kg. Spraying system (500 l tank capacity) is attached with platform for application of fungicides/pesticides from top of the plant aiming at uniform distribution over the canopy. The field capacity and field efficiency of the machine is 0.3 ha/h and 85%, respectively for orchards having 6 × 6 m plant geometry. Cost of the equipment is ₹ 400,000. Operating cost of the equipment is ₹ 6,520/ha. The developed system can also be used for other operations in orchard crops like pruning, spraying and fruits plucking.



Source: ICAR Annual Report 2020