



Success of farmer FIRST Project in enhancing income of mango farmers of Malihabad, Uttar Pradesh

Maneesh Mishra, Anil Kumar Verma, P K Shukla, S K Shukla, R A Ram, Rohit Jaiswal, Pravesh Kumar Singh, Shantanu Kumar Dubey and S C Ravi*

ICAR-Central Institute for Subtropical Horticulture, Lucknow, Uttar Pradesh 226 101

Mango crop being the major crop in Malihabad region of Uttar Pradesh has been constrained by changing pest dynamics, climate change, old and unproductive orchards, large number of market intermediaries. Huge post-harvest losses coupled with lack of processing industry has affected the livelihood and income of the mango farmers of the region. ICAR-CISH under its Farmers FIRST programme introduced various interventions to increase the income and livelihood of the mango farmers. The interventions included GAP, integration of other crops and enterprises in existing orchards and entrepreneurship development. These interventions have been successful and are being adopted by a large number of farmers.

Keywords: Entrepreneurship development, GAP, Income, Mango orchard, Value-addition

WITH an area of 0.274 million ha and a production of 4.39 million tonnes, Uttar Pradesh is the largest mango-growing state. Dashehari, Langra, Chausa, and Lucknow Safeda are notable commercial cultivars here. The Malihabad region of Uttar Pradesh is known for its world-famous Dashehari mango, which is grown on 28000 ha. The climate and soil conditions of Malihabad, with extremely hot and rainless summers, aid the development of premium quality Dashehari fruit, which is superior to that of other regions. The Malihabadi Dashehari mango variety has been granted Geographical Indication (No. 125) by India's Geographical Indication Registry, demonstrating its distinct quality. However, Dashehari's distinction has not aided farmers in this region so far, owing to a lack of awareness and declining profits from mango cultivation. Several factors, including changing pest and disease dynamics, a lack of a processing industry and an organized marketing network in the region, and the dominance of middlemen in the trading network, have reduced the profitability of the mango farmers, especially small and marginal farmers.

A team of scientists from ICAR-Central Institute for Subtropical Horticulture (CISH), Lucknow, Uttar Pradesh, demonstrated good agricultural practices (GAP) in mango, mango orchard-based poultry farming, intercropping in mango orchard, mushroom farming, on-farm value addition and secondary hardening of

tissue culture banana plantlets under the Farmer FIRST project with the goal of increasing the profitability of farmers.

Impact of mango GAP

Pesticide spray accounts for a significant portion of mango production costs in the Malihabad region. On-farm trainings and demonstrations were held to educate farmers about using the right pesticides, at the right dose, at the right time, against the targeted pest. GAP implementation could reduce pesticide sprays to four (previously 7-8). Harvesting in this region was primarily done by shaking the branches, which resulted in fruit injury and reduced mango marketability. This loss was reduced significantly by using a CISH mango harvester and fruit cracking was greatly reduced. Total harvesting losses due to cracking and bruising was 2.28% in GAP-adopted orchards and 8.67% in the control group.

Fruits were packed in single layer corrugated fruit boxes (CFB) printed with geographical indication and marketed through two channels, viz. direct marketing to consumers in the local urban area and distant marketing to private companies by the selected farmers. In the traditional marketing channel, there were more intermediaries, and the farmers' price share was significantly low. Despite the fact that the cost of marketing increased noticeably in both direct



Fruit bagging and harvesting of mangoes using CISH harvester

and distant marketing due to packaging, branding, and transportation, the price realization in distant marketing to private companies and direct marketing to local consumers in urban areas was ₹60 and ₹32 per kg, respectively. In the traditional marketing channel, it was only ₹20 per kg. When comparing GAP adopters to non-adopters, GAP adopters spent 40% less on plant protection. The yield per acre increased by 6.7 q. The net returns for GAP adopters and non-adopters were ₹64195 and ₹29930, respectively. Adoption of GAP in mango cultivation contributed to the national goal of doubling mango farmers' income while lowering costs. Community based organization named "Awadh Aam Utpadak Evam Bagwani Samiti, Nabipanah, Malihabad, Lucknow was established to spread the adoption of GAP in mango cultivation and collective marketing of mangoes. Three hundred farmers have adopted this technology in a total area of 120 ha.

Impact of integrating other enterprises in existing mango orchards

Profitability from monocropping of mango was low in Malihabad region of Uttar Pradesh. Hence, various interventions such as integration of rural poultry, intercropping were introduced.

Impact of mango orchard-based poultry farming: Through a participatory mode with mango farmers, ICAR-CISH, Lucknow developed a mango orchard-

based poultry farming practice. Night shelters for mango orchards were designed using locally available bamboo and wire mesh at a cost of ₹5000–10000. Using grain waste, *in-situ* produced *Azolla* microphylla, dried barseem leaves, and naturally available mango insects, grasses, and grass seeds, a novel, cost-effective feed technology was developed. Chicks of rural poultry strains were reared in batches of 250 to 300 per farmer for 4 to 6 cycles per year. The birds derived their food as pupa, larvae, maggot and borers underneath the mango canopy as a result the technology reduced the mango pest population and requirement for pesticide sprays. Certain bird strains such as Kadaknath exhibited high flight and fed on mango hoppers and leaf webber insect situated on upper canopy, each bird in mango orchard supplemented 45 kg manure in the form of droppings in its entire life cycle. Orchard having flock size of 500 birds gets around 225 quintals of poultry manure. Birds while scavenging pulverized the soil and ensured better aeration. Birds were gradually disposed off after achieving body weight of 1.5 kg and fresh batches were provided after 2 months of initial batch and the cycle continued. The total cost incurred was ₹57168 and ₹177916 per acre in case of mango cultivation and mango + rural poultry, respectively. Farmers realized the net returns of ₹171828 per acre by integrating rural poultry in mango. A community based organization named "Sahbhagita" was established to sustain the



Mango orchard based poultry farming



Intercropping of turmeric and elephant foot yam in mango orchards



production of cheeks by the farmers themselves. Mango orchard based poultry farming have been successfully adopted by 86 farmers in the region.

Intercropping in mango orchard: The Malihabad region's mango orchards have excessive vegetative growth. Mango trees, when pruned and managed properly, provide higher productivity and fruit quality, as well as light for growing understorey crops. Old and unproductive orchards (>40 years) require rejuvenation, whereas middle-aged orchards (15 to 35 years) can be 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.

Turmeric (*Curcuma longa* L.): Turmeric has immense potential for growing as an intercrop in mango orchards as it tolerates shade to a great extent. Well developed, healthy, disease free, seed rhizomes of around 20–30 g weight and with at least 3 nodes were distributed to the farmers. Narendra Turmeric 2 and Sudarsan varieties were chosen for demonstration based on the suitability to the region. These rhizomes should be treated with mancozeb 0.3% (3 g/l of water) for 30 min, shade dried for 3–4 h and planted. Timely fertilizer application and weeding was also taken up by the farmers. Farmers obtained an average yield of 12–15 tonnes/ha with

Narendra Turmeric-2 while, it was 20–30 tonnes/ha with Sudarsan variety of turmeric. Economic analysis of mango + turmeric cultivation resulted in a B:C ratio of 3.96. The technology was demonstrated at 20 farmers' fields but now this has been adopted by more than 100 farmers of the region.

Elephant foot yam (*Amorphophallus paeoniifolius*): Elephant foot yam is also a very remunerative intercrop as it tolerates shade very well. It has lot of medicinal uses though corms are mainly used for vegetable purpose. Sree Padma developed by Central Tuber Crops Research Institute and Gajendra from Acharya N G Ranga Agricultural University were demonstrated to the farmers in mango orchards. Timely fertilizer application and weeding was assured. Underground corms were harvested when the top leaves are completely withered and fallen. Farmers obtained a corm yield of 20–25 tonnes/ha. Farmers were able to sell their produce at a price of ₹25–30/kg. Elephant foot yam was found more remunerative than turmeric in the demonstrations conducted at farmers' fields in Malihabad mango belt. Cultivation of elephant foot yam is also being widely adopted by the farmers of the region.

Demonstration of fodder crops in mango orchards: Majority of mango farmers in Malihabad villages are small to marginal having small farm lands. Farmers also maintain few buffaloes or cows for regular income and resource recycling. Under the Farmers FIRST project, cultivation of *Panicum* grass and sorghum as fodder in mango orchards was demonstrated. These interventions helped to solve the problem of fodder shortage for animals and on-farm production led to self sufficiency and resulted in decreased dependency on the market for fodder. Fodder yield recorded from different farm demonstrations indicated 1.75 to 2.50 kg green fodder per m per cut. It results in indirect economic benefits like saving cost of feed by 47% and increase in milk yield.



Intercropping of green fodder perennial sorghum in mango orchard

Entrepreneurship development

Mushroom production: Mushroom production was demonstrated for landless households as well as farmers to enhance livelihood options and nutritional security. Under Farmer FIRST project, entrepreneurship



Branding and marketing of Dashehari mango pulp based value-added products



Mushroom farming by rural youths

development in button, milky and oyster mushroom production was encouraged. Training was provided to more than 50 farmers on production of mushroom. A total of 35 households including few farmers are cultivating milky and oyster mushrooms in the study area. Oyster mushroom was grown in winter season and milky mushroom was cultivated during summer. The critical inputs like spawn, formaldehyde and polysheet were provided to the farmers and paddy straw and structure for mushroom production was arranged by the farmers themselves. The average net income of ₹6380.00/q for oyster mushroom and ₹5760.00/q for milky mushroom was realized by the households. About five farmers were trained and provided with spawn, whereas the compost, structure and other expenditure for mushroom production was borne by farmers themselves. Farmers grew an average of 800 kg of button mushroom with the help of 15/q compost and realized a net income of ₹53540.

Entrepreneurship in value-addition of mango pulp and mango pulp-based ice cream: Small sized, inferior quality mango fruits fetched lower price to the farmers when graded according to size and other parameters. Mango pulp extraction, preservation and further value-addition was demonstrated and training was imparted mainly to woman farmers and rural youth. These efforts resulted in establishing a woman self-help group named "Swavalamban" where woman engaged themselves in preparation and marketing of various mango-based value-added products (squash, aamchur, pickle and RTS). SHG members earned ₹43050.00 each as net profit in 2021. This has empowered the rural woman

and made them Atma Nirbhar. A small-scale enterprise was also established by a rural youth for the production of mango ice cream and the entrepreneur realizes the annual turnover of ₹10 lakh from the sale of various flavours of ice cream besides ice cream prepared with Dashehari pulp. The firm has generated employment for 15 rural youth.

Secondary hardening nursery TC Banana: Banana cultivation is growing rapidly in Uttar Pradesh and tissue culture plants of G 9 variety are in great demand. Transportation cost of secondary hardened TC plants is very expensive. Establishment of secondary hardening nursery of tissue cultured banana plants is a commercially viable enterprise. To enhance entrepreneurship among rural youth, five farmers were selected for capacity building in secondary hardening of TC banana nursery. A critical input of 1000 primary hardened TC plants was given to each farmer. A low-cost shade net house was constructed by farmers. The farmers sold hardened tissue culture plants locally at the rate of ₹14/plant. Each farmer earned an average net profit of ₹20790.00 from this enterprise.

SUMMARY

It is evident from the experience gained from Farmer FIRST project that right information to farmers at right time on right aspect and right motivation helps the fast spread of technologies and also helps the farmers to increase their income sustainably. Mango GAP, mango orchard-based poultry farming, intercropping in mango orchards have an immense potential in enhancing the income of the farmers and these technologies should be made available to the large number of farmers in various others parts of the state as well as country. Entrepreneurship development activities such as mushroom farming, value-addition and nursery are very viable enterprises which help in increasing the employment and income of farm women as well as rural youth.



Secondary hardening of tissue culture banana plants

*Corresponding author's e-mail: ravisc3@gmail.com