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New mango harvester for reducing drudgery and harvesting losses

Mango is generally harvested by shaking and beating of branches which causes cracking and bruising of fruits, which results in about 8-10% losses at farm level. ICAR-CISH, Lucknow has developed a light-weight, user friendly mango harvester for reducing drudgery and harvesting losses. Fruit loss was observed to be 40% less with new harvester as compared with the old metallic harvester.

MANGO is one of the most important fruit crops of our country and is extremely popular among masses. India is the largest producer of mango in the world accounting for 45.10% of global production. In India, Uttar Pradesh is the leading producer of mango accounting for 23.3% of country's total production. Dashehari is a leading commercial variety of Uttar Pradesh grown over sizeable area. However, farmers generally do not follow appropriate harvesting practices. Based on a survey conducted for estimation of post-harvest losses for Dashehari mango in Uttar Pradesh under AICRP (All India Coordinated Research Project) on fruits, it was revealed that 44% of the farmers irrigate the field prior to harvesting of fruits, through shaking the tree and striking the fruits with *laggi* (a harvesting tool with a hook on a bamboo pole), while 50% of the farmers harvest fruits by the same method without irrigating the field. While only 6% orchardists used different mango harvesters having a nylon fruit collecting net. The harvesting by shaking the tree and using *laggi* in an unirrigated field results in cracking of 8.44 to 9.45% of the harvested fruits due to impact sustained during the falling of the fruits on branches and hard ground, making them unfit for marketing.

Injured (cracked) harvested fruit

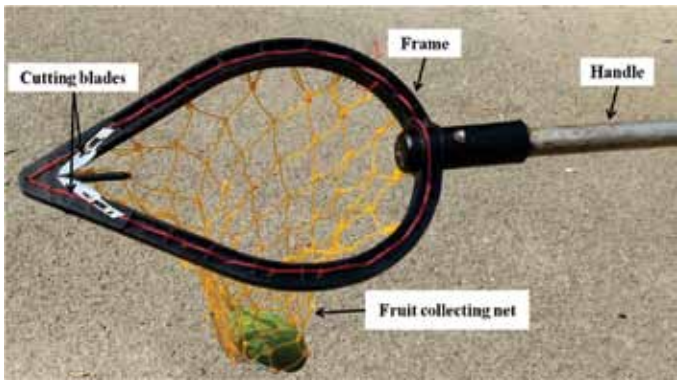
Due to shaking, some fruits get latent injuries during harvesting that result in rotting of fruits later during transport and marketing chain. As observed, the situation in irrigated fields was slightly better than unirrigated fields as cracking was apparently less i.e. 6.35-6.5% of the harvested fruits. However, only 1.4 to 1.6% of the fruits got cracked during harvesting with metallic pole harvester with a fruit collecting net designed and developed by ICAR-CISH, Lucknow earlier. Under Farmer FIRST Project (ICAR), several focused group discussions and farmer-scientist meetings were conducted for implementation of good agricultural practices (GAP) in mango orchards. The following reasons were attributed by mango farmers for less adoption (only 6% orchardists) of the metallic mango harvester:

- Heavy weight of harvester involves more drudgery in the harvesting operation.
- Blades mounted on the harvester for cutting of fruit pedicels are prone to rusting and frequently become blunt.
- It requires more time and labour for harvesting of fruits.

Keeping the above facts and limitations in consideration, a new light weight mango harvester was designed and developed by ICAR-CISH, Lucknow under Farmer FIRST project and validated at farmers' field. This tool is made from high density polyethylene fibre and therefore weighs 43.4% less than the metallic pole harvester. It is fitted with a removable high carbon steel (surgical grade) blade instead of mild steel as in old harvester. This tool is capable of cutting the pedicle up to 10 mm length, which is recommended by CODEX and facilitates harvesting up to 5 to 6 m height from the ground. The difference between the old and new harvesters is presented in Table 1.

Construction details

The main components of the harvester are cutting blades, frame, fruit collection net and aluminum pipe. The leaf shaped frame made from high density polyethylene (HDPE) is 390 mm long, 12 mm thick



New CISH mango harvester

Fruit harvested by the new developed harvester

and 210 mm wide at the center. Two sharp cutting blades (surgical grade) are mounted in the shape of inverted 'V' with screws on the external edge of the frame. In the main frame, a provision was made to attach an aluminum pole of 25 mm diameter. Fruit collection net made of nylon is tied on the periphery of the main frame.

Operating procedure

The operator has to hold the harvester with both hands and carry it near the target fruits. The operator has to ensure that fruits with pedicle lie inside the periphery of the tool and then pull it to cut the pedicle through shearing action and cut fruits are collected in the fruit collection net. The collection net can be emptied out by bringing it to the ground and flipping the tool upside down when it becomes heavy or after harvesting of sufficient fruits. About 650-900 fruits can be harvested with this tool per hour as per the distribution of the fruits in the tree canopy. The blades used in this tool are sharper and heavy duty and can be replaced when they wear out.

Table 1. Comparison between old and new CISH mango harvester

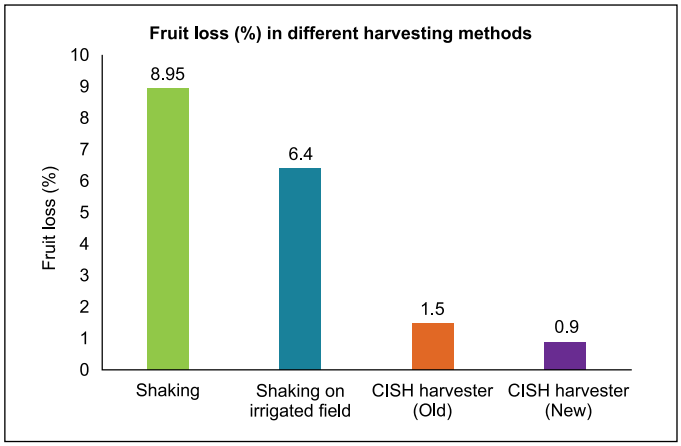
Parameter	Old CISH mango harvester	New CISH mango harvester
Weight	380 gm	215 gm
Material of construction	Mild Steel	HDPE (High Density Polyethylene)
Type of blade used	Mild Steel	High carbon steel (Replaceable)
Field capacity	600-800 fruits/hr	650-900 fruits/hr
Fruits harvested per cycle	8-10	13-15
Cost per unit, (₹)	200	150

Reduction in harvesting losses

The newly developed harvester was distributed among farmers for field evaluation. There was very less (0.9%) fruit loss observed with new harvester developed by the institute as compared to old CISH harvester as well as other harvesting methods.

Old CISH mango harvester

New CISH mango harvester



Fruit loss (%) in different harvesting methods

Sometimes small sized fruits get damaged due to bruising though blades while pulling the harvester, however this can be avoided with proper attention. Drudgery in harvesting was considerably reduced with new harvester due to less fatigue associated with light weight of the tool.

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