Increasing the yield of mango with selective harvest

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Summary
Due to inaccurate methods of harvesting, farmers tend to deteriorate the quality of mangoes and obtain reduced yields of the fruit resulting in a loss of income of the farmers. Through selective harvesting techniques, mangoes are harvested in three stages from the trees based on their maturity level. Also, proper picking poles are used to harvest the mangoes in order to avoid dropping them on the ground causing subsequent damage. This technique explains how to harvest mangoes properly and how the mango harvest can be planned in order to reduce post-harvest losses.

Description
Harvesting of mangoes at an incorrect point in time results in a loss of yield of mangoes: the mangoes are either too ripe or not ripe enough. This loss is further increased due to the damages caused to the mango while plucking. Farmers usually pluck all the mangoes when most of the fruits are ready for harvest. However, the mango flowers grow at different times, and hence the fruits also do not mature at the same time. Hence, at the harvest, nearly 50 percent of the fruits are at the right maturity level while the remaining 50 percent are either over-ripened or under-ripened. As a consequence, farmers lose nearly half the income due to the rejection of the fruits which are not at the correct maturity level. The immature fruits will never ripen since they lack the nutrients from the mother plant while the over-ripened mangoes will spoil very quickly. In addition, leaving over-ripened mangoes on the trees is dangerous: they attract birds, fruit flies and diseases onto the farm.

Using selective harvest techniques, the mango harvest can be done in different stages in an organized way promising increased harvest yields. The fruits can be classified roughly into three different maturity levels. The farmer can mark the branches with different colour tags where flowers appear at the same time for convenience during harvest.

At the beginning of the flowering season, the farmer can attach red flags to branches with the first flowers. Branches with the next batch of flowers can be marked yellow and the last batch with green flags. The dates of the flowering need to be recorded by the farmer. The mangoes can be harvested in three different sessions by judging the maturity of the fruits, i.e. selectively harvesting only matured fruits in a session.

- For the first session, the farmers can harvest the
fruits from the branches marked red depending upon the type and date of planting.

- For the second session, the fruits on the branches marked yellow can be harvested after 7 to 10 days depending upon the maturity level.
- For the last session of the harvest, the branches marked with green flags can be harvested 7 to 10 days after the second harvest.

Figure 1: Farmer recording the dates of the flowering of buds and marks the branches with different colour tags

The fruits on the branches with similar colour tags will mature roughly at the same time. Still, maturity tests should be performed for a good harvest.

1. Assessing the right harvesting moment by carrying out the maturity test

The maturity level of the mangoes can be assessed by two methods: (1) the preliminary and (2) the destructive analysis.

The preliminary check can be performed using visual aid while the destructive check requires cutting open the fruit. After preliminary non-destructive maturity tests, a few samples from the similar batch are checked using the destructive assessment of matured fruits.

1.1 Preliminary maturity assessment

There are three ways in which the maturity of the mango fruit can be detected.

1.1.1 The neck is checked, and the panicle drops inside for a matured fruit as shown in Figure 2.

1.1.2 On the fruit skin, there are tiny spots present, known as lenticels. These lenticels are brown in colour for a matured fruit. For un-ripened fruits, these lenticels are either white or yellow in colour (compare Figure 3).

Figure 2: The panicle drop in matured mangoes

Figure 3: Brown lenticels of the ripe mango

1.1.3 After reaching maturity, the stalk (hanging point of the fruit) begins to dry since it no longer requires nutrients from the mother plant (see Figure 4).
1.2 Destructive maturity assessment

The destructive maturity assessment consists of two tests:

1.2.1 Check the Brix level (i.e. sugar content): To check the brix level of the mango, a refractometer is required. The fruit needs to be cut into three parts as shown in Figure 5.

The juice of the part cut in Figure 5 (b) is poured on the refractometer and directed towards the sun. The refractometer scale gives the brix level of the fruit. Higher values indicate more sweetness and lower values less. Usually, for a brix level of greater than 9 degrees, the fruit is considered mature.

1.2.2 Check the internal colour: A colour chart ranging from white to deep yellow is often used to determine the different growth stage of the fruit. The remaining part of the mango (cut to check the brix level) is matched against the chart to

Figure 4: A dried up stalk of the ripe mango

Figure 5: Mango cut in three equal parts (a) through the seed, and (b) middle of the edge and the seed.

Figure 6: The mango juice being tested on a refractometer for its sugar content

Figure 7: Brix scale inside the refractometer. Meter indicates a brix level of 6: the mango is not ripe
determine the exact state of the maturity of the mango. The colour of the matured fruit varies depending upon the variety of the mango.

Both the brix level and the colour chart values help to determine the exact maturity level of your fruits. The specific values of brix level and colour chart indicators differ depending upon the requirement of the buyers (for local consumption, import or for the manufacture of fruit juices or dry fruits). Hence, the requirements of the buyer need to be checked before the harvesting season arrives and harvest should be planned accordingly.

**Figure 8: A typical colour chart to check the maturity**

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2. Reduce damage by using the right picking pole

Once the fruits to be picked are selected, they should be plucked without causing any harm to the fruit. Many farmers currently use a hook on the end of a stick to hook the mango and pull it so that the mangoes are dropped from the tree into the ground.

The fruits dropped from above 2 m height suffer internal cracks often unnoticed by the farmers from the outside. Upon coming in contact with the ground, the chances of fungal infections in the fruit also increase. Hence, proper picking poles which are able to hold the mangoes should be used. The mangoes should then be gently transferred into a plastic crate. The mangoes stored in such crates have proper ventilation, and thus there are fewer chances of damage.

The picking poles should be disinfected with spirit or alcohol before use to avoid the spreading of diseases. These practices improve the hygienic standard of the harvest. The selective harvesting technique is labour intensive and requires an initial investment on correct harvesting tools, but this limitation can be easily defeated by the added benefits of the higher yields.

This method of harvesting allows the farmer to harvest mangoes at the right time of maturity.

**Figure 9: A man using a picking pole for mango harvest**

This increases the yield of mangoes to nearly twice, which is a major economic benefit to the farmers in terms of increased income.

Also, the increased quality of the fruit through improved picking practices can receive higher prices for the fruits sold to the suppliers.
3. Validation of the practice
This technique also reduces the chance of spreading diseases through over-ripened mangoes. Farmers growing mangoes in every part of the world can benefit from this technique to harvest the mango.

4. Further reading
• Video of harvest can be found at https://www.youtube.com/watch?v=14qSHrepLL8

5. Agro-ecological zones
• Tropics, all