

## A Cost Benefit Analysis of Hexanal Technology for Mango and Banana

A **cost benefit analysis (CBA)** is considered a systematic process for calculating and comparing benefits and costs of a decision, policy, or project. The very purpose of a CBA is to determine if an investment decision is feasible and the benefits outweigh the costs.

### Pre-harvest spraying of hexanal formulation

Hexanal comes from plants and has been shown to extend the shelf life of perishable fruits when it is applied externally. It is available for application as *EFF* or *Enhanced Freshness Formulation*.

Experiments have shown that EFF use results in fruits staying on trees for 2-3 weeks longer, delayed ripening process, and keeps fruits fresh for at least 2 more weeks during normal storage (under ambient condition).

### Pre-harvest spraying of mango

Two applications of EFF in mango orchards resulted in an extended period of fruit availability and it facilitated an increase in the farm gate price of the produce so growers realized additional income. Field-level experiments showed that EFF enhanced the preservation and appearance of the fruit and this lead to a premium price in the market.



**Pre-harvest Spray of Hexanal in a Mango**

### Pre-harvest spraying of mango: cost and profit

Pre-harvest spraying extended the shelf life of fruits by two weeks and that helped the farmers to realize a 10-12% increase in price, a “premium price,” for the fruits earmarked for table purposes. This occurred because of the delay in harvesting. The cost of two applications of EFF spray works out to be Rs. 10,000 per acre. This can result in additional net fruit yield of 500 kg per acre which returns an additional Rs. 20,000 per acre and a net gain of roughly Rs. 10,000 per acre due to EFF spray. Further, since treated mangoes were available when mango was no longer available, the additional returns realised by the farmers in the project were estimated at Rs. 14000/acre depending on the prevailing

market price and season. The post-harvest losses were 5–7% less in the EFF-sprayed fruits meant for transport to distant markets like Mumbai, Pune, Delhi, and Calcutta.

### **Post-harvest dipping of mango**

For some farmers, pre-harvest spraying of mango might be hard to do so post-harvest dipping of mango has been tried in pack houses to take advantage of the technology at large collection points instead of at farms. The EFF dip treatment retained the freshness of mango up to two weeks without any change in fruit quality so traders were able to reduce post-production losses by 7–10% depending on the distance and mode of transport.

### **Post-harvest dipping of mango: cost, advantages and profit**

The cost of EFF dip treatment is as low as Re. 0.5 per kg. This technology is quite powerful as it is simple and bulk quantities can be treated in pack houses. Pack houses already do a series of sequential dipping in water, salt, and safe fungicides. The EFF dipping could easily fit into the pack house regime and help the farmers and traders to gain advantage of premium prices in the market. Such dip treatments are primarily performed by women with each pack house providing employment for 100 women. The women are happy to work in pack houses as they provide continuous employment. The net return obtained per tonne of mango fruit works out to Rs. 2,700.

### **Packaging of Mango Fruits in Carton Boxes**

#### **Post-harvest dipping of banana: cost and benefits**

The EFF technology is very effective for banana as it extends the shelf life of fruits by 12–15 days. Major banana varieties such as Grand Naine, Poovan, Nendran, Red Banana, and Ney Poovan have been tested and the EFF technology found suitable for all of them. Industrialists have expressed their belief that the EFF technology is highly beneficial for green banana that is intended for chip-making. The EFF-dipped fruits were reported to remain fresh and maintain their quality throughout the storage period. The cost of EFF is Rs. 0.5 per kg. The benefit of using the technology can be huge if the fruit sold later in the marketing cycle in the domestic market as well as the increased opportunities with long- distance transport and export markets.

#### **Nano-stickers for mango and banana**

Nano-stickers have been developed using an electrospinning technology. These stickers entrap Hexanal and regulate its release while in the fruit storage boxes. Each box of fruits (2–3 kg) can be preserved

with a small (5 cm<sup>2</sup>) sticker. This technology is highly suitable for long distance transport of fruits. Results showed that mango and banana exposed to the nano-stickers had an extended shelf life of up to 3 weeks. This helped the farmers to get additional income at the retail level owing to reduction in post-harvest loss. Based on the retail prices of mango and banana at Rs. 30/kg, net additional return was Rs. 1,150/ton for mango and Rs. 390/ton for banana, respectively.



**Nano-Stickers in Carton Boxes**

### **A Hexanal Testimonial**

Mr. Santha Kumar, an innovative mango grower in Krishnagiri in Tamil Nadu State, and on whose field the initial trials were conducted, has expressed that EFF-sprayed fields appeared well, that the trees were dark green in colour, and that the general crop stand was encouraging. He expressed that he was able to retain the fruits in the field for two weeks thereby his per acre return improved by Rs.10,000. He recommended the technology to the farmers living in the local area.

### **Summary of the cost benefit analysis of hexanal technology for mango and banana**

In summary EFF can be used as pre-harvest spray or post-harvest dip for reducing post-harvest losses at all levels in the value chain – from the point of harvest to the consumer. The pre- harvest spray in the mango orchard led to a additional net return of 14000 per acre. The net return obtained per tonne of mango fruit due to EFF dip works out to Rs. 2,700. Based on the current prices of mango and banana at Rs. 30/kg, net additional return was Rs. 1,150/ton for mango and Rs. 390/ton for banana, respectively. The data clearly suggest that farmers can benefit a lot by introducing a simple hexanal- based nanotechnology. Hence this technology can be advocated in all the mango and banana growing areas to reduce post production losses and gain additional monetary returns.