Food and Agriculture Organization of the United Nations

Low cost, high impact solutions for improving the quality and shelf-life of bananas in local markets

Banana (*Musa sapientum*) is one of the leading fruit crops produced in SAARC countries. Bananas are popularly consumed both in the fresh and cooked forms. Bananas are a rich source of carbohydrate and vitamins and particularly vitamin A. They are also a rich source of potassium, phosphorous calcium and magnesium. Banana production and marketing offers many economic opportunities in the region, and particularly for smallholder farmers.

Bananas deteriorate at a rapid rate because of their high moisture content and delicate nature. If not harvested at the correct stage of maturity and handled properly throughout the distribution chain from harvest to retail, bananas suffer both qualitative and quantitative loss, resulting in the reduction of income of all involved in their production and subsequent post-harvest handling. Furthermore, improper handling reduces the market or shelf-life of bananas, which limits the volume of sales and returns to retailers.

Improvements in the traditional banana supply chain: dehanding followed by delatexing of banana hands (A) and the use of plastic crates as bulk packaging containers for banana hands (B).

The importance of good post-harvest handling practice

Post-harvest begins where production ends, that is at harvest. Good practice in harvesting and in post-harvest handling is essential in maintaining quality (fresh appearance, flavor and nutritional value), extending shelf-life and in assuring the safety of bananas for the benefit of consumers. Post-harvest losses in bananas occur due to several factors, namely harvesting at immature or over-mature stages, mechanical damage, moisture loss, and decay. Efforts must, therefore, be made to prevent or minimize these losses across the banana supply chain, so that producers, marketers and consumers alike can benefit.

Improving handling practice in banana supply chains

Under the FAO Technical Cooperation Project TCP/RAS/3502, titled, *Reduction of Post-harvest Losses in Horticultural Chains in SAARC Countries*, technical improvements (Table 1) were piloted in Sri Lanka with stakeholders in traditional banana supply chains. Qualitative and quantitative losses and shelf-life were assessed.

Table 1: Traditional and improved practices in banana supply chains

Operation	Traditional handling practice	Improved handling practice
Dehanding	No dehanding of banana bunches	Dehanding of banana bunches
Delatexing	No delatexing of banana hands	Delatexing of banana hands
Packaging	Transportation of banana bunches in poly-sacks	Packing banana hands in plastic crates with a thin layer of cushion material between layers

The results

1. Post-harvest losses

Post-harvest losses in bananas at the wholesale level were mainly due to moisture (weight) loss and packaging and transport-related damage whereas at the retail level, losses incurred were due to weight loss and to quality deterioration during the display of bananas for sale.

At the wholesale market, weight loss and mechanical damage due to traditional handling practice were 3.4 percent, and 2 percent respectively, resulting in a total loss of 5.4 percent. With the improved handling practice, weight loss and quality loss were 1.9 percent, and 0.2 percent respectively, or a total loss of 2.1 percent. Therefore, a 61 percent reduction in total post-harvest loss was achieved at the wholesale level, with the improvements introduced.

At the retail level, weight loss (9 percent) and quality loss (5.4 percent) resulted in a total loss of 14.4 percent for the traditionally handled bananas after 6 days. On the other hand, with improved handling practice, a total loss of 12 percent,

Table 2: Losses at various stages of traditional and improved chains

Parameter	Supply chain level	Handling practice	
		Traditional	Improved
Total loss (%)	Wholesaler	5.4	2.1
	Retailer	14.4	12.0
System loss (%)	Farm to retail	21.0*	14.1

** Includes 1.2% harvesting loss (mechanical damage).*

representing mainly weight loss (as no quality deterioration occurred after 6 days of retail). Improvements resulted in a 17 percent reduction in total loss at the retail level.

For the entire post-harvest handling system (farm to retail), system loss was reduced from 21.0 percent to 14.1 percent, with an overall reduction of 33 percent.

2. Shelf-life

Shelf-life is the length of time that a commodity may be stored or displayed for sale without becoming unfit for use or consumption. Based on the proportion of marketable fruits over a 6-day retail period, the shelf-life of bananas handled using the improved practice was better than that of those handled using traditional practice. After 6 days in retail, 94.6 percent of bananas subjected to traditional handling were marketable, while 100 percent of those handled using the improved practice remained marketable.

Bananas handled using improved practice, however, had a higher level of weight loss (12 percent) than those handled using traditional practice (9 percent) as the cut portions of banana hands facilitated moisture loss, when compared to intact bananas in bunches. With their unblemished appearance, retailers can expect to gain more returns from bananas handled using improved handling practice due to the higher proportion of marketable fruits for sale.

3. Produce safety

Application of good practice in handling bananas from harvest to retail is critical in minimizing the risk of contamination posed by pathogenic microorganisms that may originate from the fruit itself as well as from workers who come in contact with produce during handling. In the end, all actors involved in the banana supply chain (farmers, collectors/wholesalers, retailers) and other stakeholders also benefit.

Economic benefit realized

Cost and returns analysis was used to assess the profitability of improvements introduced in the traditional banana supply chain. The expected changes in cost and returns due to the improvements were calculated for three levels of the supply chain, i.e. farmer, wholesaler, and retailer, based on the assumption of marketing 100 kg of bananas and using post-harvest loss data and other relevant information gathered by the project. A summary of the results is presented in the Table 3.

Results of the analysis show that the farmer marketing bananas directly to the wholesaler (3A) would benefit, in terms of higher gross income, from improvements in the traditional post-harvest handling system of banana, i.e. dehanding and delatexing of the banana hands and using plastic crates as bulk packaging containers. Alternatively, the farmer would gain a higher gross income if the bananas were sold to the collector because of the savings on the cost of transportation to the wholesale market assuming the price of banana is the same (3B).

For both the wholesaler and retailer (3C and 3D), the improved practice resulted in a higher net income compared to the traditional practice, with the wholesaler gaining a higher benefit than the retailer. In general, all three supply chain actors benefit from the improvements but at different levels.

Table 3: Cost and return analysis of improvements introduced at different levels of the supply chain

3A

Item	Farmer**	
	Traditional practice	Improved practice
Gross returns, Rs	5 980.00	7 000.00
Total cost*, Rs	300.00	611.42
Total gross income, Rs	5 680.00	6 388.58
Gross income /kg, Rs	**56.80**	**63.89**

** Does not include production cost; ** Farmer sells the banana directly to wholesaler.*

3B

Item	Farmer**	
	Traditional practice	Improved practice
Gross returns, Rs	5 980.00	7 000.00
Total cost*, Rs	0	61.42
Total gross income, Rs	5 980.00	6 938.58
Gross income /kg, Rs	**59.80**	**69.39**

** Does not include production cost; ** Farmer sells the banana directly to wholesaler.*

3C

Item	Wholesaler	
	Traditional practice	Improved practice
Gross returns, Rs	7 568.00	8 811.00
Total cost, Rs	6 800.00	7 611.42
Total net income, Rs	768.00	1 199.58
Net income /kg, Rs	**7.68**	**12.00**

3D

Item	Retailers	
	Traditional practice	Improved practice
Gross returns, Rs	7 760.00	10 560.00
Total cost, Rs	8 300.00	9 611.42
Total net income, Rs	(540.00)	946.58
Net income /kg, Rs	**(5.40)**	**9.47**

This information sheet summarizes the results of the FAO Technical Cooperation Project: TCP/RAS/3502 Reduction of post-harvest losses in Horticultural chains in SAARC Countries

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