



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

Snap beans (*Phaseolus vulgaris* L.) are among the most important vegetables produced in SAARC countries. They are mainly grown by smallholders and are marketed domestically. As a vegetable, snap beans are high in protein and soluble fiber and low in calories. The quality of snap beans is dependent on the maturity status of the pods at harvest and the method of post-harvest handling. Good quality snap bean pods are fleshy, young, tender, snap easily and are free from physical injury insects and diseases.

Like other fresh vegetables, snap bean pods are highly perishable because of their high moisture content and delicate nature. If not harvested at the right stage of maturity and handled properly throughout the market distribution chain from harvest to retail the produce suffers losses in both quantity and quality, resulting in a reduction of income for all involved in their production and subsequent post-harvest handling. Improper handling also shortens the market or shelf-life of snap beans which limits sales volume and returns to retailers.



Improvements in the traditional snap bean supply chain: harvesting at right stage of maturity (A), plastic crate as field container for hauling (B) and as bulk packaging container for transport (C).

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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 snap beans for the benefit of consumers. Post-harvest losses in snap beans 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 snap bean supply chain, so that producers, marketers and consumers alike can benefit.

Improving handling practice in snap beans 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 snap bean supply chains. Qualitative and quantitative losses and shelf-life were assessed.

Table 1: Traditional and improved practices in snap beans supply chains

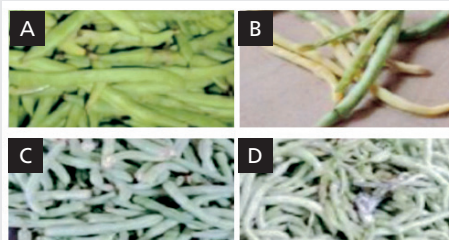
Operation	Traditional practice	Improved practice
Harvesting	Harvesting at mixed stages of maturity	Harvesting at the correct stage of maturity
Packaging	Packaging Mesh/plastic sack, 50 kg capacity	Packaging in plastic crates, 15 kg capacity

The results

1. Post-harvest losses

Losses in snap beans at the wholesale level were mainly due to weight loss and transport/packaging-related damage while at the retail level, losses incurred during display were due to moisture (weight) loss and quality deterioration, i.e. damaged and decaying beans which were unmarketable and considered as a post-harvest loss.

At the wholesale market, weight loss and mechanical damage resulting from traditional practice were 3.9 percent and 14.1 percent respectively, resulting in a total loss of 18 percent. With improved harvesting and bulk packaging practices, weight loss and quality deterioration were 2.9 percent and 4.4 percent respectively, accounting for a total loss of 7.3 percent. The improved practices, therefore resulted in a 59 percent reduction in post-harvest loss.



Forms of post-harvest losses in snap beans: loss of green color (A) and browning and desiccation (B) due to moisture loss, mechanical damage due to poor packaging/transport (C), and disease infection of damaged portion (D).

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At the retail level, weight loss and loss due to quality deterioration were 11.7 percent and 14 percent respectively, accounting for a total loss of 25.7 percent. With improved handling practice a total loss of 20.6 percent was incurred: due to 7.3 percent weight loss and 13.3 percent loss due to quality deterioration. Overall, a 20 percent reduction in post-harvest loss was achieved in retail with the improved practice.

For the entire post-harvest handling system (farm to retail), system loss was markedly reduced from 43.7 percent to 27.9 percent as a result of improvements introduced.

2. Shelf-life

Shelf-life is the length of time that a commodity may be stored or displayed for sale without becoming unfit

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

Parameter	Supply chain level	Handling practice	
		Traditional	Improved
Total loss (%)	Wholesaler	18.0	7.3
	Retailer	25.7	20.6
System loss (%)	Farm to retail	43.7	27.9

for use or consumption. Pods handled using improved practice had a lower weight loss (7.3 percent) due to moisture loss than those handled using traditional practice (11.7 percent). However, the total quantity of marketable pods was almost the same for both handling practices. In effect, retailers can expect to gain better returns from using the improved practice for handling snap beans due to higher marketable weight.

3. Produce safety

Use of good practice in harvesting and subsequent handling of snap beans from harvest to retail is critical in minimizing the risk of contamination by pathogenic microorganisms that may originate from the vegetable itself as well as from workers who come in contact with the produce.

Economic benefit realized

Cost and returns analysis was used to determine the profitability of adopting improvements in the traditional snap bean supply chain. Expected cost and returns were calculated for the three supply chain levels, i.e. farmer, wholesaler and retailer, based on the assumption of marketing 100 kg of snap beans and using post-harvest loss data and other relevant information gathered by the project. A summary of the results is presented in the tables below.

At the farm level, the farmer benefits from higher gross income, by replacing traditional plastic sacks as field containers for harvested snap beans. With the use of plastic crates as field containers, reduced physical damage to the beans results in increased volumes of good quality being sold to the collector. Alternatively, the farmer can further increase his gross income if the good quality produce is marketed directly to the wholesaler as the savings on losses in quantity and quality during transport from the collection area to the wholesale market would accrue to him.

In the case of the wholesaler and the retailer, the use of plastic crates as packaging and transport containers gave higher positive income than the traditional plastic sack. This is due to the substantial reduction in unmarketable bean pods caused by mechanical damage during transport to the wholesale market as well as quality deterioration and moisture (weight) loss during retail display.

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

3A

Item	Farmer	
	Traditional (plastic sack)	Improved (plastic crate)
Gross returns, Rs	10 000.00	10 736.00
Total cost*, Rs	460.00	17.08
Total gross income, Rs	9 540.00	10 718.82
Gross income /kg, Rs	95.40	107.19

* Does not include production cost.

3B

Item	Wholesaler	
	Traditional (plastic sack)	Improved (plastic crate)
Gross returns, Rs	9 840.00	11 124.00
Total cost, Rs	10 677.50	10 248.83
Total net income, Rs	(837.50)	875.17
Net income /kg, Rs	(8.38)	8.75

3C

Item	Retailer	
	Traditional (plastic sack)	Improved (plastic crate)
Gross returns, Rs	14 852.00	15 876.00
Total cost, Rs	12 000.00	12 000.00
Total net income, Rs	2 852.00	3 878.00
Net income /kg, Rs	28.52	38.78

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

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