



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

Cauliflower (*Brassica oleracea var. botrytis*) is a cash crop and is one of the most widely consumed vegetables in SAARC countries. It is consumed for its nutritional value and health benefit. Cauliflower is rich in nutrients and in phytochemicals (glucosinolates) that can lower the risk of cancer and cardiovascular diseases. Aside from its nutritional value, cauliflower production and marketing offer many economic opportunities in the region especially for smallholder farmers.

Cauliflower curds, like other fresh vegetables, spoil very rapidly because of their high moisture content and delicate nature. If not harvested at the correct stage of maturity and handled properly across the market distribution chain from harvest to retail, qualitative and quantitative losses occur, resulting in a reduction of income for all involved in their production and subsequent post-harvest handling. Furthermore, improper handling reduces the market life or shelf-life of cauliflower which limits the volume of sales and returns to retailers.



The importance of good post-harvest practice

Post-harvest losses in cauliflower occur due to several factors, namely harvesting at either immature or over-mature stages, mechanical damage, moisture (weight) loss, and decay. These losses can be attributed to poor harvesting techniques, careless handling, and poor packaging and transport conditions. Care must, therefore, be taken to prevent or minimize these losses across the cauliflower supply chain, so that producers, marketers, and consumers alike can benefit.

Improving handling practice in cauliflower supply chains

Under the FAO Technical Cooperation Project, TCP/RAS/3502, titled, *Reduction of Post-harvest Losses in Horticultural Chains in SAARC Countries*, good post-harvest handling practice along with simple technologies were piloted with stakeholders in traditional cauliflower supply chains in Nepal. The practices piloted are summarized in Table 1.

Table 1: Traditional and improved practices in cauliflower supply chains

Operation	Traditional practice	Improved practice
Harvesting	Harvesting at mixed stages of maturity	Harvesting at the correct stage of maturity
Trimming	No or partial trimming	Trimming of the stem to 1-2 cm long with 4 wrapper leaves attached
Packaging	Net/jute/plastic sack, 50 kg capacity	Bulk packaging in plastic crates, 15 kg capacity; plastic liner in between layers of curds
Retailing	No plastic film wrapping of curds	With or without plastic film wrapping of curds

Improvements in the traditional cauliflower supply chain: harvesting at correct stage of maturity (A), trimming of stem and leaves (B), packaging in plastic crate (C), and film wrapping of curds for retail (D).

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The results

1. Post-harvest losses

Losses in cauliflower at the wholesale level were mainly due to weight loss and transport/packaging-related damage while at the retail level, losses incurred were due to moisture (weight) loss and quality deterioration during display of the cauliflower.

At the wholesale market, weight loss and mechanical damage of traditionally handled cauliflower were 5 and 6 percent respectively, resulting in a total loss of 11 percent. With the improved handling practice, weight loss and quality deterioration

loss were 1.1 and 3.4 percent respectively, or a total loss of 4.5 percent (Table 2). Improved practices, therefore, resulted in a 58 percent reduction in total loss at the wholesale market.

At the retail level, weight loss and loss due to quality deterioration in the traditional supply chain, were 21 and 20 percent respectively, or a total loss of 41 percent. With improved handling practice a total loss of 13.8 percent; 3.6 percent weight loss and 10 percent loss due to quality deterioration (Table 2). Improvements in the traditional handling practice resulted in a 66 percent reduction in total loss at the retail level.

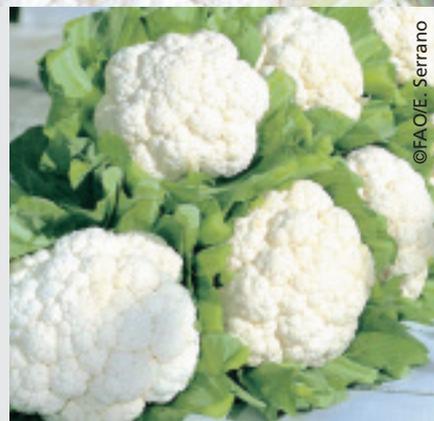
For the entire post-harvest handling system (farm to retail), system loss was markedly reduced from 52 to 18.3 percent with the post-harvest interventions and improvements introduced in the traditional cauliflower supply chain (Table 2), or a 65 percent reduction in system loss.

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

Parameter	Supply chain level	Handling practice	
		Traditional	Improved
Total loss (%)	Wholesaler	11.0	4.5
	Retailer	41.0	13.8
System loss (%)	Farm to retail	52.0	18.3

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. At the retail market, the shelf-life of traditionally handled cauliflower curds was 5 days. With the improved practice, the shelf-life of cauliflower curds increased to 8 days due to the wrapping of individual curds with plastic film. As a result, retailers are able to increase their volume of sales and returns because of the extended period of three days over which good quality produce can be displayed for sale.



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3. Produce safety

Application of good practice in handling cauliflower curds from harvest to retail is critical in minimizing the risk of contamination posed by pathogenic microorganisms that may originate from the fruit itself and from workers who come in contact with produce during handling.

Economic benefit

Cost and returns analysis was used to determine the profitability of improvements in the traditional supply chain for cauliflower. Expected changes in cost and returns were calculated at different levels of the supply chain: i.e. farmer, wholesaler and retailer, based on the assumption of marketing 100 kg cauliflower curds and using post-harvest loss data and other relevant information gathered by the project. A summary of the results is presented in Table 3.

Results show that trimming the stem and wrapper leaves of cauliflower at the farm level would benefit all actors in the supply chain. Farmers benefit from an increased gross income when selling trimmed cauliflower as compared to selling untrimmed cauliflower. The same is true for both the wholesaler and retailer; however, the retailer gains the most benefit from proper trimming of the cauliflower.

Both the farmer and wholesaler benefit in terms of higher income from the improvement in bulk packaging of cauliflower using plastic crates when compared to the traditional practice of using plastic sacks. For the retailer, wrapping of cauliflower curds with plastic film would give a higher net income when compared to the untrimmed produce, since a larger volume of good quality cauliflower curds can be sold over an extended retail period.

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

3A

Item	Farmer	
	Plastic sack (no trimming)	Plastic crate (with trimming)
Gross returns, Rs	2 225.00	2 865.00
Total cost*, Rs	50.00	6.40
Total gross income, Rs	2 175.00	2 858.00
Gross income /kg, Rs	21.75	28.58

* Does not include production cost.

3B

Item	Wholesaler	
	Plastic sack (no trimming)	Plastic crate (with trimming)
Gross returns, Rs	2 225.00	2 865.00
Total cost, Rs	2 250.00	2 506.40
Total net income, Rs	(50.00)	385.60
Net income /kg, Rs	(0.50)	3.86

3C

Item	Retailer	
	No film wrapping of untrimmed cauliflower	Film wrapping of trimmed cauliflower
Gross returns, Rs	3 160.00	5 772.00
Total cost*, Rs	2 500.00	3 540.00
Total net income, Rs	660.00	2 232.00
Net income /kg, Rs	6.60	22.32

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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