



WWF

PAKISTAN

POLICY BRIEF -  
FOOD SECURITY

# POST-HARVEST FOOD LOSSES IN RICE AND TOMATO SUPPLY CHAINS



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# The policy issue

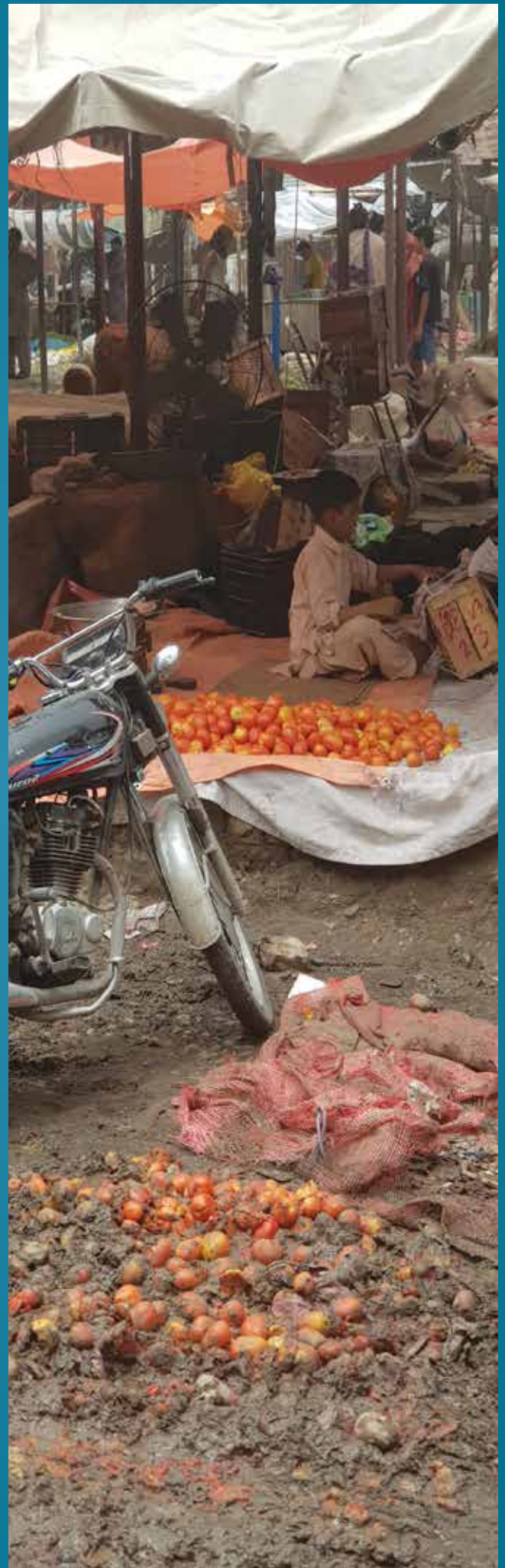
Food security remains an essential component of Pakistan's development paradigm. An essential aspect of ensuring food security is minimizing post-harvest food losses. Post-harvest food loss pertains to the loss of food and the inputs required to produce it at any instance along the supply chain.

For a country such as Pakistan, which has one of the highest incidences of malnutrition in the developing world, post-harvest losses remain a significant concern. Sustainable and resilient approaches to food systems call for a substantial reduction in post-harvest losses such that agricultural productivity is enhanced and incomes of small-scale food producers are increased.

It is in this regard that WWF Pakistan, under its Food and Markets Programme, researched post-harvest losses in tomato and rice supply chains across four major cities of Pakistan. The purpose was to understand the processes and key stakeholders involved in the agricultural value chain, identify critical loss points and develop policy recommendations.

# Methodology

The research focused on collecting primary data for losses and waste along the supply chain. For this purpose, customized survey instruments were prepared to collect data from actors in the supply chain of food commodities, including farmers and retailers at the farmer's markets.



# Findings

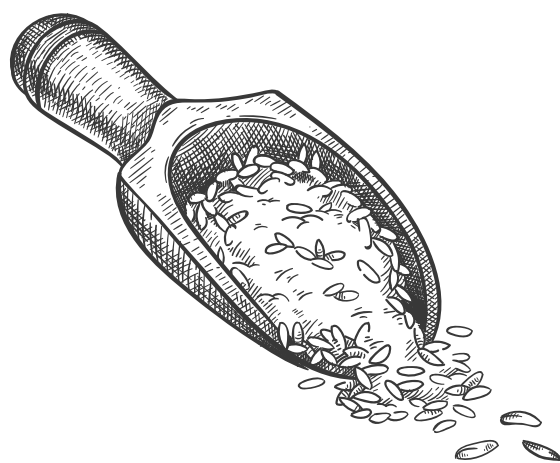


## Losses in the rice supply chain

The focus of the research was in three cities namely Peshawar, Islamabad and Lahore. The survey was conducted between March and August 2019. The timing of the survey coincided with the harvesting and threshing of the Rabi rice crop. May to June is also the peak period for milling. In the cities surveyed for calculating losses in the rice crop, limited distribution systems were found. It was observed that farmers with greater landholdings directly supplied their produce for milling to the mills, but for smallholders, this was not the case, and they had to sell their produce to mediators who then took rice to the mills, resulting in increased cost.

From the mills, rice is eventually supplied to wholesalers, distributors and to the government. The major rice mills in the country are situated in Punjab, Sindh, Lahore and Gujranwala. In the Khyber Pakhtunkhwa region, small and medium-sized mills facilitate the farmers.

Due to a dearth of reliable data and the reluctance of farmers and other actors in the supply chain, data collection was only possible at one of the mills. It was observed that the entire production till cultivation takes between 115-125 days. After the milling is complete, it takes up to a year for the rice to reach consumers. The major processes involved in the rice value addition are harvest, post-harvest handling, and storage followed by transportation to the mills for milling.







## Risk factors

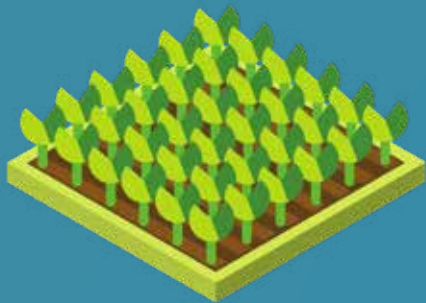
The rice supply chain was observed to have several risk factors that usually result in forming critical loss points (CLPs). The risk factors are both natural and originate from the activities of supply chain actors, leading to the potential loss of rice. As far as losses in the supply chain of rice are concerned, these are attributed to the entire supply chain. Firstly, losses take place at the farm level, especially during harvest, paddy separation, packing, stacking and the transportation process. Secondly, losses also take place at the processing level where rice is processed, i.e. paddy cleaning, dehusking, polishing and grinding. Finally, losses happen when the rice is repacked, stored and transported for distribution to consumers through different channels, including retailers, warehouses, distributors, shops etc.' Other factors that affect losses of the rice crop include crop varieties, agricultural management practices, and rainfall at the time of cultivation, and harvest timing. If effectively addressed, these points in the supply chain can contribute to reduced losses (Kirby et al., 2016).

The farmers in Peshawar reported that two to five bags per hectare are lost from an overall yield of 20-22 bags per hectare. In Islamabad, the ratio was one to four bags per hectare, at 1-7 bags/hectare in Lahore, from a total yield of 27-29 bags per hectare. In the mills, it was observed that there were considerable quantitative and qualitative losses during milling and storage. Quantitative losses can be as high as 30 per cent in mills, while qualitative losses such as the loss of moisture content can be up to three to six per cent during storage. CLPs in the rice supply chain are summarized below.

- Losses during transportation
- Losses during threshing
- Grain loss at the village aggregator
- Quantitative and qualitative losses during milling and storage at mill



# Farm to fork: food supply chain in Pakistan



1

FARM

2

HARVESTING



3

TRANSPORTATION



4

PROCESSING





# Losses in the tomato supply chain

The tomato value chain comprises of three main stages; harvesting, transportation to sheds for ripening and transportation to markets. Harvesting entails fruit picking when the product is ripe. Then, the collection of fruit in buckets, containers, and bags, loading onto vehicles. The second stage is transportation to the packing house, where the fruit is spread to ripen (FAO, 2018).

The tomato shelf-life is heavily affected by the time of the year as during winters, the fruit can go without spoiling for about four to five days, while in summers, the shelf life shortens to one to three days. The number of losses reported by sellers was similar. However, the difference became apparent when considering the shop's size and the weekly volume of tomatoes sold by the vendors. Some prominent vendors, who owned multiple shops in the area were able to procure and sell larger quantities, but reported a loss of about 0.25 kg per crate in winters and two to three kg per crate in the summers.

In the fields, the tomato fruit is primarily harvested manually at the stage when the colour is green or pinkish and when the fruit is mature. It was observed that some producers sorted the fruit during harvesting. The harvested tomatoes were collected in buckets or other containers and carried to sheds for ripening, the tomatoes were placed on the ground or on sheets of cardboard and left to ripen. Further sorting is performed daily, and rotting tomatoes are eliminated from the produce. Tomato is a delicate fruit, and it does not require any processing. Once the tomato has ripened, it is sorted based on size and turgidity and packed in less aerated wooden crates with newspaper wrapping around it with a 10-15 kg capacity. The wooden crate weighs about 1.25 kg and is made from wood acquired from mostly indigenous plant species. The lost quantities of fruit in the farmer's market are detailed in the table on the next page.





# Tomato losses at the retail level

CITY	NO. OF RESPONDENTS	TOTAL QUANTITY	WASTAGE (KG)	PERCENTAGE (%)
Peshawar	20	28,650	2,317	8.0
Lahore	10	4,570	561	12.2
Karachi	8	7,120	852	11.9
Islamabad	8	2,250	401	17.8
				12.4% average

## Conclusion

This study shows that post-harvest losses in the rice and tomato supply chains are a result of poor agricultural practices, storage, logistics, and packaging. In this regard, the recommendations are mentioned on the next page.



# Policy recommendations

## IMPROVED PACKAGING THROUGH UTILIZATION OF PLASTIC WASTE

Locally made, inexpensive, reusable, and recyclable packaging material can be used in place of traditional packaging materials to prevent weight loss.



## IMPROVING ACCEPTABILITY OF 'UGLY' FOOD ITEMS

Common masses are not aware of the fact that the nutritional value of the ugly produce is the same as the one of with seamless shape. Academic institutions, conservation organizations (such as WWF-Pakistan), think tanks, and relevant governmental departments can work towards changing the perception of the public in this regard.

## MINIMIZING TRANSPORT LOSSES

Minimizing losses during transport requires a particular focus on vehicles, equipment, infrastructure, and handling procedures. There is a need to load and carefully unload vehicles to avoid damaging the food.



## TEMPERATURE MANAGEMENT

Advances in logistics and cold chain management using technology to better manage the storage life of produce and improve its quality.

## TECHNOLOGICAL INNOVATIONS

Technological innovations in the form of farm machinery, electronic devices, and mobile apps can be introduced at different points of the supply chain to prevent food loss.





### CAPACITY BUILDING

Training on the importance of reducing post-harvest losses, losses during transportation, segregation, logistics, and packaging should be given to farmers and workers engaged in loading, unloading, packing, segregation, and storage. This may be done through agriculture extension departments at the local level.

### ENHANCED RESEARCH AGENDA

This is preliminary research that takes into account only two food crops. An enhanced research agenda is required whereby post-harvest food losses are studied in greater detail by looking at the supply chain of other major food crops across urban and rural regions in Pakistan. Universities can pick up this issue for further research through their master's and doctorate programmes.



## References

- FAO. 2018. Food loss analysis: causes and solutions – Case study on the tomato value chain in the Republic of Guyana. Rome.
- FAO, IFAD, UNICEF, WFP & WHO. 2019. The State of Food Security and Nutrition in the World 2019. Safeguarding against economic slowdowns and downturns. Rome.
- Kirby, M., et al., Agricultural production, water use and food availability in Pakistan: Historical trends, and projections to 2050. Agric. Water Manage. (2016), <http://dx.doi.org/10.1016/j.agwat.2016.06.001>

## Acknowledgement

This policy brief is based on WWF-Pakistan's report titled "Food Loss and Waste in the Pakistani Food Supply Chains, Hospitality Industry and Households" completed in 2020.



WWF-Pakistan came into being in 1970 and has been working to conserve Pakistan's natural resources ever since.

WWF-Pakistan carries out conservation work according to six Global Goals which include wildlife, oceans, freshwater, food, forests, climate and alternate energy.



The organization works through 30+ offices, including five regional offices, and a team of over 300 dedicated staff members.

Our greatest responsibility is to lead the way in conserving Pakistan's rich natural diversity so that future generations can continue to benefit from them.



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