

Post-harvest Management for Sustainable Agriculture

fact sheet

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Introduction

Agriculture is a major source of livelihoods in developing countries in the Asia-Pacific region. On average, the sector accounts for 36 per cent of total employment but only 10 per cent of the GDP in these countries [1], indicating low productivity in the sector relative to other sectors of the economy. Low productivity and lack of infrastructure are constraints to agricultural production as well as trade. According to ESCAP estimates, up to 218 million people in the region could be pulled out of poverty by an improvement in agricultural productivity [2].

To unlock the potential of increased productivity, a significant reduction in post-harvest loss is needed. The Food and Agriculture Organization of the United Nations (FAO) estimates that 15-50 per cent of fruit and vegetable production and 12-37 per cent of the grain harvest in the region is lost between production and marketing [3].

This loss is mainly caused by inefficient harvesting and post-harvest handling practices as well as inadequate knowledge and infrastructure.

The loss can be qualitative in the form of a reduction in the quality and consequently, the value of the food item and/or quantitative with a reduction in weight and consequent loss in total value.

Loss carries a price. On the one hand, it is absorbed by the farmer as reduced farm-gate price and on the other, it is passed on to the consumer in the form of increased prices caused by a supply shortfall. In low-income areas, this affects both producers and consumers. The intermediate and retail segment is also significantly affected by the loss. Making the region's value-chains more efficient can bring immense benefits and play a critical role in supporting global trade and distribution of products to meet the needs of a growing and increasingly affluent population. There is, therefore, a great incentive to minimize post-harvest loss.

The reasons for post-harvest loss vary according to the food item:

- *Perishable food crops*, such as fruit and vegetables, usually have soft tissues and are vulnerable to injury. The losses are partly caused by endogenous factors such as respiration, transpiration and germination, and partly by exogenous factors such as rot and insects.
- *Durable food crops*, such as cereals, grain legumes and some root crops, have hard tissues that provide good protection against injuries. Losses occur typically during storage and are mainly due to exogenous factors such as moisture, insects or rodents.

The Hazard Analysis and Critical Control Point (HACCP) approach has been effective in controlling risk factors and avoiding wastage. In developed country markets, such as in the European Union, HACCP is obligatory for all stages of food production after primary production. HACCP principles, namely identification and classification of risks, together with measures to contain these, should be incorporated into Good Agricultural Practices.

PROBLEMS AND SOLUTIONS FOR POST-HARVEST MANAGEMENT OF SOME CROPS

PERISHABLE CROPS

For perishable crops in particular, pre-harvest factors influence post-harvest quality. Crops need to be protected from defects caused by weather, practice, growth conditions or water availability.

Post-harvest losses in perishable crops can result from:

- physical, chemical and biological factors (which may also affect the safety of the food);
- mechanical and physical damage;
- physiological deterioration;
- pests; and
- rot.

The extent of loss is aggravated by incorrect handling of harvested produce such as:

- Improper packing and washing;
- Improper transport;
- Breakage and crushing;
- Cracking and rotting; and
- Exposure to high temperature, low relative humidity and/or windy conditions.

Typical post-harvest management operations at packing houses are cleaning, sorting/grading, ethylene ripening, washing in solutions, curing and packaging.

NOTE: Sorting/grading alone may increase income by 40-60 per cent.

Cooling is an effective way to reduce post-harvest loss; some cooling methods do not require expensive equipment, such as dipping in cold water (hydrocooling) or evaporative cooling storage.

NOTE: Cooling outside recommended temperatures and relative humidity may injure the produce.

Packaging and storage in modified atmosphere increases shelf-life and avoids weight loss through water evaporation; it can increase net gain by \$0.21-\$0.70/kg.

Increased income can be earned from value added products, such as fresh-cut, dehydrated, fermented, juiced, frozen, pickled, preserved, canned or bottled.

In case of minimal defects in the produce, processing can avoid wastage; in general, however, processing requires high quality ingredients.

DURABLE FOOD CROPS

Factors that influence the quality of durable crops such as grains and legumes include:

- unseasonable weather and climate conditions;
- type of crop (cereal or pulse) and crop variety;
- how the crop is harvested;
- processing method, including drying and threshing;
- management practice, such as pest control procedures and standard of store hygiene;
- type of storage structure or container; and
- the length of time the produce remains in store.

The main reasons for post-harvest loss in durable crops are:

- inadequate storage facilities;
- attacks by rodents, insects and birds;
- inadequate drying or prolonged delay in processing; and
- improper transport, such as falling off the truck.

Durable crops are often dried under the sun, but this increases climatic risk and that of attacks by livestock, rodents and insects; research highlights the benefits of system driers.

The metal silo is a simple storage technology, relatively easy to use; it helps preserve grain and cereals in good quality. It is generally recommended to store grain for consumption in larger silos and seeds for sowing in small metal silos. Good seed storage also contributes to a good crop in the next season.

A large variety of processing chains are related to durable crops; for grains, flour forms the basis of a huge variety of processed food.

Figure 1. Good Marketing Practices



Good practices to establish proper post-harvest management

While Good Agricultural Practices cover the agricultural phase of food production, the post-agricultural phase also needs proper management through Good Marketing Practices. Good Marketing Practices include:

- Good post-harvest management
- Consistent marketing
- Efficient trade

The importance of Good Marketing Practices is emphasized by the following facts:

- Total food loss during storage and transport could be as high as 16 per cent (cited in [2]).
- World Bank (India) estimates that agricultural production losses due to lack of adequate storage and marketing infrastructure in India can be as high as 20-40 per cent of total output (cited in [2]).
- Wastage of agricultural produce caused by improper transportation/logistics amounts to \$13 billion per year in India [4]. Producers and exporters of fresh fruits and vegetables in Thailand lose \$96.4 million/year due to spoilage and poor storage.

10 RECOMMENDATIONS FOR GOOD MARKETING PRACTICES

1. Assist in understanding the market and its requirements; see also section on **Marketing** below.
2. Promote a quality-based approach through marketing support; see also section on **Marketing** below.
3. Facilitate agricultural trade by optimizing trade-related procedures; see section on **Trade** below.
4. Implement Hazard Analysis and Critical Control Point (HACCP) method for all steps after primary production to control risks and avoid wastage.
5. Promote/regulate Good Agricultural Practices (GAP) for farms.
6. Promote/regulate proper record-keeping.
7. Provide technical assistance in the form of extension services or service centres for:
 - Training
 - Review of HACCP plans and GAP records
 - Assistance to resolve particular issues in primary or secondary production
 - Assistance in record-keeping
8. Provide support to laboratories to become certified against relevant international standards (e.g. ISO17025).
9. Promote transport cooperatives and decentralized logistic platforms for improved transport, providing services such as:
 - Concentration of goods
 - Cold-chain handling
 - Provision of transport services
 - Export services
10. Fund supporting action through public-private partnership.

MARKETING

Knowledge of markets is a key ingredient. The better the knowledge of the requirements of the market, the less is the wastage of the product. Consistent product quality is also key to successful marketing.

Marketing and quality standards help farmers understand market requirements and, ideally provide a clear framework for managing food production quality.

Cooperatives and clusters are good platforms to achieve volume, consistency of offering and to share marketing costs.

Promotion agencies are helpful for export products. The World Bank notes a clear link between export volumes and export promotion agencies adhering to the following principles:

- private participation
- addressing specific markets
- 'small is beautiful'

A number of countries, including Malaysia, Norway and Australia are also successfully offering generic or specific labels as a common marketing platform. Key to success are:

- specificity
- quality control

TRADE

Trade in Asia and the Pacific is complicated. Compared to developed nations, Asia and the Pacific exports take far more time, require more documents and involve more stakeholders.

A key element in agrifood trade facilitation is the availability of information about the food and its history.

ESCAP and the Economic Commission for Europe (ECE) have developed the **smart food vision** for consistent application of information technology to facilitate agrifood trade. The smart food vision uses traceability as an enabling technology.

Traceability is a key requirement of high-value markets and, therefore, a prerequisite for trade. Traceability is a tool not only for managing food safety risks, but also

- to measure the performance of the food chain and individual companies in it;
- to enable efficient connectivity between supply and demand; and
- to provide information to customers and build trust relationships.

Paper-based traceability is inadequate for chain-traceability and, typically has few benefits; **only electronic traceability can unlock the benefits** of chain-traceability.

Successful traceability systems are based on a public-private partnership; there are very few successful examples of fully private schemes or fully public schemes.

A legislative/regulative framework for traceability is essential for its success.

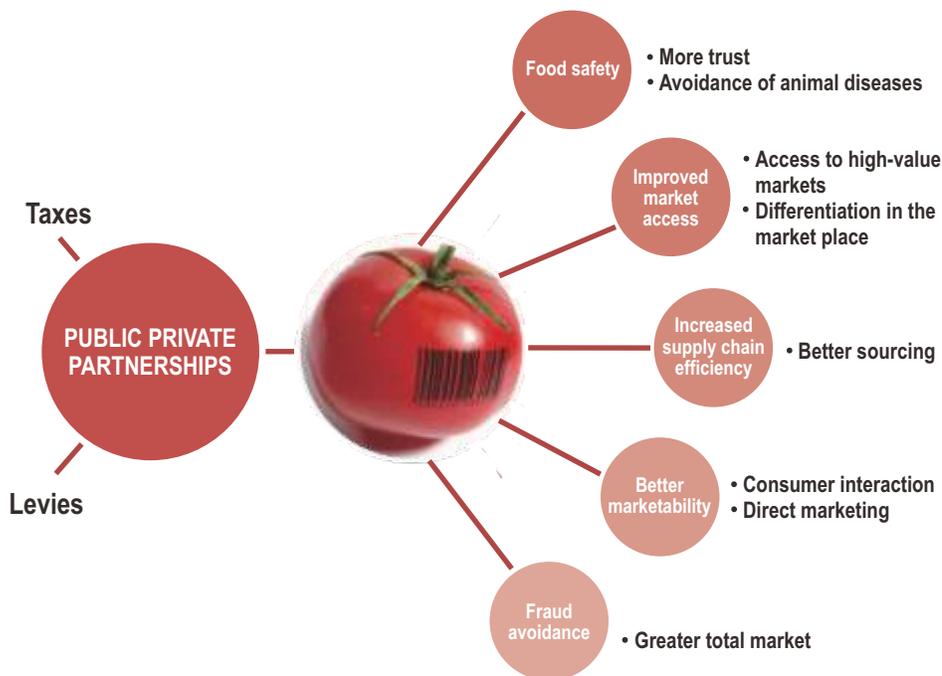
Implementing Good Marketing Practices

The recommendations above for proper marketing of agricultural produce require a multi-tiered approach. While a proper regulatory framework is needed to provide incentives to food business operators to adopt Good Marketing Practices, training and practical assistance, for example through service centres or extension services, are also needed to support food businesses.

Only a combination of positive and negative incentives will provide enough impulse to unlock the potential of agriculture in the Asia-Pacific region.

Several implementation strategies are possible and the selected strategy must be evaluated in the national context. As a general rule, the involvement of private industry is essential for success.

Figure 2. Implementing Good Marketing Practices



A Public Private Partnership (PPP) is an effective method for funding the implementation of Good Marketing Practices and enlisting the support of the private sector. PPPs have shown to be successful for the provision of marketing, research, extension and other services, as in Australia, Norway or the United Kingdom. In such a PPP, levies raised from production, for example per unit volume produced – are complemented with public funding. The complementary funding corresponds to the direct benefit to the private sector from better post-harvest management and enables public interest in better food, more jobs and less fraud.

The World Bank estimates that GDP growth originating in agriculture is at least twice as effective in reducing poverty as GDP growth originating outside agriculture. In this context, finding a national solution for implementing Good Marketing Practices for agriculture is bound to bring growth to the Asia-Pacific region.

Further reading

A number of case studies are available that highlight the benefits of all or partial aspects of Good Marketing Practices. A recent SATNET training manual on Post-harvest, Trade and Marketing (accessible from www.satnetasia.org) offers the following case studies:

- The effect of pre-harvest factors on post-harvest quality of Pak Choi
- Storage of Oriental Bunching Onion
- Developing a quality assurance system for fresh produce in Thailand
- Good cold-chain practice guide for table grapes from South Africa
- Cashew production in the Philippines
- Market extension training in north-west Bangladesh
- Pakngao maize farmer group enterprise in Lao PDR
- Practical traceability at a large South African fruit pack house
- Shrimp traceability for smallholders in Viet Nam
- Traceability for grape exports from India
- Traceability in pomelo farming in Thailand
- Agricultural trade facilitation in action: The case of Greece

References

- [1] United Nations, Economic and Social Commission for Asia and Pacific (2015). Online Statistical Database. Available from: www.unescap.org/stat/data/statdb/DataExplorer.aspx. [Accessed 13 April 2015].
- [2] United Nations, Economic and Social Commission for Asia and Pacific (2011). *Facilitating Agricultural Trade in Asia and the Pacific, Studies in Trade and Investment, no. 74*.
- [3] Gustavsson, J. and others (2011). *Global Food Losses and Food Waste – Extent, Causes and Prevention*. Rome: Food and Agriculture Organization.
- [4] International Finance Cooperation (2010). *IFC Annual Report 2010 - Where Innovation Meets Impact*. Washington D.C.

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