

PACKAGING IN FRESH PRODUCE SUPPLY CHAINS IN SOUTHEAST ASIA



RAP PUBLICATION 2011/20

**Packaging in fresh produce supply chains in
Southeast Asia**

**Food and Agriculture Organization of the United Nations
Regional Office for Asia and the Pacific
Bangkok, 2011**

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ISBN 978-92-5-106998-1

Photo credits:

Cover page by Chaval Sinthusing

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FOREWORD

Packaging is very often critical to the success or failure of horticultural supply chains. In recent times, considerable emphasis has been placed on packaging in fresh produce supply chains in order to respond to changing consumer habits, market demand, trade requirements and the drive to reduce losses. Improved packaging can greatly contribute to improving efficiency in supply chain management and can increase returns for producers and retailers while delivering top quality fresh produce to consumers.

Bulk packaging of fresh produce in Southeast Asian countries ranges from traditional bamboo baskets and wooden crates to plastic crates and corrugated fibreboard boxes used for export. Retail packaging formats used vary widely in accordance with the nature of the retail outlet. Growing and changing consumer demands are, however, bringing about considerable change in retail packaging formats for fresh produce across the region.

This publication documents the results of surveys commissioned by FAO in three countries – the Philippines, Thailand and Viet Nam – to provide comprehensive up-to-date reviews on fresh produce packaging in the region's supply chains. Information presented in the publication is based on field surveys, interviews with supply chain stakeholders and experts, references from available sources as well as experiences of the various authors.

This publication provides the basis of FAO's future work in the area of capacity building on fresh produce packaging in the region. It is hoped that the information provided in this report will stimulate greater thought and action on measures to sustainably reduce losses across fresh produce chains in the region through improved packaging practices.



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ABBREVIATIONS AND ACRONYMS

ACCSQ	ASEAN Consultative Committee for Standards and Quality
ACFS	National Bureau of Agricultural Commodity and Food Standards
APEC	Asia-Pacific Economic Cooperation
BAFPS	Bureau of Agriculture and Fisheries Product Standards
BAR	Bureau of Agricultural Research (Philippines)
BAS	Bureau of Agricultural Statistics
BFAD	Bureau of Food and Drugs
BMC	box manufacturer's certificate
BPI	Bureau of Plant Industry
BRC	British Retail Consortium
CA	controlled atmosphere
CAT	Communications Authority of Thailand
CCF	corrugated common footprint
CEN	European Committee for Standardization (Comité Européen de Normalisation)
CF	common footprint
CFR	Code of Federal Regulations
CPLP	certified packaging laboratory professional
DA	Department of Agriculture
DOST	Department of Science and Technology
ECIB	European Chamber of International Business
EDI	electronic data interchange
EFTA	European Free Trade Association
EHWT	extended hot water treated
ENs	European Standards
EPAL	European Pallet Association
EPCIS	Electronic Product Code Information Services
EPS	expanded polystyrene
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FEFCO	European Federation of Corrugated Board Manufacturers (Fédération Européenne des Fabricants de Carton Ondulé)
FTC	full telescopic container

FTD	full telescope design
FTHS	full telescope half slotted
GAP	Good Agricultural Practices
GDP	gross domestic product
GEM	Growth for Equity in Mindanao
GMA	Grocery Manufacturers' Association
GSMP	Global Standards Management Process
GTS	Global Traceability Standard
HACCP	Hazard Analysis and Critical Control Points
HDPE	high density polyethylene
IAF	International Accreditation Forum
IATCA	International Auditor and Training Certification Association
ICARD	Information Center for Agriculture and Rural Development
IEC	International Electro Technical Commission
IFPRI	International Food Policy Research Institute
ILAC	International Laboratory Conference
IPPC	International Plant Protection Convention
ISO	International Organization for Standardization
ISPM	International Standards for Phytosanitary Measures
ISTA	International Safe Transit Association
iTAP	Industrial Technology Assistance Program
LLDPE	linear low density polyethylene
LDPE	low density polyethylene
MAP	modified atmosphere packaging
MDF	medium density fibreboard
MTEC	National Metal and Materials Technology Center
NaOCl	sodium hypochlorite
NEDA-CAR	National Economic and Development Authority – Cordillera Autonomous Region
NLAQ	North Luzon Agribusiness Quadrangle
NMFC	National Motor Freight Classification
OSB	oriented-strand board
OTR	oxygen transmission rate
OVOP	One Village One Product
PASC	Pacific Area Standards Congress
PE	polyethylene
PET	polyethylene terephthalate

PHTRC	Postharvest Training and Research Center
PLA	poly lactic acid
PMO	produce marketing organization
PNRI	Philippine Nuclear Research Institute
POSSEC	Perishable One Stop Service Export Center
PP	polypropylene
ppm	part(s) per million
PRDC	Packaging Research and Development Center
PS	polystyrene
PVC	polyvinyl chloride
RFID	radio frequency identification
RO/RO	roll-on roll-off
RPC	reusable plastic container
RSC	regular slotted container
SC	subcommittee
SCSC	Standards and Conformance Subcommittee
SPS	Sanitary and Phytosanitary Standards
TC	technical committee
TISI	Thai Industrial Standards Institute
TISTR	Thailand Institute of Scientific and Technological Research
TPA	Thai Packaging Association
TPC	Thai Packaging Centre
UPLB	University of the Philippines-Los Baños
USAID	United States Agency for International Development
USFDA	United States Food and Drug Administration
USP	unique selling proposition
VHT	vapour heat treated
WG	working group
WHO	World Health Organization
WPP	woven polypropylene
WTO	World Trade Organization
WTO-SPS/TBT	WTO's Agreement on the Application of Sanitary and Phytosanitary Measures and Agreement on Technical Barriers to Trade
XCEP	Excellent Center for Eco-Product Development

Chapter I

Toward improved packaging practices for post-harvest loss reduction¹

The past fifteen years have witnessed considerable growth and change in fruit and vegetable chains across Asia and the Pacific region. These changes have been accompanied by an evolution of packaging trends to respond to consumer and market demand in both local and export markets. These trends have also been largely influenced by the cost and availability of packaging to meet the need of various target markets.

Packaging plays an important role in maintaining the quality of fruits and vegetables as they move through the supply chain. Packaging protects produce from compression and abrasion damage during handling and transportation, and from exposure to chemical, physical and microbiological risks that could compromise their safety. Packaging facilitates the transportability of produce, while extending its shelf-life. Packaging alone cannot, however, address produce quality and safety. Other factors such as the maturity index of the produce at harvest, temperature control, washing and storage conditions of the produce, time to market, the retail system and consumer needs and preferences all play a critical role.

Across the ASEAN region, traditional packaging materials such as baskets and wooden crates are currently being replaced by corrugated boxes and returnable plastic crates for the bulk packaging of produce destined for high-end local markets, and institutions, while corrugated boxes are used primarily for export markets. Concurrently, plastic bags have begun to replace these forms of bulk packaging in the repackaging of produce at wholesale markets, owing to their lower cost, ready availability and ease of handling. The latter shift is of concern from both practical and environmental perspectives in that plastic bags do not allow for adequate ventilation, often compromising the shelf-life of produce under ambient conditions, offer little protection to produce against mechanical injury during handling, and are not biodegradable.

Growth of supermarkets in the region and growing consumer demand for quality, convenience and portion control has led to growth in retail packaging and, in some cases, branding of fresh produce for sale in high-end supermarkets. Retail packaging is also of interest from the retailer perspective in enhancing the visual appeal of produce on display in these establishments.

FAO's current initiatives to address post-harvest loss reduction in horticultural supply chains across the region bring in a specific focus on promoting the use and adoption of environmentally

¹ Rosa S. Rolle, FAO Regional Office for Asia and the Pacific

sustainable practices. Through capacity building activities and initiatives, FAO continues to place emphasis on the *reduce-reuse-recycle* concept of preserving the environment, in the marketing chains for fresh produce and promotes the proper use of recyclable bulk packaging materials such as reusable plastic crates to minimize losses during transportation. Given the changing trends in fruit and vegetable retail, emphasis is also placed on the appropriate use of consumer packaging. FAO continues to develop and disseminate pertinent technical support materials in the form of bulletins, technical guides and via Web-based communication.

The adoption of sustainable bulk packaging practices in horticultural supply chains, such as the use of reusable plastic crates will hinge greatly on awareness raising and training and education of supply chain stakeholders. Governments of the region can facilitate the adoption of good packaging practice in horticultural supply chains by providing an enabling environment that is supportive of the implementation of sustainable post-harvest practices. This could take the form of incentives to supply chain stakeholders that promote the adoption of recyclable plastic crates, for example, and the provision of facilities for the recycling and hygienic maintenance of these crates in wet markets. The private sector and particularly packaging companies can also play a role in providing services such as crate leasing arrangements. Academic and research institutions must, in the interim, continue to pursue research on the adaptation of traditional packaging materials, to enhance their suitability for the bulk packaging of fresh produce.

This publication documents surveys commissioned by FAO in three countries – the Philippines, Thailand and Viet Nam – on the use of packaging in fresh produce supply chains. It is hoped that the information provided in this report stimulates greater thinking and action on measures to sustainably reduce losses in fresh produce chains in the region, through improved packaging practices.

Chapter II

Basic principles of fresh produce packaging

1. Packaging

Packaging is defined as a term for material used for containment, protection, handling, delivering and presenting goods from the producer to the consumer or user, as well as preserving the product (European Parliament and Council, 1994/62/EC). Packaging is also regarded as an efficient system for delivering products to consumers. The packaging system includes various operations starting from conversion of packaging materials into packages, filling the packages with products before transporting them to the marketplace, consumption of packaged products and disposal of packaging waste.

The Packaging Institute International defines packaging as the enclosure of products, items or packages in container forms to perform one or more of the following functions: containment, protection, preservation, communication, utility and performance.

Packaging plays a significant role in delivering fresh produce to the consumer through distribution systems. Proper packaging reduces damage and loss, maintains quality, and protects produce against contamination risks throughout the supply chain. In addition, packaging plays a key role as a marketing tool, which is an important part of consumer decision-making. Packaging effectively serves an important role at every step of the supply chain.

2. Importance of packaging

Growing consumer demand for fresh produce has led to increased competitiveness in the fresh produce business, with quality and safety as major concerns. Consumers are increasingly searching for fresh produce with improved characteristics in terms of freshness, appearance, taste and flavour. Moreover, in today's fast-paced society, consumers are looking for additional benefits and convenience.

Packaging is used in moving fresh produce from farm to fork. It is the key solution in delivering produce of good quality to consumers. Packaging also adds value to fresh produce. Basic functions of packaging for any product including fresh produce are containment, protection and preservation (Box 1). Additional functions such as communication and convenience are becoming increasingly important in meeting consumer requirements. Packaging materials must also be designed to minimize environmental impacts. Advances in packaging design offer solutions to address these needs.

Primary functions of packaging for fresh produce include:

- *Containment*: Produce often comes in a number of discrete units of which distribution and marketing are difficult without packaging.
- *Protection*: Packaging of produce offers protection from post-harvest damage such as wilting, ripening and bruising.
- *Communication*: Packaging provides a medium for communicating information about the packaged produce between supply chain actors. By different means of communication, packaging can help promote and motivate the buying decision of consumers.
- *Convenience and use*: Pre-packaging provides consumers with convenience in consumption. A popular example of a convenience food is a pre-cut salad mix product, in which vegetables are cleaned, cut to size and are ready to eat, thus helping save on food preparation time.

3. Characteristics of fresh produce

Fresh produce is a living entity. Even after harvest, fresh produce continues its metabolic activity and undergoes physiological changes. These changes occur in three phases as growth, maturation and senescence. Ripening generally occurs during the later stages of fruit maturation to the first stages of senescence. Fruits generally undergo marked changes during ripening, leading to the development of desirable quality attributes – appearance, odour, flavour, and taste – that appeal to consumers.

Two types of fruit can be differentiated on the basis of respiratory patterns and ethylene production during ripening. A sharp increase in respiration and ethylene production occurs in “climacteric fruits” on the onset of ripening. This is not, however, the case in “non-climacteric fruits”. Tropical climacteric fruits include mango, durian, mangosteen, papaya, etc., while non-climacteric fruits include pineapple, cantaloupe melon, water melon, litchi, longan, pomelo, etc.

Major factors in maintaining the quality of fresh produce at harvest and in the post-harvest state, include maturity at harvest, harvesting practices and post-harvest practices. Maturity indices are used to determine appropriate stages of produce maturity for harvesting. While mature produce can fully develop some characteristics such as size, colour, flavour and taste, immature produce may not fully develop such characteristics to meet consumer requirements. Produce harvested at a more mature stage is often susceptible to physical damage, disease and decay.

Proper harvesting and post-harvest handling practices reduce damage and minimize quality loss.

4. Packaging requirements for fresh produce

Packaging must be appropriately designed to maintain the quality and prolong the shelf-life of fresh produce. Fresh produce packaging must:

- be resistant to low temperature storage;
- be resistant to water damage resulting from produce cooling;

- be semi-moisture-proof to minimize weight loss and shrinkage of produce during marketing;
- be strong enough to protect produce from mechanical damage during distribution;
- be able to hold produce in place to prevent abrasion or impact of adjacent produce within the package;
- permit ventilation to dissipate heat resulting from produce respiration;
- have good gas permeability to avoid the risk of metabolic processes which may occur in the absence of oxygen (anaerobiosis), except in the case of modified atmosphere packaging, of which a degree of gas barrier may be essential;
- be biologically and chemically safe as food contact materials;
- be compatible with handling and transport equipment – facilitating the use of new modes of transportation, e.g. air transportation of light fibreboard boxes designed in rectangular shapes for efficient area utilization;
- provide convenience to consumers during marketing and consumption;
- be easily disposable, reusable or recycled.

5. Benefits of fresh produce packaging to consumers

Fresh produce packaging offers a number of benefits to the consumer:

- it reduces waste due to rotting or bruising;
- it extends the shelf-life of fresh produce – this is enhanced by low temperature storage and controlled atmosphere or modified atmosphere packaging;
- it enhances produce appeal – appearance and freshness to consumers;
- it increases convenience to consumers and decreases time required for shopping;
- through branding and proper labelling, it provides consumer confidence in produce quality;
- it increases the availability of produce to consumers, owing to the ability to ship produce from remote production areas to consumers worldwide.

6. Packaging formats for fresh produce

Fresh produce is packaged in either bulk or retail packaging formats.

Bulk packaging is used to facilitate the delivery of large volumes/quantities of fresh produce throughout a supply chain. Bulk packaging protects produce from physical damage and facilitates efficiency in handling and distribution. It is used for handling and transporting fresh produce for various purposes in the supply chain, including for harvesting, storage, wholesaling and also retailing. Design features of bulk packaging include strength, stackability, ease of handling and space utilization.

Retail packaging is a means of preparing fresh produce in unitized (small package) formats for retail markets by pre-packing produce in various forms. Retail packaging facilitates the delivery of individual units of produce for sale to the consumer. The main purpose of retail packaging is to meet consumer requirements for convenience.

The function of retail packaging goes beyond basic containment and protection. Retail packaging also facilitates communication as well as convenience and use. Printing and graphics are an important consideration in the design of retail packaging as a marketing tool for branding and consumer attraction. Retail packages are ready to be displayed in refrigerated cabinets at supermarkets.

7. Packing of fresh produce

Packing is primarily concerned with providing protection from the hazards of handling and distribution. Packing operations are generally conducted in packing house facilities that may be operated by middlemen, distributors, large retailers or exporters.

Fresh produce is susceptible to mechanical damage during handling and transportation. Damage may result from shock, vibration and compression. Shock usually results from drop and impact. Vibration may occur continuously during transportation, but the intensity of the vibration may vary with the mode of transportation. Compression damage occurs primarily during handling and storage.

Various types of cushioning materials are used along with distribution packages to reduce damage and loss due to mechanical injury during handling and transportation. Sheets of newspaper or shredded newsprint are commonly used as a lining material in bamboo and plastic crates (Photo 2.1), and in corrugated boxes. Leaves are also used as a lining material inside bulk containers. Plastic foam netting is commonly used for wrapping individual fruits before filling in corrugated boxes (Photo 2.2) and partitions and pads made of corrugated board are used to accommodate fruits in layers (Photo 2.3).

7.1 Methods of packing produce

- ***Random pack or jumble pack (Photo 2.1)***

This packing pattern refers to filling or packing of produce into containers randomly either by hand or via a filling machine. The quantity is usually based on weight rather than count. This is the most common method of produce packing as it is simple and low in cost. It, however, has the lowest density, which generally causes the greatest degree of produce damage during handling and transportation. Besides, it is the least attractive and uniform pattern. Therefore, this is not commonly used for the packaging of expensive, premium quality produce destined for high-end markets.



Photo 2.1 Random pack or jumble pack pattern

- **Pattern packing or place packing (Photo 2.2)**

In pattern packing, produce is generally placed by hand in a pattern, in the package. Pattern packing generally results in higher density packing as compared to random packing. Pattern packs are less vulnerable to produce damage, are more uniform and are more appealing in appearance. Pattern packing is generally used for relatively expensive, premium quality produce for high-end or export markets.



Pattern pack

Photo 2.2 Pattern packing or place packing

- **Tray or cell packing (Photo 2.3)**

Produce is placed in an individual compartment of a tray or cell stacked in a shipping container. Tray or cell packing offers protection of produce from stacking pressure as well as from impact with each other. However, with its loose packing density and headspace in each compartment, produce could be damaged due to vibration during transportation. Trays are generally made from moulded pulp paper or plastic. Cells are usually formed from corrugated board. Produce should be of uniform size in order to fit properly in moulded tray compartments. The tray pack pattern has become increasingly common for produce packing as it is a simple and convenient system, with an appealing appearance.



Photo 2.3 Tray pack pattern

Chapter III

Packaging in fresh produce supply chains in the Philippines²

1. Introduction

Changing consumer and market demand, trade requirements and the need to reduce losses in horticultural supply chains dictate that greater attention is given to the proper use of packaging in horticultural supply chains in the region. The objective of this study was to review the status of packaging in horticultural supply chains in the Philippines.

To appreciate and understand the agricultural sector in the Philippines, various published articles were referred to. Documented research and studies gave meaningful insights into the current situation of the fresh fruit and vegetable supply, the overall performance of the fruit and vegetable sector, areas requiring improvement, post-harvest practices and growth prospects for the sector. This background provided a good overall understanding of current handling and packaging practices. Visits were made to several provincial wet markets and supermarkets, major “bagsakan” or trading posts and a number of growers, retail vendors, traders, handlers and truckers were interviewed to validate prior knowledge.

A number of resource persons from different institutions including: the University of the Philippines-Los Baños (UPLB) – Postharvest and Seed Science Division, Packaging Research and Development Center (PRDC) of the Department of Science and Technology, Department of Trade and Industry (Philippine Trade Training Center and Bureau of Export Trade Promotions, National Economic and Development Authority – Cordillera Autonomous Region (NEDA-CAR) in Baguio, Municipal Agriculture Office in La Trinidad, DTI-Region 10 Regional Office, and San Miguel Yamamura Packaging Group, contributed useful information in the preparation of this report.

Statistics were obtained from the Web sites of the Bureau of Agricultural Statistics (BAS) and the Bureau of Agricultural Research (BAR) of the Department of Agriculture.

This study on the “Status of packaging in fresh fruit and vegetable chains in the Philippines” surveyed the following:

- trends in fresh produce (including fresh cut) horticultural supply chains;
- marketing channels for fresh horticultural produce;

² Aniceto Abner S. Villahermosa, Packaging Consultant, Philippines

- types, cost, accessibility and availability of packaging materials used in the supply chain and marketing channels;
- in-country programmes to promote the use of packaging in horticultural supply chains;
- regulations that govern the use of packaging within the country and in regional and international export markets;
- traceability issues and packaging;
- gaps that prevail in the fresh produce supply chain.

2. Fruit and vegetable consumption trends

Fruits and vegetables in the Philippines are primarily procured in wet markets. However, with increasing income and with improved purchasing power, produce is increasingly being purchased in supermarkets. Buying decisions of supermarket shoppers are based on the composite influence of price, convenience, safety, packaging, branding and produce quality. Now visibly evident in Metro Manila, the popularity of supermarkets will likely continue to evolve in key urbanizing cities and municipalities nationwide.

The fresh fruit and vegetable sector is challenged to proactively respond to the following consumer trends and to find growth opportunities in the process.

- **Growing sophistication which brings about a greater emphasis on quality, safety and overall wholesomeness of food.**

Changing lifestyles brought about by rapid urbanization, increased purchasing power and more women in the workforce are creating a market of consumers willing to pay for safe, high-quality value-added products. Health and wellness concerns are also overriding factors in food trends. Families will improve eating habits by turning to natural and healthy foods. Fresh fruits and vegetables fit snugly into this trend not only as nutrient sources but also as alternative healthy snack foods.

“Organic,” “naturally-grown,” “traditionally-grown,” “pesticide-free” and similar taglines or unique selling propositions (USPs) will likely be keywords in the market promotion of fresh fruits and vegetables.

- **Increasing number of smaller families and single households**

Trends point toward a growing demand for single-portions and preference for produce packaged in convenient formats. Solo papayas are, for example, preferred over larger sized papayas on export markets. Similarly, smaller varieties of pineapples such as the Queen pineapple produced, in Camarines Norte (Bicol Region in Luzon) may find wide acceptance in markets nationwide.

- **Continuing tug-of-war between value and price**

A good understanding of customer demands and market segmentation will play a critical role in developing market niches for value-added products. With limited disposable income, consumers

will stretch their financial resources in every possible way. They will trade down to lower-priced brands and eat out less. On every possible occasion, they will, however, treat themselves by indulging in small yet affordable luxuries. They will hold on to favourite brands as long as they can. Consumers want to control how they live and how they spend.

Malls and supermarkets are actively balancing value and low cost with the average consumer in mind. The coined word “mallng” means many things other than buying. Supermarkets nurture a “feel-good” atmosphere for meeting friends, enjoying recreation or even just letting time pass. Commonly seen in malls and supermarkets are families spending bonding moments together.



Photo 3.1 Supermarket shopping scenes in the Philippines

Consumers will demand more value for money in the form of high quality produce, assured safety and consistent customer service. To obtain their money's worth, consumers like to be informed more about products they buy, where they are sourced and how they are processed. Package labels and branding are wide-reaching media that are used to communicate relevant messages and information that consumers want to know.

- **Increasing desire for new flavours and variety**

All trends pose both threats and opportunities at the business level. One threat comes from the growing volume of fresh produce imports into the Philippines. Many consumers perceive imported fruits as being of better quality than those that are locally produced. When offered at lower prices in visually appealing packages, Filipino consumers will not hesitate to purchase imported fresh produce.

Imported temperate fruits such as apples, pears, peaches, persimmons, plums, citrus, cherries, litchis from China, Republic of Korea and Taiwan Province of China stand out visually on display shelves in supermarkets and in wet markets across the country. Imports from Thailand such as longan and sweet tamarind packed in paperboard folding boxes also stand out. Photo 3.2 shows examples of fruit imports sold in wet markets in Metro Manila and in the provinces.

Opportunities also come from the growing global demand for the year-round availability of a range of high quality fresh produce items. New markets may be found in countries where Filipino populations exist. These markets can be effective in promoting ethnic or indigenous fruits to mainstream populations of Filipinos. The large number of overseas Filipino workers also brings the need for more choices.



Photo 3.2 Fruit imports sold in wet markets in Metro Manila

- **Brand consciousness of consumers**

Brands that can communicate what they really stand for and show how they can make life easier will earn consumers' trust and loyalty. It should be noted that a brand simplifies the buying process and stays long in the memory of the consumer. It also differentiates suppliers from competition.

- **Growing appreciation for social consciousness and responsibility**

Consumers procure produce from companies that demonstrate concern for their manpower, ecological protection and social commitment. Food processors source their raw materials from domestic growers as their contribution to community development. Nestle has, for example, entered into agreements with Philippine coffee growers not only because this is logistically advantageous but also to improve livelihoods in rural areas. Supermarkets are promoting reusable "green bags" for packaging as their share in solid waste reduction and overall environmental responsibility.

3. Fresh fruits and vegetables produced in the Philippines

Fruits and vegetables are the most dynamic agricultural commodities traded globally. International trade in fruits and vegetables has been growing at a steady pace for over two decades, and has grown by as much as 30 percent since 1990 (Rudyard, 2008).

The Philippines ranked among the world's top 30 exporters of fruits and vegetables (fresh fruits, processed fruits and vegetables, and fruit and vegetable juices) according to a 2004 ERS report. Its foreign trade partners include Iran, United Arab Emirates, Republic of Korea, Singapore, Hong Kong Special Administrative Region, United States of America, Germany, Malaysia, New Zealand, Canada and Japan. These foreign trade markets, particularly Japan, are major export destinations of the country's top fresh tropical fruits, particularly banana, pineapple, mango and papaya.

The large Japanese fruit and vegetable market is an important trade partner not only for Asian countries but also to the rest of the world. Together with the United States, Philippine fresh tropical fruit exports to Japan (mainly banana, followed by pineapple and mango) comprised at least 50 percent of total imports (Dyck and Ito, 2004) into that country.

In 2008, the Philippine crop subsector, which accounts for 47.7 percent of total agricultural production, showed 4.0 percent growth over that in 2007. Palay and corn registered output

increases at 3.5 percent and 2.8 percent respectively. Higher production outputs were obtained for pineapple (9.6 percent), banana (6.1 percent) and sugar cane (22.6 percent). The crop subsector accounted for close to 48 percent of total agricultural production grossing ₱635 billion (at current prices) and grew about 24 percent over 2007 (Bureau of Agricultural Research).

The Philippine agricultural sector accounts for about 20 percent of the country's gross domestic product (GDP) and employs about one-third of the population. It is the bedrock of the rural economy. Of the five identified Super Regions, major agribusiness development will be focused on: (1) North Luzon Agribusiness Quadrangle (NLAQ) and (2) Agribusiness Mindanao.

Top 5 fruits produced

During the period January to June 2008, the Bureau of Statistics (BAS) reported increases in area planted over 2007 at 12.64 percent for pineapple, 3.1 percent for mango, 2.93 percent for calamansi and 1.8 percent for banana.

The top five fruits produced in the Philippines are:

- Banana Generally priority crop in most regions
- Pineapple Generally priority crop in most regions
- Mango High domestic demand. Luzon accounts for 49 percent; exports account for 2-3 percent of world market demand.
- Calamansi Processed into juice drinks and concentrates.
- Papaya Capital intensive; primarily large-scale concentrated in Mindanao particularly in South Cotabato; also grown on a large scale in Southern Luzon particularly in Cavite.



Photo 3.3 Top five fruits produced in the Philippines

Main exports of the Philippines include bananas (Cavendish) and pineapples which are exported by multinational companies such as Del Monte Philippines and Dole Philippines. Vapour heat treated (VHT) mangoes are exported to Japan by companies such as Diamond Starr Agro Products, Hi-Las Marketing, Marsman Drysdale and Dole. Extended hot water treated mangoes (EHWT) are exported to Hong Kong and China by Phil Harvest Agro Marketing Corp., Mabuhay 2000 Enterprise, Fruitful Harvest, Wenatchee Marketing, Sucrex, Flying Horse and Eden Marketing. Dried mangoes are exported by Profoods, Hi-Las, 7-D, AEO and Cebu Legacy.

Top 5 vegetables produced

Two main categories of vegetables are produced in the country:

- Highland or temperate Salad vegetables, e.g. lettuce, tomato, carrots, cucumbers
Other major crops are cabbage, Chinese cabbage, cauliflower, broccoli, potato
- Lowland Eggplant, squash, okra, bitter gourd, string beans, garlic

Some of the highland or temperate vegetables are also grown in the lowlands in limited quantities. Benguet is the major source of temperate vegetables.

The top five vegetables produced are eggplant, tomato, cabbage, onion and bitter gourd.



Photo 3.4 Top five vegetables produced in the Philippines

Issues and concerns

Post-harvest losses

Post-harvest losses across fruit and vegetable marketing chains vary between 20 and 40 percent in the Philippines and are a major bottleneck that must be addressed. These high levels of post harvest losses result largely from inefficiencies in handling, transportation, harvesting, packaging and storage operations.

The more complex, multilayered or fragmented the marketing system, the higher the levels of losses. A reduction in losses would increase the availability of marketable volumes and thereby increase the affordability of produce. Proper post-harvest handling practices, cold chain systems, improved logistics and appropriate transport and packaging systems for fresh fruits and vegetables will contribute greatly to reducing losses and to expanding market reach.

Cost of transportation

Charges for the transportation of fresh produce in the Philippines are based on the number of containers, rather than on the basis of the weight of the produce. For this reason, large containers are used for the transportation of fresh produce. This, however, results in losses owing to compression. Large wooden crates are, for example, used for the shipment of papayas from Mindanao, and large and overfilled *kaing*/bamboo baskets and woven polypropylene (WPP) sacks are used for shipping eggplants from Iloilo (a province in Visayas).

Moreover, fresh produce is often treated as “low priority cargo” in air freight and probably even during sea shipments. Low priority is given to the shipment of fresh produce when compared to tuna (air shipment) and livestock (sea shipment).

Distance to market

Fresh produce farms are generally located in very remote locations and are relatively distant from each other. Transportation of produce to markets, therefore, necessitates high handling and transport costs and incurs spoilage and losses. In Luzon and Visayas, vegetable farming is characterized by smallholdings which are further subdivided into tiny parcels of land planted with various types and varieties. The situation is somewhat different in Mindanao where parcels are bigger and are owned by fewer landowners.

Because fruits are generally perennial crops, harvest for the coming season is, in general, pre-allocated to traders at lower than prevailing market price. This is due to the fact that wholesalers and traders have paid way ahead of time by providing farm inputs like fertilizers and pesticides.

Fresh produce supply chains

A schematic of commodity flows for fresh fruits and vegetables in supply chains in the Philippines is shown in Figure 3.1. Fresh produce all over the country passes either through wholesale vegetable markets or through trading posts where buyers bargain for the lowest price. Numerous small farmers compete for buyers at arm’s length transactions and very volatile daily prices (Concepcion and Montiflor, 2003).

The centre of the supply chain for temperate and lowland vegetables is the wet market which serves as the primary retailer for both the consumer and institutional markets such as supermarkets, fast-food chains, restaurants and hotels.

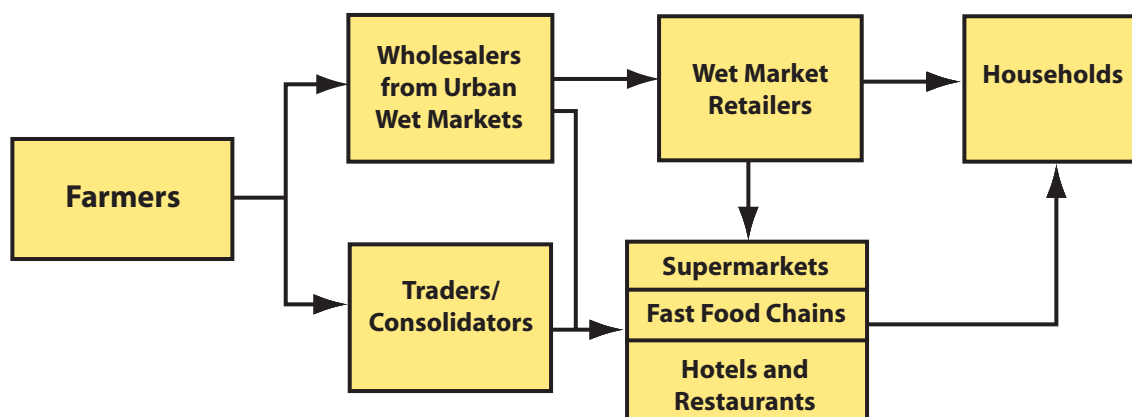


Figure 3.1 Schematic of commodity flows for fresh fruits and vegetables in supply chains

Harvested produce is, in general, either loosely packed onto vehicles, or is packed into large *kaings* which are loaded into jeeps and trucks for transportation. On arrival at the trading post, produce is sorted, weighed and packed into plastic bags, woven polypropylene sacks or reused corrugated boxes as specified by traders, consolidators, wholesalers.



Photo 3.5 Packing and packaging of fresh produce for transportation to wholesale markets

The produce is subsequently loaded onto large trucks for delivery to Divisoria (the mecca of value shopping in Manila) and Balintawak (a fresh produce trading centre located in Quezon city) in Metro Manila and other trading posts and wet markets in lowland provinces, including those in Visayas and Mindanao. On arrival in Manila markets, bulk-packaged produce in large bamboo baskets is repacked into smaller packaging units for retail in other wet markets in Metro Manila and nearby provinces. Once purchased, fresh produce always ends up in plastic bags or is packed into baskets by consumers.



Photo 3.6 Repackaging of fresh produce at wholesale markets for sale to retailers

Vegetables destined for remote areas go through several wholesalers before reaching wet markets. Most farmers are not concerned where or to whom their produce is ultimately sold.

Key players in fruit and vegetable supply chains

Wholesalers, consolidators and traders are key players in fresh fruit and vegetable supply chains. Their main focus is on maximizing profit by providing consistent and reliable supplies of produce. Consolidators and traders who procure produce for institutional markets are becoming increasingly active in trading posts which are generally located in close proximity to wet markets. In some cases, these consolidators and traders sell to institutional markets and procure produce directly from retailers and wholesalers in wet markets.

Farmers/growers and consolidators are increasingly developing closer relationships for the supply of complete lines of vegetables that are demanded by institutional buyers. Supermarkets deal with a very limited number of consolidators for their produce supplies. One or two consolidators

specialize in vegetables and the same number for fruits. Thus, consolidators also source from different farm areas to assure continuous supplies.

In situations where supermarkets make direct purchases, they exercise tight control over the placement and packaging of produce. The cost of shrinkage due to water loss and product spoilage is borne by the supermarket. In some cases, supermarkets lease out space to a vegetable supplier who in turn takes care of the assortment of produce, packaging, stocking, display and all other merchandising activities. Standards and other operating parameters are also imposed by supermarkets.

Grower cooperatives and cluster farming associations currently trade alongside private wholesalers and consolidators. Large growers of fruits from Mindanao have established their own trading areas or booths in Divisoria or Balintawak.

Transportation systems used in fruit and vegetable supply chains

Carts, trolleys, tricycles, jeeps, trucks and vans are used for the collection, handling and delivery of fresh produce to wet markets and trading centres. In remote farming areas, carabaos and horses are the major sources of fresh produce transportation. Fresh produce handling will likely remain a manual operation.



Photo 3.7 Transportation systems used for moving produce to wholesale markets

Shipments from Visayas and Mindanao are now made convenient by roll-on roll-off (RO/RO) vessels that connect Luzon, Panay, Guimaras, Negros Oriental and Mindanao through the so-called strong Philippines nautical highway. As a supply chain solution, RO/RO allows loading and unloading of self-driven vehicles onto the vessels. Gains are in the form of short timeframes between the farm and market, resulting in reduced handling and produce losses. Relatively limited quantities of fresh produce are shipped by air freight.

4. Packaging systems for fresh produce

Bulk packaging

Bulk packaging used for fresh produce transportation includes corrugated boxes, wood crates, bamboo crates or “kaings” and “bayong” (woven baskets). The most widely-used forms of bulk packaging in supply chains in the Philippines are plastic bags, wooden crates, corrugated boxes, sacks and plastic crates. These are now described in terms of their use, price and availability.

Indigenous bulk packaging materials

<p><i>Basic features</i></p> <ul style="list-style-type: none"> • are generally “kaings” made from bamboo and rattan, 20-50 kg capacity; • used for harvesting/collecting; transporting and bulk selling; • used in wet markets and roadside stalls in provinces. 	<p><i>Examples of current usage</i></p> <ul style="list-style-type: none"> • as collection/harvest containers; • for collecting tomatoes for processing; • for the collection of “saba” bananas for processing by fast-food chains; • as display/sale pack for mangoes and small-sized fruits.
<p><i>Supply and Prices</i></p> <ul style="list-style-type: none"> • supply increasingly difficult and are becoming scarce; • no known company supplier; are handcrafted where a concentration of growers exists; • prices ranging from ₱20 to ₱80 a piece depending on size and material; large rattan kaings cost ₱120–₱150/piece. 	<p><i>Prospects</i></p> <ul style="list-style-type: none"> • being replaced by LDPE bags; • suitable for deliveries over short distances; • used as gift packs for fruits such as mangoes



Kaings used for harvest, collection, handling and road-side vending



Photo 3.8 Bulk packaging materials from indigenous materials in use

Wood boxes and crates

<p><i>Basic features</i></p> <ul style="list-style-type: none"> ● good mechanical protection, good stacking height, weight-to-strength ratio, resilient, good ventilation; ● some crates labelled with supplier codes; ● untreated boxes can be contaminated with pests and insects; ● after-use-value for firewood or for repair of broken box parts. 	<p><i>Examples of current usage</i></p> <ul style="list-style-type: none"> ● long-distance shipment of heavy fruits such as pomelo, watermelons, durian, mangosteen, lanzones, and bananas in large volumes; ● shipment of tomatoes from Mindanao; ● exports to nearby countries like Hong Kong, Malaysia and Taiwan; ● reused as retail stands or for firewood.
<p><i>Supply and prices</i></p> <ul style="list-style-type: none"> ● supplied by individuals and from community enterprises; ● no known company supplier; ● growers fabricate to meet own requirements; ● wood is increasingly becoming a scarce resource; ● prices range from ₱15 to ₱40 a piece. 	<p><i>Prospects</i></p> <ul style="list-style-type: none"> ● will likely continue to be used for transportation of heavy fruits; ● wood crates for mangoes may be replaced with corrugated boxes for domestic shipments; ● use declining in export markets owing to importer regulations.



Photo 3.9 Wood crates used as packaging options for fresh produce



Wood crates having a capacity of 70 kg that make use of reused corrugated board (₱4.00/kg) as liners/side panels in the packaging of solo papaya; Growers source wood and assemble crates. Crates cost ₱35/piece. Solo papayas are repacked at trading centres into LDPE bags with newspaper wrap in accordance with buyer specifications.

Woven polypropylene (WPP) sacks

<p><i>Basic features</i></p> <ul style="list-style-type: none"> • poor protection from compression; • capacity of 50 kg; • are often overfilled; • can easily be returned for re-use; • commonly seen in trading centers; • difficult to clean and allow build up of decay 	<p><i>Examples of current usage</i></p> <ul style="list-style-type: none"> • used for produce items such as potatoes, root crops, and small fruits; • used as bulk overwraps for leafy vegetables; • used for the short-distance land delivery of green mangoes, green papayas calamansi (Philippine lemon) and unripe avocados, etc.
<p><i>Supply and prices</i></p> <ul style="list-style-type: none"> • easy to source from local converting companies; • reused sacks are commonly used; • cost about ₱10/piece. 	<p><i>Prospects</i></p> <ul style="list-style-type: none"> • will remain with “overloaders” in provincial areas or for short-distance land deliveries; • may be substituted with plastic bags for orders weighing less than 20 kg; • usage will decrease since transparent bags are, in general, preferred by traders.



Photo 3.10 Use of woven sacks in fresh produce packaging

Raschel bags

<p><i>Basic features</i></p> <ul style="list-style-type: none"> • strong, good ventilation; • referred to as “red bags” in trading centers. 	<p><i>Examples of current usage</i></p> <ul style="list-style-type: none"> • for the packaging of onions and garlic • for the packaging of calamansi.
<p><i>Supply and prices</i></p> <ul style="list-style-type: none"> • domestic supply; • price about ₱12/piece. 	<p><i>Prospects</i></p> <ul style="list-style-type: none"> • packaging of onions and garlic; • packaging of calamansi.



Called “red bags” for onions

Calamansi

Photo 3.11 Use of raschel bags in the bulk packaging of fresh produce



Traders and vendors in Divisoria associate violet sacks with imported garlic and red sacks with imported onions. This practice illustrates the power of colour as brand equity.

Plastic bags

<p><i>Basic features</i></p> <ul style="list-style-type: none"> • poor compression, difficult to clean, allows build up of decay; • good barrier against water; • capacities ranging from 10 kg to 50 kg; • shipping bags are made of LDPE and have poor ability to facilitate exchange of moisture and gases; • shopping bags are made of HDPE. 	<p><i>Examples of current usage</i></p> <ul style="list-style-type: none"> • used mainly for vegetables such as carrots, potatoes, root crops; • LDPE bags are the predominant packaging material for vegetable deliveries from Benguet and nearby provinces to Divisoria; • used for shipping, repacking and retail/ "take-home" purchase.
<p><i>Supply and prices</i></p> <ul style="list-style-type: none"> • easy to source from many converters in Metro Manila; • easy to deliver, freight-efficient; • can be sourced in wet markets from vendors/ packaging traders; • prices: shipper/big @ ₱2.30–₱5.60/piece retail/shopping @ ₱0.20–₱0.50/piece 	<p><i>Prospects</i></p> <ul style="list-style-type: none"> • will be more dominant even for provincial deliveries; • are a preferred form of packaging for traders/ repackers; • may introduce branded deliveries.



Photo 3.12 Use of plastic bags in the bulk packaging of fresh produce



Multipacked okra in LDPE plastic bags in Divisoria

Okra multipacked in plastic netting for export to Japan

Photo 3.13 Packaging formats for okras destined for local and export markets

Corrugated shipping boxes

<p><i>Basic features</i></p> <ul style="list-style-type: none"> • shipping boxes can be customized; • resistant to moisture; this resistance is improved by wax and other chemical coatings; • easily printed and doubles as shelf display, bins, dispensers, carriers, etc.; • made of kraft linerboards and mediums. 	<p><i>Examples of current usage</i></p> <ul style="list-style-type: none"> • large commercial volume for fruits particularly for exports – bananas, mangoes and pineapple; • suitable for high-value vegetables for export; • reused for fruits and vegetables.
<p><i>Supply and prices</i></p> <ul style="list-style-type: none"> • sources concentrated in Metro Manila, Cebu and Davao; • reused box costs ₱5–₱15/box (depending on condition and location); • new box prices range from ₱20 to ₱50/piece depending on structure and volume order. 	<p><i>Prospects</i></p> <ul style="list-style-type: none"> • substitute for wood crates (pomelos) for delivery to supermarkets; • growth hindered by relatively high price, volume orders, availability; • airlines require corrugated boxes rather than wood crates; • as gift packs for fruits.



Mango for export to Hong Kong

Bin at trading center in Baguio

Banana for export

VHT box for mango export

Del Monte box reused for mangosteen

Banana box reused to ship mangoes from Mindanao

Used boxes for resale

Photo 3.14 Use of corrugated shipping boxes in the bulk packaging of fresh produce

Regular slotted containers (RSC) and full telescopic containers (FTC) are two of the most popular shipping carton structures. RSC is most simple and the lowest-cost box style. However, the RSC has relatively low stacking strength when compared to the FTC which actually consists of one box inside another. In some instances Bliss box is constructed with three different pieces for maximum stacking strength. Corrugated fibreboard containers are shipped to the packer in the flat form and are assembled at the packing house.



18.41 kg (40 lb) FTC; Bottom box is double-walled. Top cover is top white linerboard. Mandatory label information such as the batch code and handling instructions are included on the label.



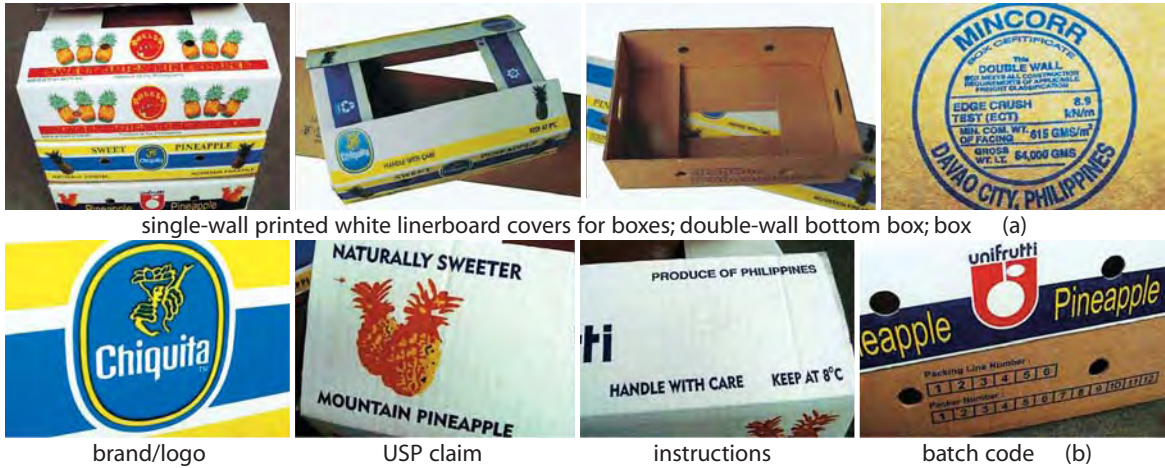
4.7 kg and 7.2 kg FTC; Bottom box for 7.2 kg is double-walled while for 4.7 kg is single-walled. Side panels include USP claims such as “fresh and sweet” and “natural health”.

Photo 3.15 Boxes used in the packaging of bananas showing special features of design and labeling



17 kg; 200-test, partitioned, wet-strength boxes, with ventilation holes covered with nylon mesh, with or without foam padding for the packaging of vapour heat treated mangoes.

Photo 3.16 Boxes used in the packaging of mangoes, highlighting special features



single-wall printed white linerboard covers for boxes; double-wall bottom box; box (a)

brand/logo USP claim instructions batch code (b)

Photo 3.17 Boxes used in the packaging of pineapples, highlighting special features of labelling and branding

Plastic crates

<p><i>Basic features</i></p> <ul style="list-style-type: none"> • commonly produced using HDPE or polypropylene (PP); • best for closed returnable system • hygienic and easy to clean; • usually nestable and stackable; • long reusable life/highly recyclable; • often times recommended by post-harvest studies. 	<p><i>Examples of current usage</i></p> <ul style="list-style-type: none"> • widely-used container in pack houses and processing plants; • high-value vegetable deliveries to supermarkets, hotels, restaurants; • retail display trays; • deliveries to consolidation centres.
<p><i>Supply and prices</i></p> <ul style="list-style-type: none"> • stock crates are retailed; • proprietary crates require mould payment at about ₱1 million; Minimum order volume at 5 000 pieces; • use of recycled material lowers price; • price range: ₱250–₱300/piece. 	<p><i>Prospects</i></p> <ul style="list-style-type: none"> • limited use as containers for fruits and vegetables; • crates are offered on lease by the San Miguel Cooperation.



Photo 3.18 Use of plastic crates for the bulk packaging of produce

Successes achieved with the use of plastic crates for bulk packaging

The horticulture community in the Philippines has done its part in training, research and development nationwide. Despite its limited resources both in terms of manpower and finances, the community has published various articles on increasing yield, improving varieties, developing pest-resistant plants and improving post-harvest practices for specific fruits and vegetables. Packaging innovations, however, continue to lag behind innovations in fresh produce supply chains. Reasons for this lag include continuing resistance to innovations, rigid or self-serving attitudes among supply chain players, lack of market information and insensitivity to changing consumer preferences. These problems are compounded by the inadequacy of farm-to-market roads and unavailability of cold storage facilities.

The resistance to adopting innovations among farmers is not without reason. Farmers are competent in production rather than in marketing. Farmers/growers expect the cost of packaging innovations to be borne by traders and consolidators who they perceive to be deriving the largest percentage of profit.

San Miguel Packaging Specialists Inc. (now known as San Miguel Yamamura Packaging Group), in 1995, presented its leasing crate arrangement programme to producers and distributors nationwide as part of its Total Packaging Solution strategy. This marketing strategy was based on the high initial costs of the purchase of plastic crates coupled with the fact that plastic crates are the most economical shipping container over the long run for closed distribution systems.

Farmers interviewed in Benguet during this survey, were not interested in plastic crates because of their high cost. Fully aware of high losses, farmers were pleased with the use of *kaings* and plastic bags which they could overload to maximize space during transportation and delivery.



Photo 3.19 Packaging and transport systems used in traditional fresh produce supply chains

A lettuce grower of Mount Moriah Farms in Bukidnon, Cotabato in Mindanao, recognized the need for the use of plastic crates to maintain produce quality during shipping.



Photo 3.20 Packaging and transport systems used in a modern supply chain for lettuce

Mount Moriah Farms, therefore, entered into the leasing of crates (with an option to purchase) with San Miguel, a packaging company. The former paid on a per-trip basis, while San Miguel retrieved the crates in Metro Manila and shipped them back to Bukidnon. The arrangements worked perfectly despite the fact that the supply chain was not really a “closed” system. Today, Mount Moriah is well accepted as a reliable lettuce supplier for Metro Manila fast-food chains. The company now owns 10 000 plastic crates. It has also partnered with consolidators for supplying supermarkets.

NorMinVeggies (Northern Mindanao Vegetable Producers’ Association)

NorMinVeggies (Northern Mindanao Vegetable Producers’ Association), a “cluster farming system” is another success story. Originally comprising small farmers to supply local wet markets, the cluster now ships about 50 metric tonnes of high-value, semi-temperate vegetables weekly to major fast-food chains, supermarkets and hotels in Cebu and other cities in the country. The cluster was closely assisted by the Department of Agriculture and USAID’s Growth with Equity in Mindanao (GEM) Program. In conformance to Good Agricultural Practices (GAP), NorMinVeggies makes use of plastic crates in its supply chains to assure delivery of quality produce.

Retail Packaging

Retail packaging in wet markets

Retail packaging in wet markets is largely done by vendors. Plastic bags are packed with pre-weighted quantities of small-sized produce such as tomatoes and calamansi. Rubber bands are used in unitizing selected produce items such as string beans and petsay (pak choi). Pre-cut vegetable mixes are packed in plastic bags while pre-sliced fruits are packaged either in plastic bags or in cling-film overwrapped styrofoam trays.



Photo 3.21 Retail packaging formats used in wet markets in the Philippines



Photo 3.22 Retail sale and packaging of fresh produce in wet markets in the Philippines



Photo 3.23 Green bags used for the packaging of sweet Japanese corn in Laguna

Retail packaging in supermarkets

Retail packaging is done on-site in most supermarkets to assure fresh produce quality. While still in the process of setting standards and strengthening their supply networks, supermarkets in the Philippines are likely to delegate retail packaging to their consolidators in the coming years. Manually perforated plastic bags (mainly low density polyethylene) are used for the multipacking of vegetables and fruits. Eggplants, bitter gourds and cucumbers are sold in packs of three or six. Lettuce, cabbages, string beans, bananas, tomatoes and other seasonal fruits are cling-film wrapped with or without styrofoam trays. Pre-cut salad mixes and pre-sliced fruits are commonly packed in film overwrapped styrofoam trays. Branded salad mixes in printed flexible packs are slowly being introduced on supermarket shelves but volumes are still very limited.

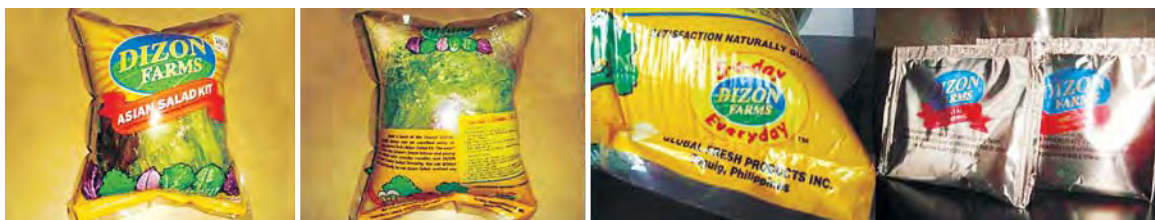


Photo 3.24 Branded salad mixes packaged in printed flexible packaging

Retail packaging for export

By and large, packing houses have yet to consider retail packaging in the true sense of the word. The labelling or tagging of individual fruits with stickers is, however, gaining popularity. With the exception of clear cling film, all materials for retail packaging are produced by converters based in Metro Manila and are distributed nationwide by wholesalers and vendors in trading centres, supermarkets and wet markets.

With the exception of okras shipped to Japan, relatively little is done on retail packaging for export. Retail packages of okras destined for the Japanese market consist of plastic nets (imported from Japan) as multipacks with label headers made from paper. The plastic nets are, however, imported from Japan.



Photo 3.25 Retail packages of okras for export

Thermoformed plastic trays, clamshells and cups

<p><i>Basic features</i></p> <ul style="list-style-type: none"> • made primarily out of polystyrene; other materials are polypropylene (PP) and polyvinyl chloride (PVC); • expanded polystyrene (EPS), usually referred to as styrofoam, is popular; • relatively easy to source; • retailed by packaging traders and supermarkets. 	<p><i>Examples of current usage</i></p> <ul style="list-style-type: none"> • on-site retail packaging of pre-cut vegetables and sliced fruits in trays which are cling-film overwrapped seen mostly in supermarkets; • domestic interest remains lukewarm as retail/ individual fruits packaging.
<p><i>Supply and prices</i></p> <ul style="list-style-type: none"> • easy to source in retail volumes; • at least 3 major suppliers in Metro Manila; • proprietary design mould payment @ ₱50 000/set; • price range: ₱1.50–₱2.00 for cups; ₱2.00–₱3.50 for trays; for EPS trays depending on size. 	<p><i>Prospects</i></p> <ul style="list-style-type: none"> • use will grow with fresh-cuts; • perfect use as convenience packs for niche markets; • a good option for fresh strawberries and export mangoes.



Usually made of polystyrene in clear clamshell, trays or expanded also called “Styrofoam” white or colored trays



Photo 3.26 Plastic trays and clamshells used for the retail packaging of fresh and fresh-cut fruits and vegetables in the Philippines

Paper and paperboard

<p><i>Basic features</i></p> <ul style="list-style-type: none">• common paper stocks used are sulphate, sulphite, grease-proof, glassine, tissue, chipboard, clay-coated boards.• surface treatment to improve properties includes waxing, lamination, varnishing.	<p><i>Examples of current usage</i></p> <ul style="list-style-type: none">• as labels, tags, folding cartons;• better used in the processed food sector.
<p><i>Supply and prices</i></p> <ul style="list-style-type: none">• few large companies but numerous medium, small and specialty ones;• minimum volume orders vary from small to large depending on suppliers;• box prices (₱10–₱15/piece) depending on type of material, size, surface treatment, print quality, etc.;• sticker labels: ₱0.25–₱0.75/piece.	<p><i>Prospects</i></p> <ul style="list-style-type: none">• no application as shipping packages for fresh fruits and vegetables;• can be used as carriers for light-weight loads.



Photo 3.27 Moulded pulp trays with potential use in the packaging of strawberries

Some years ago, a company was trying to introduce moulded pulps (right) for domestic applications. One of the target markets was fresh produce particularly strawberries. This packaging format was not adopted owing to the high price.

Limited growth in retail packaging will likely take place in the future. This growth will hinge greatly on how rapidly supermarkets increase from their current share of 5 percent of fresh produce total sales. The National Capital Region will likely be the main source of growth for retail-packaged fresh produce sales.

Cushioning/wrappers/liners

Partitions and liners are often used in order to protect produce from shock and vibration within the package. Cushioning materials used in fresh produce packaging for the domestic market include leaves, rice stacks, newspaper and plastic bags.



Photo 3.28 Cushioning materials used for the packaging of fresh produce for the domestic market

Manila paper, tissue paper, foam, kraft liners and paperboard partitions are used to immobilize produce destined for export.



Photo 3.29 Cushioning materials used for the packaging of fresh produce for the export market

Labelling

Produce labelling is not practically feasible particularly in wet markets owing to current retail and display practices. In some cases, suppliers stick labels on individual fruits or fruit bunches or pack vegetables in labelled plastic bags, thereby mobilizing packaging as a marketing tool. Labelling of this type is also common in supermarkets. Shipping packages such as plastic bags, woven polypropylene (WPP) sacks and wood crates are rarely labelled. Corrugated boxes are the only form of bulk packaging that is properly labelled.



Photo 3.30 Presence and absence of labels on different types of bulk packaging

Minimum labelling requirements for consumer food products in the Philippines are summarised in the Table below.

<p><i>Per Consumer Act and BFAD (Bureau of Food and Drugs)</i></p> <ul style="list-style-type: none"> • product name • net content declaration • ingredient list • name and address of manufacturer, packer or distributor • country of origin • expiry/best before (for selected products) • brand name, trademark 	<p><i>Example: fresh broccoli as recommended by BPRE</i></p> <ul style="list-style-type: none"> • name of product • grade • name and address of grower or supplier • net weight (kg) • pesticide residues (per Codex) • country of origin 	<p><i>Example: Guimaras mango for export to United States and Australia</i></p> <ul style="list-style-type: none"> • name of product • net weight • name of grower, barangay, municipality (using codes) • box number • date of packing • name of PQS signing officer
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Exporters must comply with labelling laws of importing countries for additional mandatory information such as chemical residues and pest infestation. Handling, stacking and storage instructions must also be printed on corrugated boxes for shipping. Many importing countries also require that bar codes are printed on shipping containers.

Below is a good example of a well-labelled shipping box for Cavendish banana exports from the Philippines.



Photo 3.31 Details of labelling on a shipping box for Cavendish banana exports

Sources of packaging materials in the Philippines

The Philippine packaging industry supplies major packaging materials such as glass containers, metal cans, closures, plastic bags, flexible packages (which are made of single materials consisting of combinations of paper, films, and foil), plastic crates, trays, bowls, cups and pallets, corrugated boxes, paper, paperboard, woven polypropylene (WPP) and raschel sacks.

Packaging converting plants are largely concentrated in the Metro Manila area. Few are located in nearby provinces of Laguna, Cavite and Batangas. Despite the number of packaging facilities in Metro Cebu, packaging users in the Visayas continue to source their packaging requirements from Metro Manila. In Mindanao, corrugated box makers primarily supply requirements for the packaging of banana and pineapple exports.

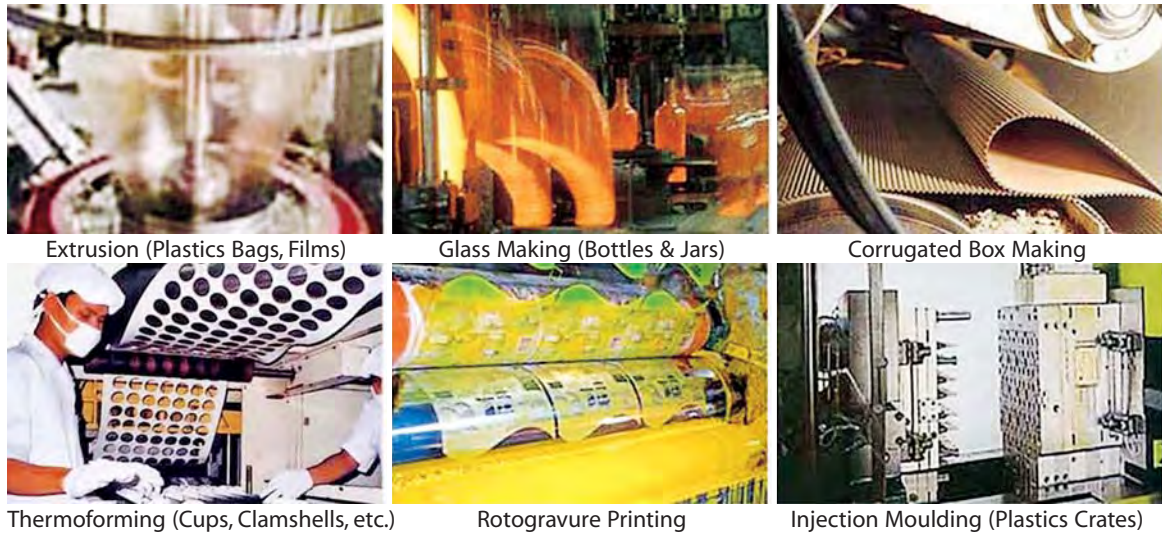


Photo 3.32 Packaging materials produced in the Philippines

About 60 percent of the materials used in the production of packaging materials, such as plastic resins, paper and paperboard, pigments, glues and other additives and converting machinery and equipment are imported. Some packaging materials such as glass, metal cans, flexibles, plastic nettings, plastic bottles, tubes and jars are sourced from overseas markets despite the availability of local supplies. Reasons for this include lower price, more variety and consistency of supply.

The Philippine packaging industry was valued at roughly ₱100 billion (US\$2 billion) or about 1.15 percent of national gross national product in 2008. Its largest industry client is the food sector which consumes about half of its output. Other major industry clients are the beverage, pharmaceutical and personal care sectors.

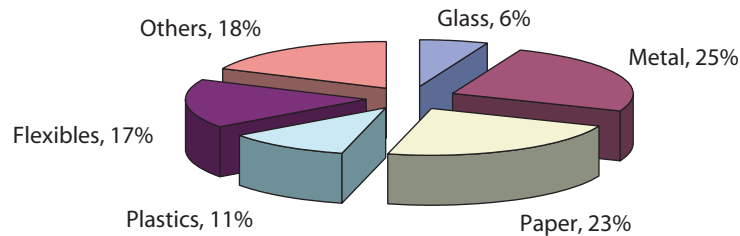


Figure 3.2 Philippine packaging market (2008)

Best estimates on packaging mix show metal packaging claiming 25 percent share of the industry output, followed by paper-based packaging at 23 percent. Large clients of metal-based packaging are processors of fish and meats, dietetic products, paints, beverages and beer and soft drinks. In recent years, domestic paper-based packaging users pursued cost reductions through down gauging or the use of lower-weight paper and plastics.

Flexible packaging materials, plastics and glass follow at 18 percent, 11 percent and 6 percent respectively. Consistent with global trends, flexible packaging films are the fastest growing segment with bags, pouches and sachets. Plastic bags are widely used for fresh produce packaging. Rigid plastic packaging dominates in the personal care industry and as shipping crates for beer and soft drinks. Collectively, other packaging materials account for 17 percent, including indigenous packaging materials such as *kaings*, wood crates, sacks and reused materials.

Glass containers remain unchanged as packaging for beer, alcoholic spirits and heat-processed fruit and vegetable preserves. Fruit juices and flavoured drinks are retailed in various packaging formats such as glass bottles, plastic bottles and flexible stand-up pouches. Bottled water is the domain of polyethylene terephthalate (PET) bottles.

Few large packaging converters dominate the packaging material sectors. Converting plants are located mainly in Metro Manila which accounts for about 65 percent of the consumer market. Where there is a concentration of demand, converting facilities follow. Large volume demands of Del Monte, Dole and other large exporters of pineapple and bananas in Mindanao have resulted in the establishment of in-house or commercial corrugated box making facilities. Box makers serving Mindanao are Mindanao Corrugated (a San Miguel), Davao Packaging Corporation and Steniel Manufacturing.



Photo 3.33 Different types of packaging produced in the Philippines

Leaders in the different packaging material sectors in the Philippines are:

- Plastic crates – Mainly plastics: San Miguel Yamamura (San Miguel), Plastimer Corporation, Plastech
- Flexibles – Leading plastics bag suppliers:
For fresh produce are GoldTop Plastics, Asian Plastics Center (Calypso) and Pagoda Plastics;
For processed goods, Rightpak Intl (San Miguel), Flexo Manufacturing, Bonpack Gilvan, Daibochi, Imports (for fast-moving consumer goods)
- Corrugated boxes – San Miguel Yamamura, Mega Pack, Malinta Packaging, Valenzuela Packaging, Cavite Packaging, *Serving the Mindanao box requirements* are Mindanao Corrugated (San Miguel), Davao Packaging Corporation (DAPACOR) and Steniel Manufacturing.
- Paper/paperboards – Printwell; other numerous suppliers of labels and folding carton boxes as the segment is highly fragmented.
- Glass containers – San Miguel Yamamura, ABI, Imports
- Metal containers – Oriental, Century, PhilCan

There are no known listed suppliers of *kaings* (made of bamboo or rattan) and wood crates. These are locally sourced where there is a concentration of fresh fruits and vegetables for sale. *Kaings* are generally supplied by farmers/growers, traders and enterprising individuals.

Packaging supply issues and concerns

Some of the nagging complaints from packaging users include:

High cost: The cost of packaging is a major constraint cited by small enterprises whose volume demands are often below economies of scale. Having strength in price negotiations, large packaging buyers always get the best terms and can resort to importation when local prices are unacceptable. Still, the high cost of packaging remains an issue.

Non-availability of supply: There are basically two hurdles to accessing fresh produce packaging in the Philippines. One is the minimum volume order required to justify production. The other is the logistic delivery of goods. As most converters are heavily concentrated within the Metro Manila area, shipments must fill a truck or van to make delivery economical.

Furthermore, some packaging users have experienced difficulties even in asking for price quotations. Presumably, when the volume is not interesting, the response of the packaging supplier is lukewarm.

Key complaints of packaging suppliers:

Packaging buyers are “too focused”: It is understandable that packaging buyers will source from suppliers offering the lowest price. Low price does not necessarily mean cost-effectiveness. Quality performance by reducing damage and spoilage must also come into the formula for computing total overall costs. Consistency of quality, reliability of supply and customer service must also be factored into the supply selection process.

Limited market demand: This is the response of packaging suppliers to packaging users’ complaints about non-availability of supply. In the past, there were efforts by packaging suppliers to put up supply satellites by themselves or through trading companies in strategic provinces. Success was achieved on a very limited scale.

High cost of research and development: While a few large packaging companies venture into joint packaging development projects with their select clients, initiatives of this type are more an exception than a rule with small producers. Without guarantees of volume and protection, interest in packaging research remains low. Many experiences of packaging suppliers in the past have been painful. After spending on research, prototype preparation and field testing, packaging suppliers are left empty handed after the first order because the packaging buyers source from other suppliers owing to low price.

The problems and concerns expressed by both packaging buyers and suppliers are not easy to understand and accept. This is one wide gap that needs creative solutions and cooperative implementation.

Against this realistic scenario, it is interesting to know that the packaging industry sees the fresh fruit and vegetable sector as an opportunity for growth.

Likely future packaging scenarios in the Philippines

- *Plastic bags* will dominate as shipping, repacking and retail packages for domestic shipments in view of their low cost, freight efficiency and widespread availability. As plastic bags begin to be used as substitutes for woven polypropylene (WPP) sacks, their demand will likely continue to increase.
- *Corrugated boxes* will find growth with increasing exports and as replacements for wood crates for high-volume and long-distance domestic shipments of fruits such as tomatoes, watermelons and green papayas.
- *Plastic crates* have yet to be accepted as economic shipping containers to augment their current share in the packaging of high-value vegetables and in processing plants. Growth of plastic crate packaging will likely continue with developments in the cold chain and with the adoption of GAP by farmers/growers.
- *Wood crates* will be primarily used for the long-distance shipment of heavy fruits, and for tomatoes, where the supply of corrugated boxes is not accessible.
- *Kaings* will continue to be used. Their use will, however, be limited to packaging for short-distance delivery to wet markets and roadside vendors and as harvest/collection containers.

- *Mixed loads* will dominantly consist of plastic bags, reused corrugated boxes and wood crates.



- *Retail packaging* will remain at a very low level both for domestic and export markets. Most retail packaging will be done at/or for supermarkets.

Regulations that directly or indirectly influence packaging

The “Consumer Act of the Philippines” (RA 7374) seeks to protect the general interest and health and welfare of consumers. This Act is implemented by the Department of Health which is also tasked with the establishment of standards and quality measures for food and with the adoption of measures to ensure a pure and safe food supply. In accordance with this Act, provincial, municipal and city governments shall regulate the preparation and sale of fresh fruits and vegetables and other foodstuffs for public consumption.

The use of packaging for transportation and marketing of fresh fruits and vegetables for domestic consumption in the Philippines is currently not regulated. Attempts have, however, been made in the past to ban the use of plastic shopping bags and expanded polystyrene (or better known as Styrofoam) disposable cups, clamshells and trays. The Provincial Council of Lanao Norte (Reg. 10 Mindanao), for example, passed a resolution on 17 February 2009 requesting its 22 municipalities to research, develop, promote and use indigenous materials available in its localities for packaging. The resolution intends to regulate, if not prohibit, the use of plastic bags (Mindanao Current, February 2009).

In-country programmes to promote use of packaging in horticultural chains

Fresh fruits and vegetables are produced in the Philippines on small and scattered farms. The primary aim of production is to sell produce to the wet markets the earliest time possible. Fresh fruits and vegetables are, therefore, shipped in packaging materials that are readily available. The farmer’s day is over once his produce is purchased by a wholesaler, consolidator or trader at a “bagsakan” or trading post. The wholesaler sorts, weighs and packs ordered quantities and loads the produce onto trucks. The journey begins and trading begins at another *bagsakan*. Produce purchased by vendor-retailers end up in the bags and baskets of consumers.

In its simplest form, fresh produce marketing is a “daily” activity. Tomorrow is a repeat of today. Consumers are able to identify quality. Consumers will often pay a higher price for added value. In the consumers’ mind, the tug of war between low cost and value is heating up. Striking the correct balance is one challenge which needs active response from stakeholders in fresh produce supply chains.

The task begins with the perceived high losses which are estimated to range between 20 percent and 40 percent. A reduction in losses would increase the availability of marketable volumes and thereby increase the affordability of produce. The next step is to upgrade produce quality. Home-grown fruits when displayed alongside imported fruits, suffer from poor overall visual appeal. Proper post-harvest handling practices, cool/cold delivery systems and appropriate packaging and transport systems will contribute greatly to expanding market reach.

These twin tasks can be addressed mutually by rationalizing the roles of packaging in the supply chain beyond its delivery and shipping functions. Packaging must address issues in consumer-based marketing to perk up consumption by communicating relevant information through labelling, branding and industry promotion. The need to make consumers feel good and safe cannot be overemphasized.

Many initiatives have been pursued by governments assisting agencies, cooperatives, industry clusters and foreign-funded institutions. Documented and published studies and reports on specific fruits and vegetables recommend the planting of high-yielding varieties, upgrading post-harvest practices, extending produce marketable life, establishing market linkages and developing appropriate packaging.

Jointly with farmers and suppliers, extension workers have tested and implemented recommendations on model farms and packing houses prior to commercial or full-scale implementation. Some recommendations have been adopted. Others go to the reference archives. Nevertheless, extension workers just keep on going even if rewards come after several modifications and re-testing. Patience seems to be their common virtue.

Research and development studies on fruits and vegetables are largely concentrated on high-value crops, particularly those intended for export. Mangoes, bananas, and pineapples have received attention from both the government and private enterprises. Those fruits and vegetables which contribute to the livelihoods of many small farmers nationwide are, however, often neglected. More importantly, they are the ones needing most assistance from the government and assistance institutions.

Agencies associated with fresh produce packaging

This section briefly describes studies, programmes and projects extended by government agencies, academic and private institutions in the Philippines.

Postharvest and Seed Science Division, University of the Philippines-Los Baños

Formerly known as the Postharvest Training and Research Center (PHTRC), UP-Los Baños in Laguna, the division has been active in post-harvest training and development of specific fruits and vegetables intended for domestic markets. The institution boasts post-harvest technologists and practitioners who are highly academically trained (most with doctoral degrees) and well-experienced in the practical application of post-harvest technology. It has published research studies, training materials and textbooks. Recommendations on appropriate packaging form part of these post-harvest handling projects. UP-PHTRC has developed ethylene gas absorbers for fruits, vegetables, cut flowers and ornamentals.

Department of Agriculture (DA)

The Department of Agriculture (DA) conducts various projects primarily aimed at increasing production. Much of its research and many of its projects involve agricultural applied science, building infrastructure such as cold storage facilities, expanding market outlets and overall policy-making.

National Mango Research and Development Center

As part of the Bureau of Plant Industry (BPI), the National Mango Research and Development Center in Jordan Guimaras took the lead role in the collaborative development of mangoes for export to the United States.

Packaging Research and Development Center (PRDC)

The Department of Science and Technology (DOST), through its Packaging Research and Development Center (PRDC), is currently pursuing packaging development for specific fruits. DOST is equipped with facilities for shelf-life testing, package design and toll packing.

PRDC is the packaging development resource in the Philippines for small and medium enterprises. Its aim is to develop generic packaging for a wide range of produce. In the process, PRDC is developing pseudo-standards which could become official packaging standards in the long term.

Growth for Equity in Mindanao (GEM)

Other assistance agencies are focused on strengthening the competitive positions of small farmers by organizing associations, industry clusters and consolidating supply to enable them to negotiate sales as a group. Funded by USAID, GEM has reported successes in development projects which benefited farmers involved in mango, durian, banana, mangosteen, rambutan and lanzones. Challenging Luzon produce suppliers, Mindanao is now making its presence felt in the supply not only of fruits but vegetables as well. Plastic crates are now more visible in the area as collecting, distribution and shipping containers.

Trucking and freight community

The trucking and freight community is also contributing to the movement of fresh produce. For example, half-load container shipment and refrigerated vans are being promoted to enhance trade among suppliers nationwide. RO/RO facilities are overcoming hurdles by facilitating land and sea travel with minimum handling.

Packaging industry

While efforts are being made by the packaging supply sector, more needs to be done to overcome issues of economies of scale. Suppliers of packaging are largely concentrated in Metro Manila. More needs to be done to make packaging, other than plastic bags which are freight efficient and low cost, more conveniently available to end users. San Miguel Yamamura continues to promote its leasing arrangements for plastic crates to the fresh produce supply chain. Corrugated box makers serving fruit exporters are working on new cost-saving structures that include the production of boxes which double as display and shippers as well as the conversion of shipping boxes to look

like retail packages. In general terms, however, the packaging supply sector must proactively initiate new packaging ideas and innovations to smooth the rough edges of the supply chain.

5. Conclusion

The development of packaging is an evolutionary process that responds to changing lifestyles and consumer preferences. The objective of packaging development for fruits and vegetables is to come up with packaging materials and packaging systems that will: (1) protect product quality effectively so as to avoid loss and spoilage; (2) market products efficiently; and (3) source materials economically.

Given the perishable nature of fruits and vegetables, stakeholders in fruit and vegetable supply chains must collectively pursue packaging programmes, to reduce spoilage and losses and to enhance the value of produce.

The fresh fruit and vegetable sector in the Philippines must transform itself from being production-based to being market-driven. At the retail level, consumers do not only buy low-priced produce. Their purchase motivators are many and include quality, convenience, safety, hygiene, branding and ecological friendliness, among others. Consumers must be confident of the safety and quality of the goods they procure.

The selection of retail packaging is truly dictated by the dynamics of the marketplace. Package converters cannot dictate material usage to the buyers of packaging. They can, however, influence the selection of packaging by making packaging materials available.

In the Philippines, there is a need to narrow the gap between package supply and current demand particularly in rural areas. But the greater challenge is to introduce packaging that not only conforms to mandatory regulations but also helps increase fresh fruit and vegetable consumption. In this regard, packaging converters must be sensitive to emerging consumer and industry trends to enable themselves to proactively introduce new and innovative packaging for transport and retail. They should not limit themselves to order taking. Instead, packaging converters should take an active role in strengthening the supply chain.

Economies of scale continue to constrain packaging converters, trucking and shipping companies in responding efficiently at low cost. Moreover, the lack of labelling and produce branding leaves retailers and consumers fully reliant on sensory attributes as quality measures. This practice slows down the buying process.

Plastic bags are the most widely accepted shipping containers for vegetables in the country. Wood crates will likely be dominant for large-volume, long-distance deliveries of heavy fruits and for tomatoes. As the packaging choice for the export of mangoes, pineapple and bananas, corrugated boxes will find new markets for the domestic shipment of pomelos, mangoes and other high-value or novelty fruits. Plastic crates will be the choice for deliveries to supermarkets, processing plants and fast-food chains using cool/cold facilities. Growers/suppliers aligning with GAP will also continue to make use of plastic crates.

As to the supply chain players, they have yet to appreciate and understand what consumer marketing is. Hopefully, the influences of supermarkets in terms of clean and hygienic practices and packaging will impact on wet markets which will continue to account for more than 90 percent of fresh fruit and vegetable sales.

Resource persons

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- Dominica Cachero, trader, La Trinidad Vegetable Trading Post
- Felicitas Ticbaen, Municipal Agriculturist, La Trinidad, Benguet
- Janet S. Balicdang, Processing and Packaging Center, La Trinidad, Benguet
- Gina Cagusin, Supervising Economic Development Specialist, National Economic Development Authority-CAR (Cordillera Autonomous Region), Baguio City
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- Edita P. Molato, Group Marketing Manager, Sales and Marketing Directorate, San Miguel Yamamura Packaging Group, Mandaluyong City, Metro Manila
- Lolita A. Reyes, Sales Services Manager, Sales and Marketing Directorate, San Miguel Yamamura Group
- Zita Abellare, Trade and Industry Development Specialist, Provincial Office-Department of Trade and Industry, Guimaras
- Liz Tagaylo, Senior Trade and Industry Development Specialist, Regional Office-Region 10 Department of Trade and Industry, Cagayan De Oro, Misamis Oriental
- Genesis Lucenda, photographer, Quezon City, Metro Manila
- Wholesalers, traders, handlers, truckers in La Trinidad, Divisoria, Balintawak and wet markets in Cagayan De Oro (Misamis Oriental), Tagbilaran City (Bohol), San Jose (Antique), Legaspi (Albay), Imus (Cavite)

Chapter IV

Packaging in fresh produce supply chains in Thailand³

1. Introduction

Packaging is very often critical to the success or failure of a horticultural supply chain. Changing consumer habits, market demand, trade requirements and the drive to reduce losses have resulted in major advances in the use of packaging in horticultural supply chains in recent times. These advances focus on ease of handling, ease of distribution, loss reduction, preservation of quality, promotion of safety, and can even modify purchasing habits of consumers. Improved packaging technology can greatly contribute to improving the efficiency of supply chain management and increase returns for producers and retailers while delivering top quality fresh produce to the consumer.

This report focuses on Thailand's use of packaging in supply chains for fresh produce, current practices and the adoption of new technology. The aim of this study is to provide a comprehensive survey of the status of packaging for fresh produce in horticultural supply chains. The content of this report is based on field surveys, interviews with supply chain stakeholders and experts, references from available sources as well as the author's experiences.

1.1 Fresh produce supply chains

A supply chain is defined as the movement of materials involving activities, information, and resources from a source to an end consumer. Supply chain management refers to the coordination and alignment of activities and processes of materials, financial and information flows. Supply chain management aims to minimize waste and achieve cost reductions while maximizing overall value. Packaging is important at every step in the supply chain, from farm to shelf.

Fresh produce supply chains are concerned with produce of a short shelf-life and which are highly susceptible to temperature extremes that greatly impact on quality. Proper packaging systems considerably help to reduce damage and maintain produce quality while facilitating the ease of distribution of produce.

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Fresh produce supply chains include a number of stakeholders and vary in accordance with location as well as produce type. Several different supply chain models exist for the marketing of fresh produce in Thailand (Figure 4.1).

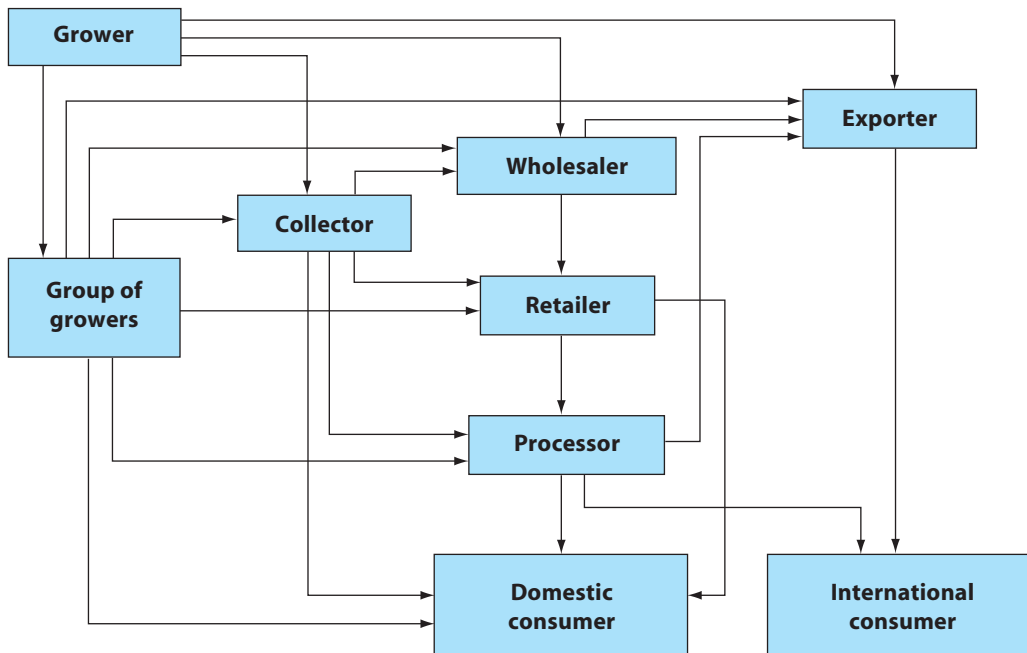


Figure 4.1 Supply chains for fresh produce in Thailand

Stakeholders in fresh produce supply chains include growers, middlemen, wholesalers, retailers and consumers. The roles and functions of these stakeholders are now described.

Group of growers or farmers

Individual growers in Thailand may own or rent small tracts of land for growing produce. Groups of growers or contractors may also come together to form a union, in order to benefit collectively rather than individually. Growers’ unions are very popular in Thailand. They are generally location specific and in some cases can be crop specific.

Growers’ unions range in size from the “muban” formed at the village level, which is the smallest growers’ union, to the “tambon” formed at the subdistrict level, the “amphoe” formed at the district level and the “changwat” which is the largest union formed at the provincial level. The main objective of growers’ unions is to represent all of their members. Growers’ unions are, in general, managed by a committee selected from members by members. In addition to representing their members, growers’ unions serve many different functions including but not limited to collection, wholesaling, retailing and in many cases processing of produce. However, most growers’ unions in Thailand function as collectors and may be contacted or contracted by other parties including exporters.

A contractor may form a group of growers that could consist of any of the parties involved in the supply chain (collector, wholesaler, retailer or exporter, or even processor). Agreements between contractors and growers (or a group of growers) can be made either verbally or in the form of written signed documents.

Advantages of group formation by growers include: reduced cost of agricultural supplies; increased negotiating power; and increased access to agricultural technology and practices. Contractors benefit by being able to manage and assure the quality and quantity of fresh produce available for marketing, as well as the agricultural practices applied from production through to post-harvest.

Collector

Produce is transferred from the grower to the next stakeholder in the chain who may be a collector, middleman, broker, distributor or packer. These stakeholders share a similar function in collecting harvested produce from each grower or group of growers to deliver or distribute to the next set of stakeholders in the chain. In addition to collecting and delivering fresh produce, a collector may perform other functions such as storing, cleaning, packing, distributing, selling, marketing, exporting or processing.

Wholesaler

The wholesaler receives fresh produce directly from the grower or collector and for the most part, receives the fresh produce in bulk packaging. The main function of a wholesaler is to sell fresh produce in large quantities to retailers, consumers or exporters. In Thailand, a wholesaler may also be a collector, retailer, exporter or processor. Wholesale outlets are the wholesale markets located in each city, while the main wholesale markets are located at different areas throughout Bangkok. Many wholesalers have their own packing houses and these facilities have become increasingly important in preparing fresh produce for both domestic and international markets.



Retailer

Fresh produce is sold to the end user – the consumer – at different places that change over time in response to changes in consumer behaviour. There are various types of retailers offering fresh produce in Thailand. These are now described:

- ***Superstore, super-centre, hypermarket and warehouse membership club***

These stores combine a supermarket and a department store in a large retail facility, offering a wide variety of food and non-food merchandise. Fresh produce is displayed in the fresh food or fresh produce section of the store. Fresh produce in such superstores is generally displayed in open cabinets at temperatures ranging between 4°C and 12°C. The different types of fresh produce are