Asia-Pacific Economic Cooperation

APEC Seminar on Strengthening Public-Private Partnership to Reduce Food Losses in the Supply Chain of Fruits and Vegetables

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Public-Private Partnership in the Supply Chain of Vegetables and Fruits-

Chinese Taipei's APEC Multi-Year Project

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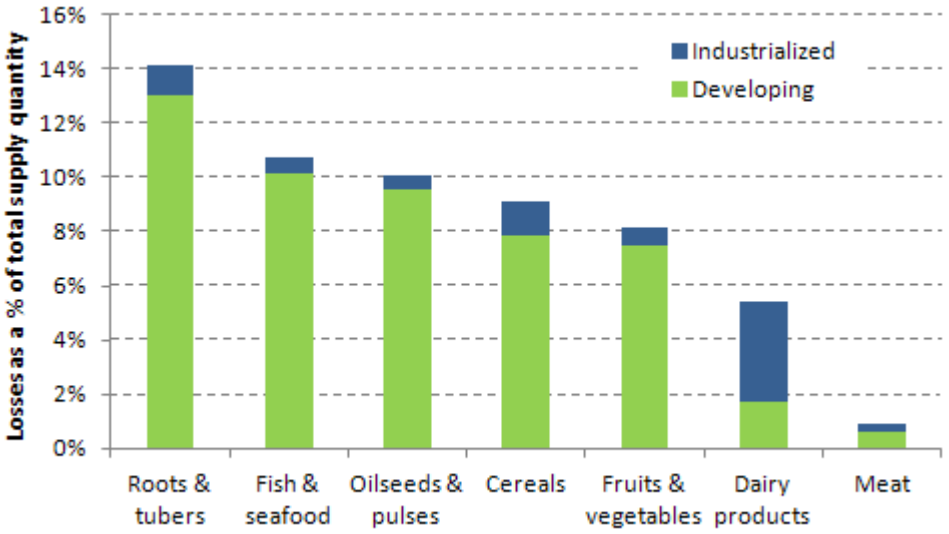
Outline

- Challenges for Asia Pacific
- Causes: Loss Assessment
- Solutions: Case Study
- Way Forward: Public-Private Partnership

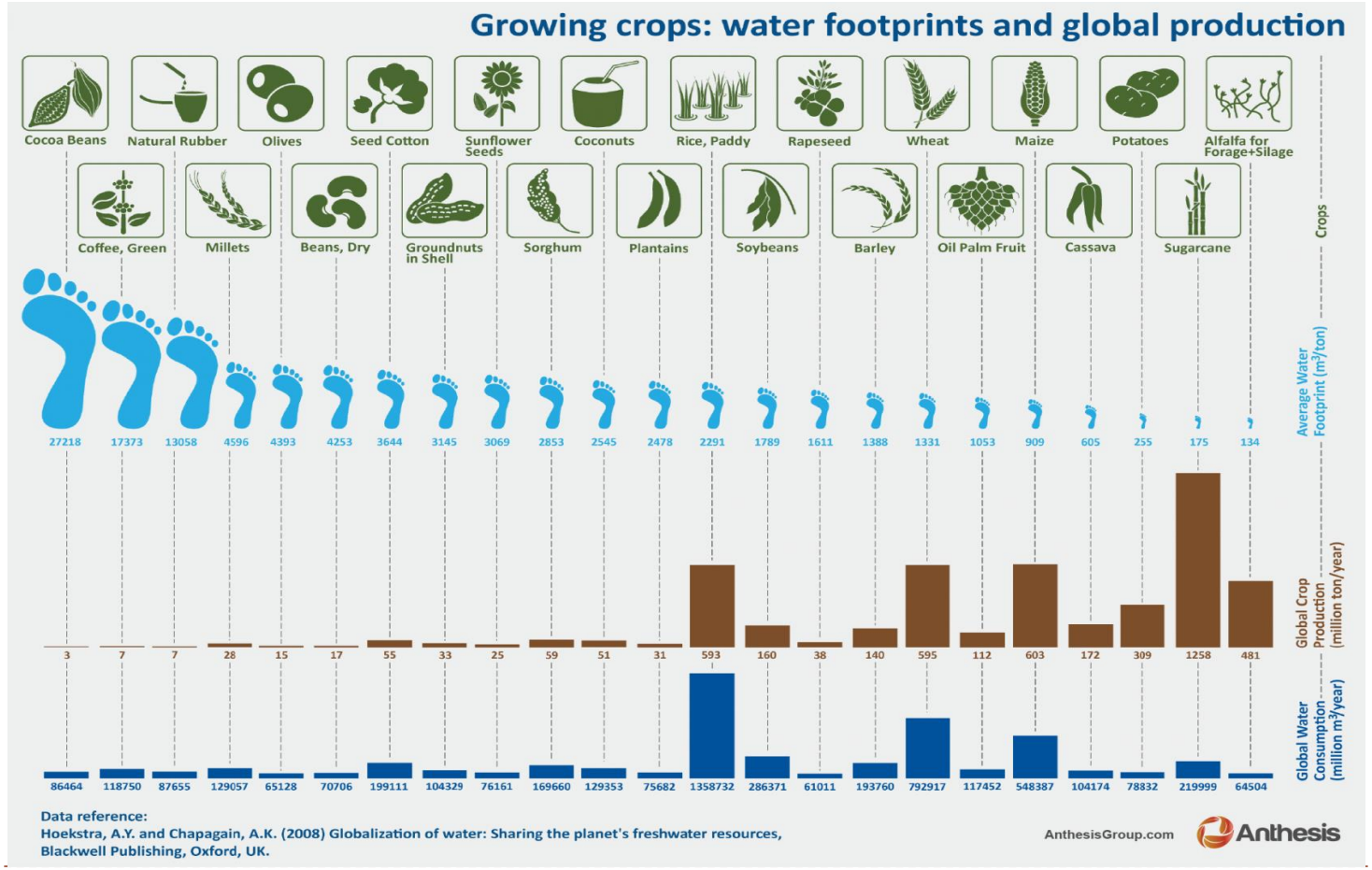
Challenges for Asia-Pacific (1)

1. **Reducing food losses and waste is an urgent issue**
   - About one-third of edible parts of food produced for human consumption, which is about 1.3 billion tons per year, gets lost or wasted (Gustavasson, et al., 2011)
   - Developing economies in APEC accounted for most of the postharvest losses, with higher losses in the Southeast Asia than the other areas (Hredzak and Le, 2012)



Challenges for Asia-Pacific (2)

2. Food loss represents a financial cost to supply chain as well as a loss of our environment (land, water, energy, …)



Challenges for Asia-Pacific (3)

3. **Substantial reductions in food loss require a mixture of public and private-sector approaches**
   - **Loss Estimation:** Definition, Quantify the "quality" aspect, Under or over-estimate?
   - **Concrete actions:** Technical issue**,** Sanitary issue, Cost issue, Changes in consumption pattern, Ageing society issue.

Questions

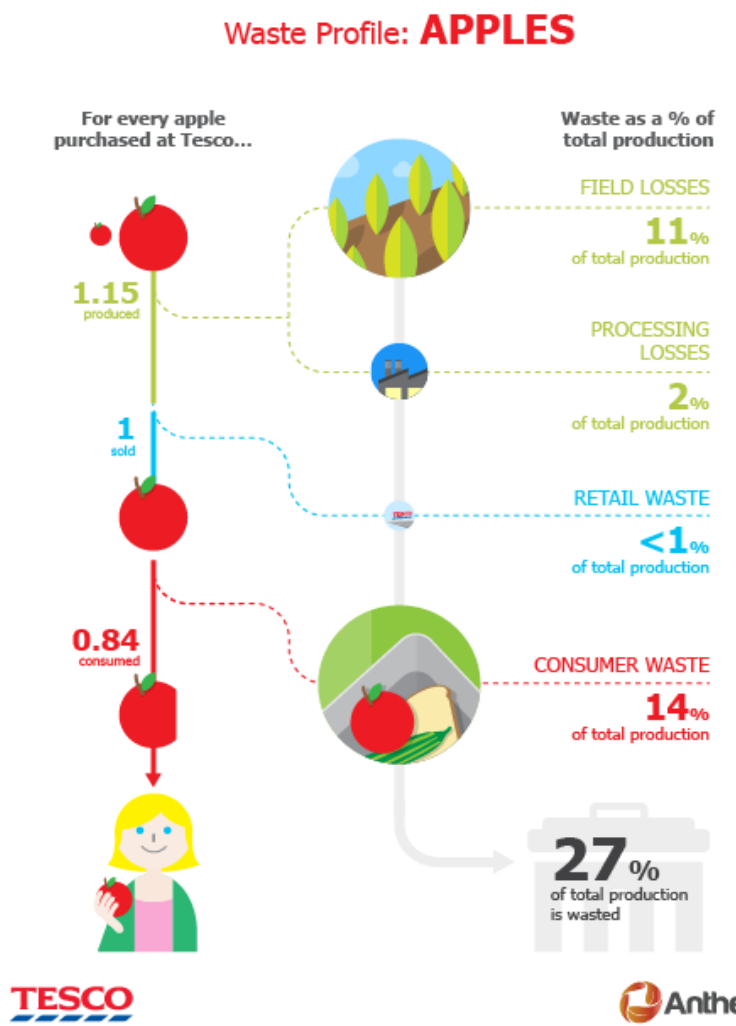
➔**Who should be responsible for loss reduction?**

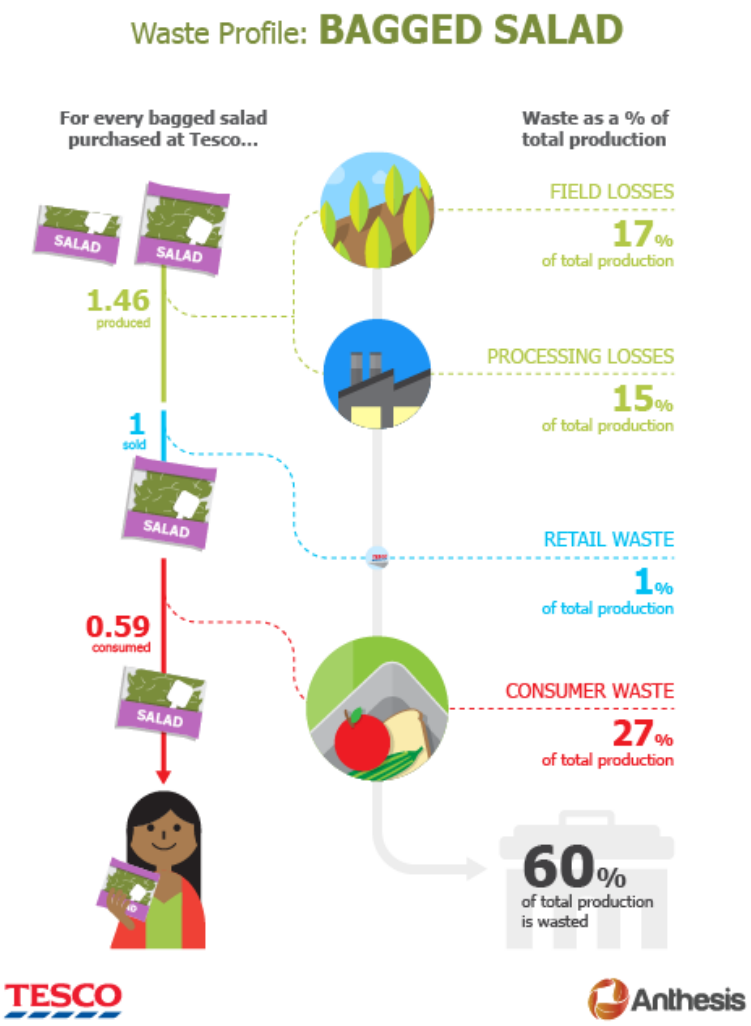
➔**How to get started?**

Challenges for Asia-Pacific (4)

4. **Many tools have been proposed to correct the post-harvest system, but there is likely no single solution.**
   - **Developing**
     - Technologies: Inadequate storage, transportation, etc
     - Management: Loss-reducing practices is less common
     - Infrastructure: Lack of investment in farm and retail levels
   - **Developed**
     - Strict hygiene and safety rules inhibit recovery of uneaten food
     - Costly to reduce loss, to collect, store, and transport food to food banks.

Where should we start?





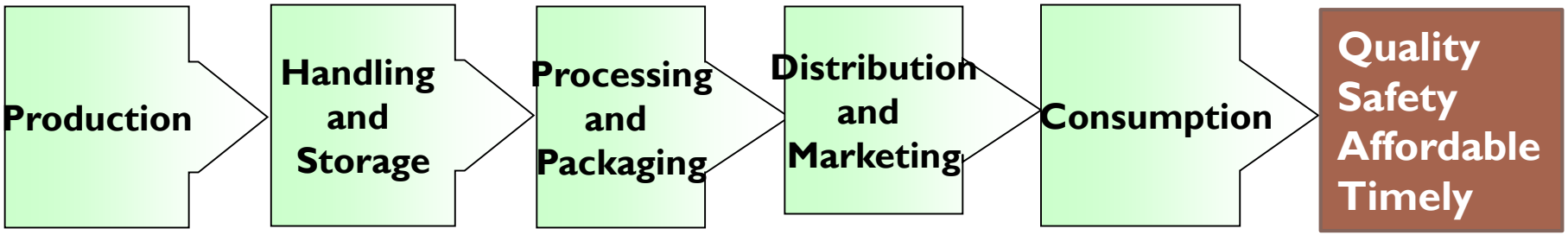
Source: Download from Anthesis website: http://anthesisgroup.com/tesco-farm-to-fork-apples/

Strategies to Improve Postharvest Loss System

APEC Food Security

- **Linking Postharvest technology with food security and safety**
- **Linking small farm/agribusiness with global supply chain**
- **Linking technology and management capacity building**

Post Harvest Loss Value Chain System



Facilitating Factors

- Access to market information
- Access to affordable technologies adapted to local conditions
- R&D on resistant variety, cost-effective drying, storage, grading, packaging, ..
- Infrastructure investment on road, storage, water/electricity supply, …
- Setting standards and creating incentives for collective marketing
- Mainstream postharvest loss reduction into agricultural policies
- Facilitate credit to small farmers and supply chain actors

Loss Assessment-1 Definition

- "Measurable quantitative losses along the food supply chain starting with its harvest until consumption by the end users."
  - **Food loss**
    - a decrease in edible food mass at the production, post-harvest, processing and distribution stages in the food supply chain.
  - **Food waste**
    - food appropriate for consumption being discarded, usually at the retail and consumer levels.
- Redlingshöfer and Soyeux (2012)
  - Need to take into account the initial purpose of food including their by-products and their final utilization.
  - What humans do not directly eat or consumed (e.g., citrus fruit zest, apple or potato peels, bones, egg shell, etc.) cannot be counted as food loss or wasted.

Loss Assessment-2 Methodology

Commodity System Analysis (CSA)

- widely use on postharvest handling and marketing of a given commodity.
- CSA is made up of 27 components that together account for all the steps associated with the production

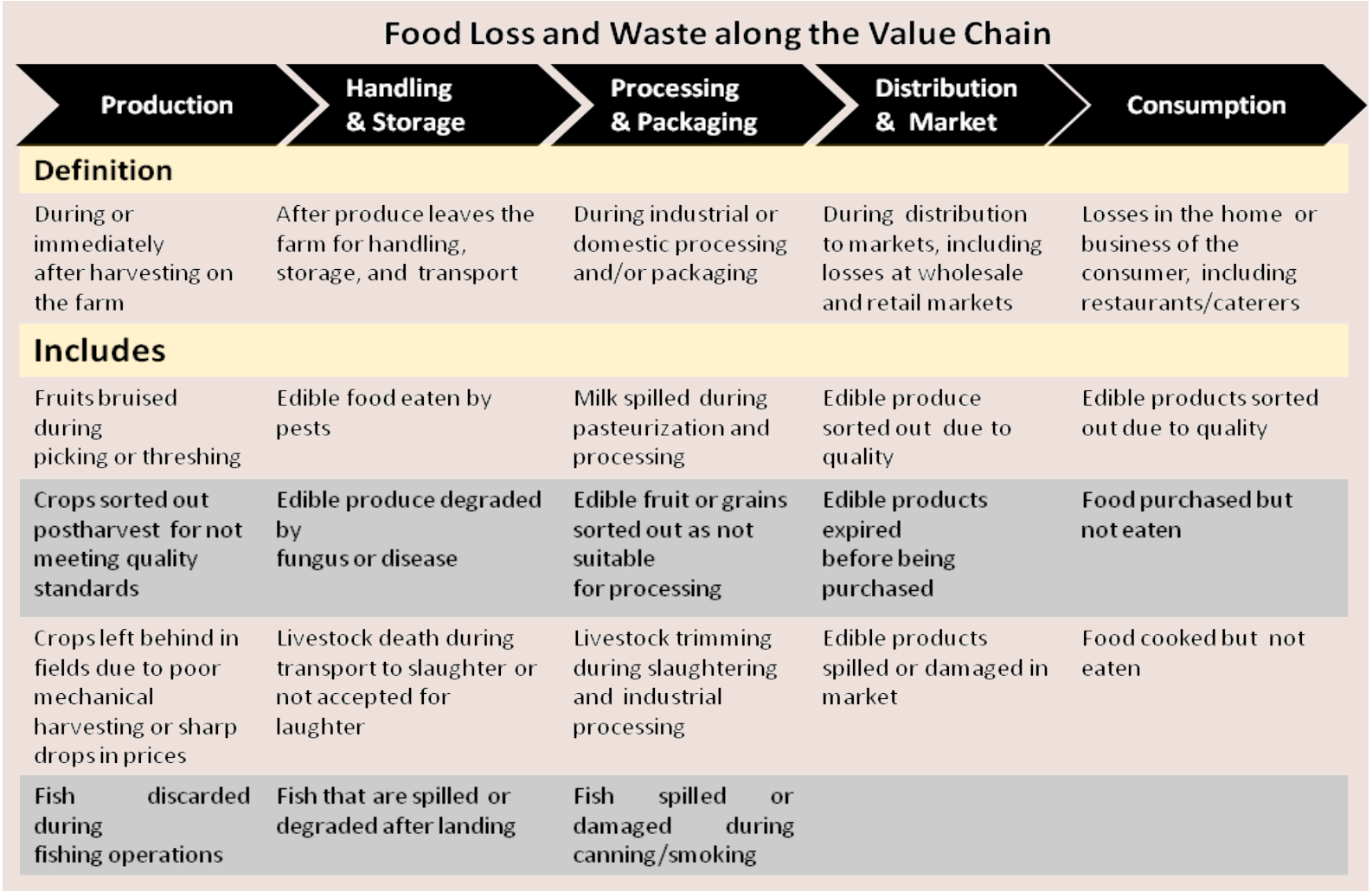
Mass Flow Model (MFM)

- developed by the Swedish Institute for Food and Biotechnology (SIK)
- Using available food balance sheet data
- Aimed to human consumption
- Quantify physical mass throughout the supply chain using own assumptions

Problem of CSA

- Losses for developing country records do not exist
- Do not cover a long enough period of time
- Assessment are only estimated by several observers
- Records may not truly represent a continuing situation, for example :
  1. losses may have been calculated only when unusually high or low
  2. loss figures may be deliberately over- or understated in order to gain benefits or to avoid embarrassment

Mass Flow Model (MFM)



Source: Linpinski et al .(2013) Creating a Sustainable Food Future, Installment Two: Reducing Food Loss and Waste

Estimation Procedure

- Although FAO Food Balance Sheets are not perfect in statistical terms, they do provide a consistent and clear picture of overall food situation of individual economy.

Agricultural Production Flow

- FAO Food Balance Sheet
- By product
- By economy

Food Loss % in each stage

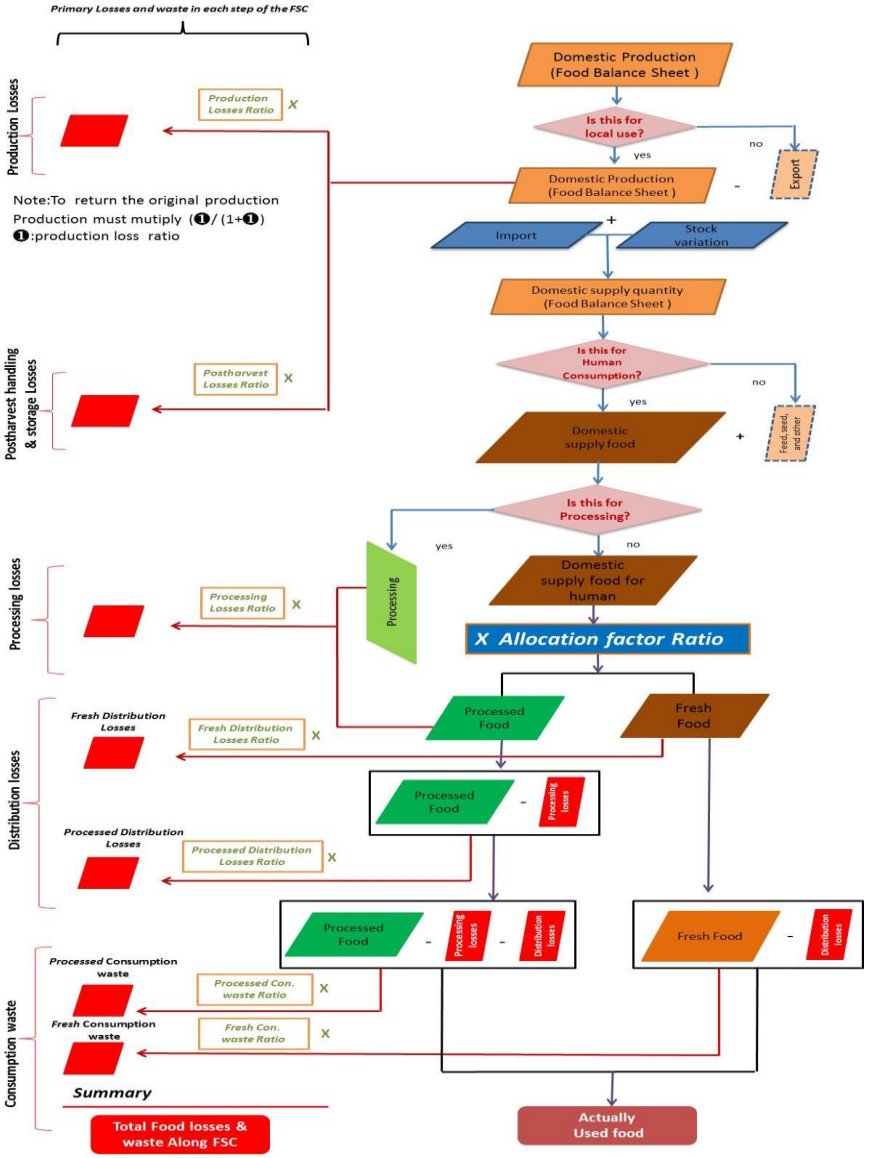
- Gustavsson et al., (FAO 2011) Study
- Loss in %
- by stage, product, group, region

Food Loss Volumes

- By product,
- By economy,
- By stage

Estimation Procedure

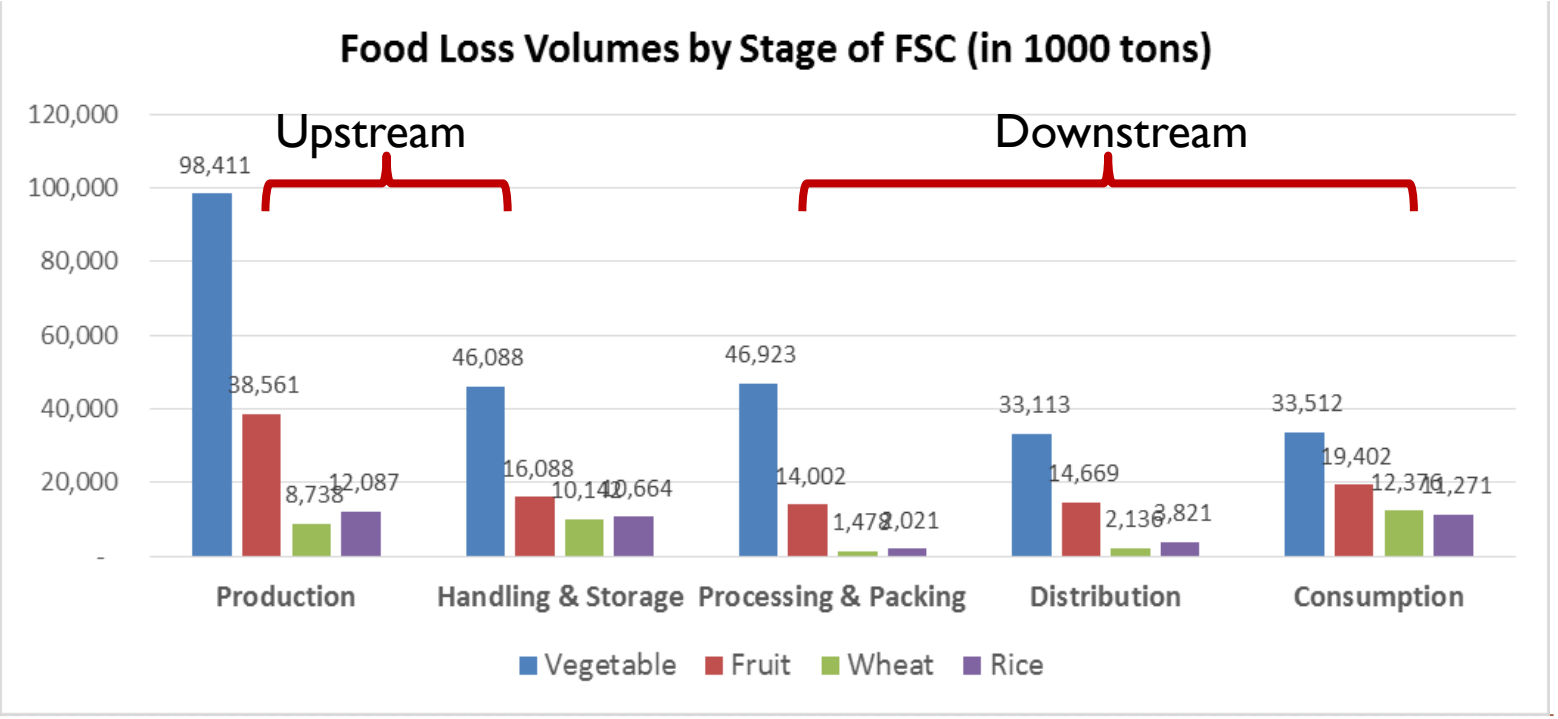
- Accounting technique and internal consistency checks are used within the framework of the Supply/Utilization Accounts.
- Total loss volume has edible and non-edible part and only edible part is counted as food loss.



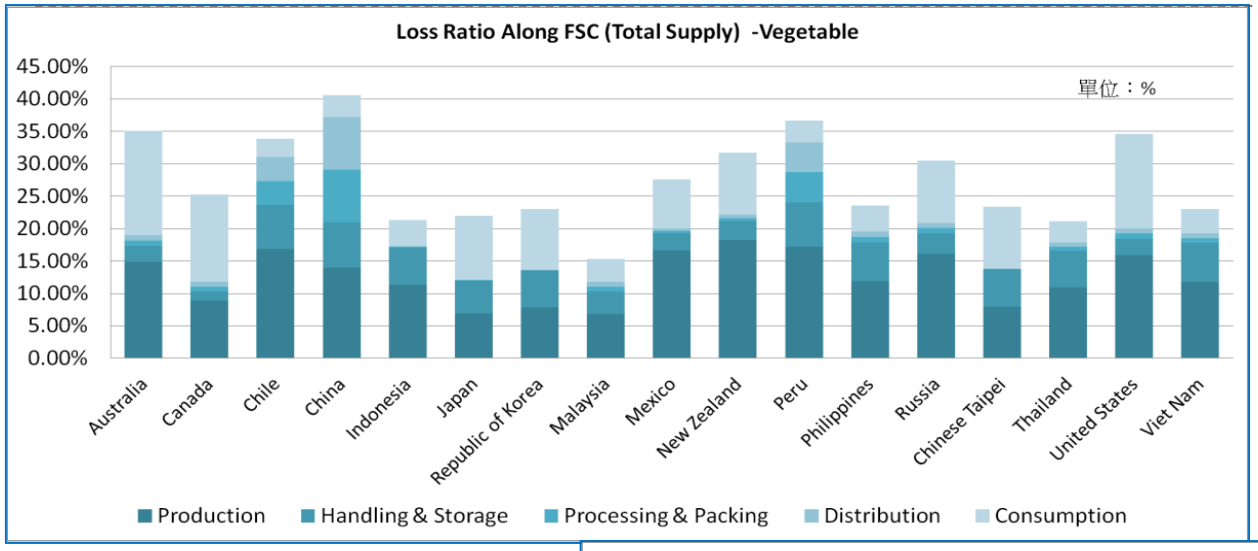
Assessment Results

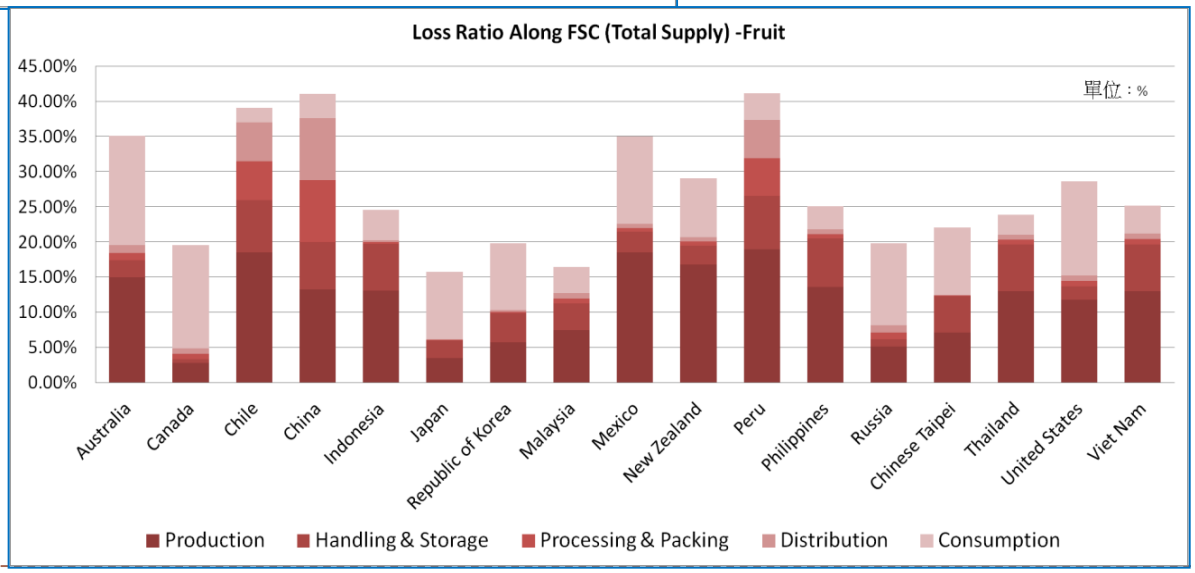
- Distribution of losses between upstream and downstream

	Total Loss Volume (million ton)	Upstream (%)	Downstream (%)
Vegetable & Fruit	360	55%	45%
Wheat & Rice	75	56%	44%

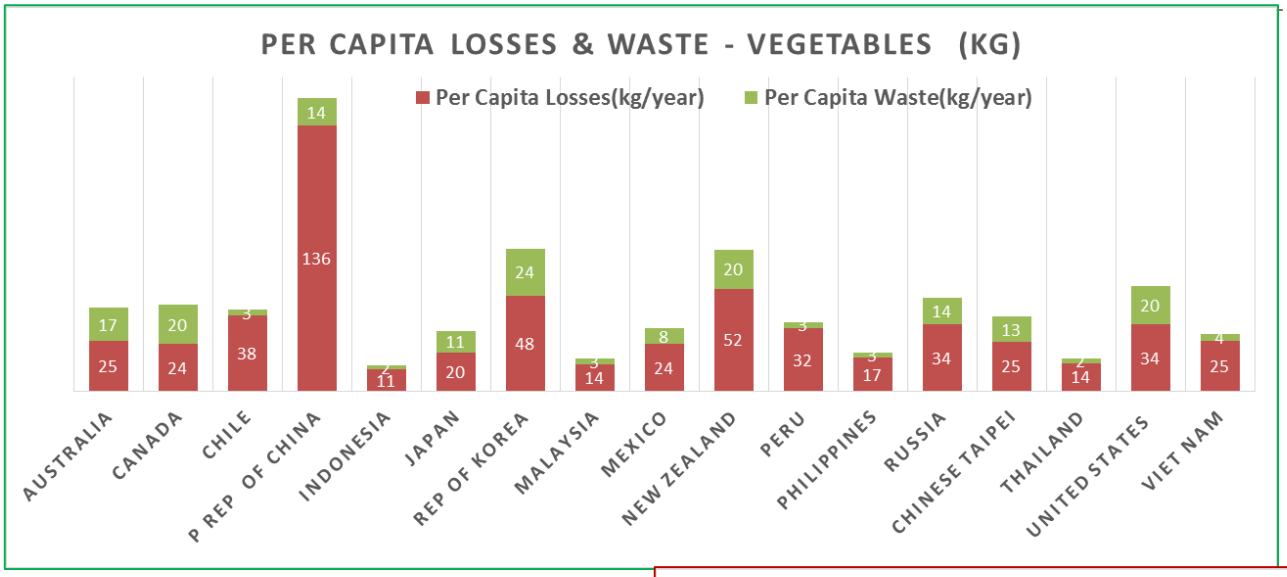


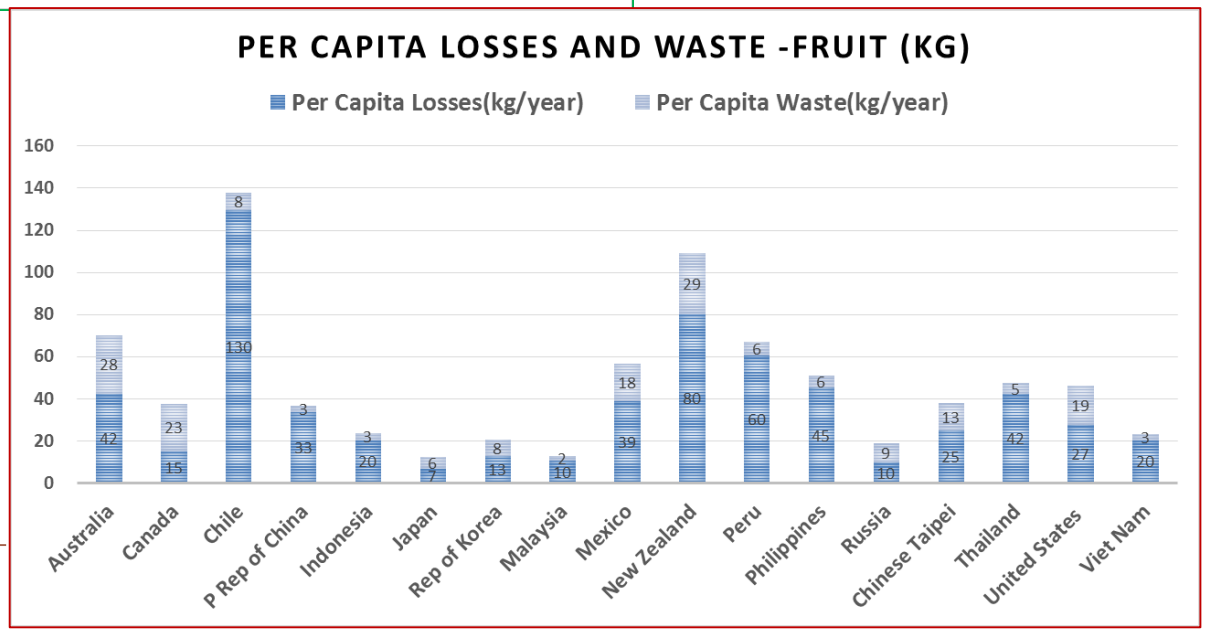
Estimation Results on Vegetables and Fruits
-% Loss by Stage, by Economy, 2011





Estimation Results on Vegetables and Fruits
-Loss Per Capita in Kg by Stage, by Economy, 2011





Estimation Results on Vegetables and Fruits - Cross Comparison

	Developing		Developed	
	Vegetables	Fruits	Vegetables	Fruits
MYP project based on FAO	25-40%	30-40%	10-30%	15-40%
World vegetable Center	20-30%	34-55%	-	-
EU and US (Buzby et al)	-	-	6-10% (Retail excl.)	10-15% (Retail excl.)
Madrid	13-20%	13-20%	5-10%	6-13%
Kumar et al.	25-30%	30-35%	-	-
Tesco	27-60%	19-33%		

- Highest loss occurs at production stage, followed by consumption stage
- Economy-wide and stage-wide comparison allow us to identify Hotspots and Priority for improvement.

Case Study: Solutions

- Two-step Survey
  - Pilot
  - Follow-up
- Purpose
  1. to collect existing technologies and practices along the food supply chain
  2. to create an open platform for information exchange
  3. to identify the most efficient and cost-effective way to reduce losses in the region

APEC **A P I P - P H L O W S**
APEC INFORMATION PLATFORM ON POST HARVEST LOSS AND WASTE SYSTEM

NO.	3	Title	Grapes management
Production Types	■Fruits ☐Vegetables ☐Rice ☐Wheat ☐Others:_____		
Problems	Reducing the losses and waste on grapes		
Stage	■Harvesting ☐Handling & Storage ☐Processing & Packaging ☐Distribution & Marke ☐Consumption		
Solution Types	■Management ☐Machine ☐Chemical methods ☐Biological methods☐Equipment ☐Breeding methods ☐Technology ☐Staff Training ☐Others:_____		
Specific content	1、Pruning and controlling the number of branches to maintain strong growth potentia 2、Bagging early to reduce the chance of corruption 3、Cleaning the vineyard regularly.		
Photos	 Pruning the branches.		 Grapes gathering
Sources	☐	Company	
	☐	Website	
	■	Government	Taichung District Agricultural Research and Extension Station, Council of Agricultural, Executive Yuan, Chinese Taipei
	☐	Others	

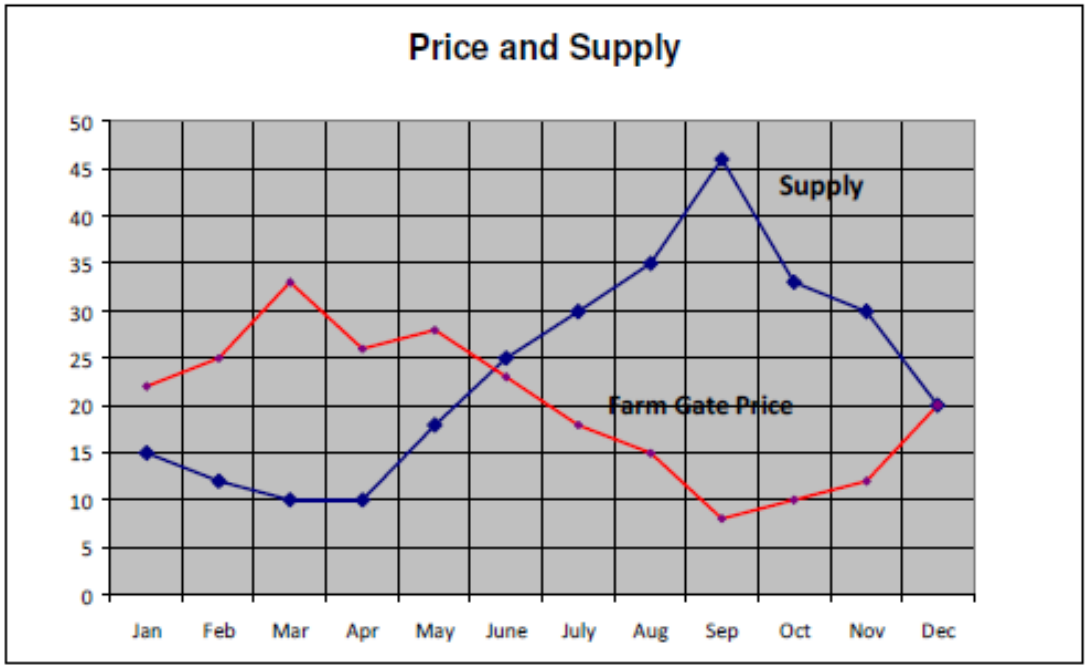
Before	Loss Ratio	%	Loss by Weight	Kg/yr	Loss Value	USD/
After		%		Kg/yr		USD/
Specific Outcome							

Pilot Partners

- The Philippines :
  - Calamansi: NGO, AsiaDHRRA
  - Banana: NGO, AsiaDHRRA
- Chinese Taipei
  - Carrot/Sweet Potato: FuYei International, Inc
  - Grape: Taichung District Agricultural Research and Extension Station, Council of Agricultural, Executive Yuan

Calamansi: Major problems

- The targets are farmers in Mindoro Oriental.
  - Due to concentrated production following natural pattern, seasonality in production persists.
  - At the production level around 15-20 percent is lost due to low farm-gate prices.



Background:

- Mindoro Oriental produce around 59 percent of the total annual production in the entire country.
- But Mindoro Oriental farmers rely on the natural fruiting season of calamansi during the period July to November each year.

Calamansi: Pre-Harvest Preparation

Before: Trees without pruning interventions (taller trees)

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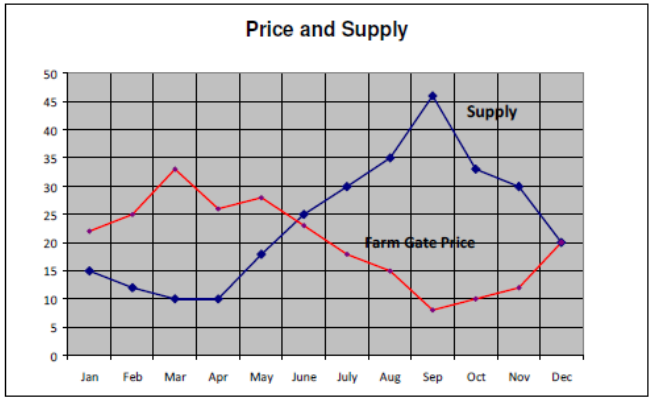

After: with annual pruning interventions (shorter trees)

- To achieve all-year round production, physical interventions to induce flowering and fruiting.
- The added benefit is that, the cost of picking the fruits from taller trees is far more expensive that shorter trees.

Calamansi: Postharvest Handling/Transportation

Before:

At the packaging, transport level, 10 to 15 percent is lost due to transport damages

After:

AsiaDHRRA introduced wooden crates to improve product shipment/storage

Cardaba/Saba Banana: Major Problems

- Most of cardaba/saba bananas for local consumption do not meet the specifications of exporters and processors.

- Production practices lead to significant losses due to
  - Quality and size.

    ➔Around 18 percent is lost.

  - Increase bananas' vulnerability to diseases (*bugtok, bunchy top* and *sigatoka)* resulting to huge fruit losses.

    ➔ Around 25-30 percent is lost.

Pre-Harvest Improvement

Before:

After:

- Regular fertilization (organic or inorganic)
- Removal of dry and old leaf sheaths
- Stripping of infected, removal of non-functional leaves
- Weeding and cleaning of pseudo stem and mat
- Maintaining 10 to 12 leaves before and during flowering
- Deflowering (removal of the blossom immediately at the emergence of last set of fingers)
- Bagging the fruits (to protect fruits from insects and pests)
- Maintaining a low number of suckers per mat (3 suckers per mat or hill)

Carrots/Sweet Potatoes

Before

infected sweet potatoes

After

Temperature-controlled environments

- Set standards on water content and weather condition before harvesting to extend the storage time.
- Screening out infected/injured to avoid deterioration during the storage and cross contamination.
- Storage conditions such as temperature and humidity to reduce the differences in environmental conditions

Grapes

- Pruning and controlling the number of branches to maintain strong growth potential.
- Bagging early to reduce the chance of physiological deterioration
- Cleaning the vineyard regularly.

Public-Private Partnership

- Role:
  - PPP allocates tasks, obligations, and risks among the public and private partners in an optimal way.
- Driving Force (Rolando Dy, Juejan Tangtermthong)
  - Private Side:
    - Reduce risk on investment
      - Land ownership
      - Transaction cost due to complexity of supply chain, labor, inputs, technology,
      - Regulations
    - Enter a new market
      - which is unknown to its management
      - without starting from scratch
      - without delay on authorization process
  - Government side:
    - Lack of public funding
    - Increasing acceptance that private sector can handle many traditional task of the public sector
    - Private sector has better ability to increase efficiency and quality of services

PPP on Management and Capacity Building – Mango Export in Chinese Taipei

'Irwin' Mango Orchard at Tainan, Chinese Taipei

Traceability System– EAN Bar-Code

Fruits resorted → Fruit packaging → Barcode stuck to carton → Quarantine inspections before Transport

MAP of MANGO

Mexico

Chinese Taipei

Harvesting

- Hand harvest into baskets, nets, or buckets
- Latex removal required ?
  - Remove Latex
- Transfer to field lug boxes(shaded)
- Transport to packinghouse by truck

Handling & Storage

- Stage in trucks at packinghouse
- Stage under cover in packinghouse
- Dump into clorinated water

Mango Puree Processing

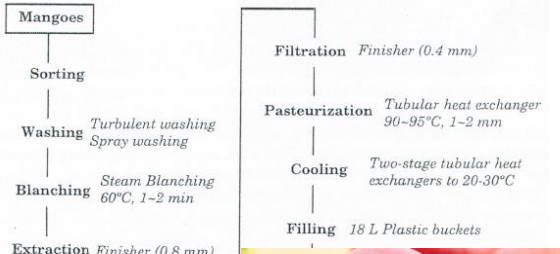

Fig. 3: Flow diagra

PPP on Processing/Distribution Center
Agricultural Processing Center in Rep of Kora

- Korea National Agricultural Cooperative Federation (Semook Park and Jongho Hong, 2013)
  - Located in fruit and vegetable production areas
  - Precooled, selected packaged, processed and stored products
  - PPP arrangement:
    - Central Government: Set up policy and principles of subsidy for APC
    - Local Government: Set up plan for assisting APC within its region
    - Private (NACF) sector:
      - Assist funding for infrastructure and marketing
      - Provide consulting service for APC
      - Provide education and cooperation among farmers and APC

PPP on Safety Standard & Quality Certification

- **Recent highly publicized food safety incidents**
- **Food safety and quality standards applied to fresh fruit and vegetables include**
  - Phytosanitary certificate
  - Limits on pesticide residues
  - HACCP
  - Traceability
  - Microbial contamination
  - Good agricultural practice
  - Quality grades

- **PPP: Planning and Compliance**
  - **APEC Food Safety Cooperation Forum Partnership Training Institute Network**
  - **Henson et al, "Assessing the Demand for Trade-Related Food safety and Quality Interventions in Agri-Food", World Bank website.**
    - What the alternatives are for producing agro-foods of different qualities?
    - Whether a particular compliance service is required and is economically-viable?
    - What is the best way in which to establish and/or deliver this compliance service?
    - Where this compliance service might be best situated?
    - Whether the compliance service capacity is likely to be sustainable in the long term?
    - How all this information feeds into a strategy for securing the desired level of quality?

Way Forward: Pilot Porgram (1)

- **Causes:**

➔ **How to improve food loss assessment?**

- Qualitative losses vs Quantitative losses
- Impact on Environment
- Value of losses
- Hot product: Which product is the most responsible?
- Hot spot: When and where the loss occur?

Way Forward: Pilot Program (2)

- **Solutions:**
- **How to establish a food loss reduction program?**
- **Develop 2nd stage Case Study**
  - **3 phases**
    - Measure: Understand the current process and quantity of losses
    - Target and Pilot: Select one-root cause and develop new way to reduce
    - Scale-up and Sustain: Apply to other location or product
  - Participants:
    - Production: Supplier (farmers, cooperative,)
    - Consumption: Retailer
  - Develop Joint business plan
    - Information sharing
    - Loss prevention measures
  - Cost-benefit analysis
    - to make informed decisions
      - What are the benefit of new technology/practice on food safety/quality ?
      - What are the hidden cost behind the safety/quality standards?
  - KPI/metrics
    - for performance evaluation

Thank You & Comment Welcome

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