Asia-Pacific
Economic Cooperation

APEC Workshop on Strengthening Public-Private Partnership to Reduce Food Waste at Retail and Consumer Levels

Food Loss and Waste Reduction Toward a Food-Secured Future in APEC:
Summary of MYP 2016 and Policy Recommendations

PPFS & ATCWG Multi-Year Project M SCE 02 2013A

Ching-Cheng Chang
Chinese Taipei

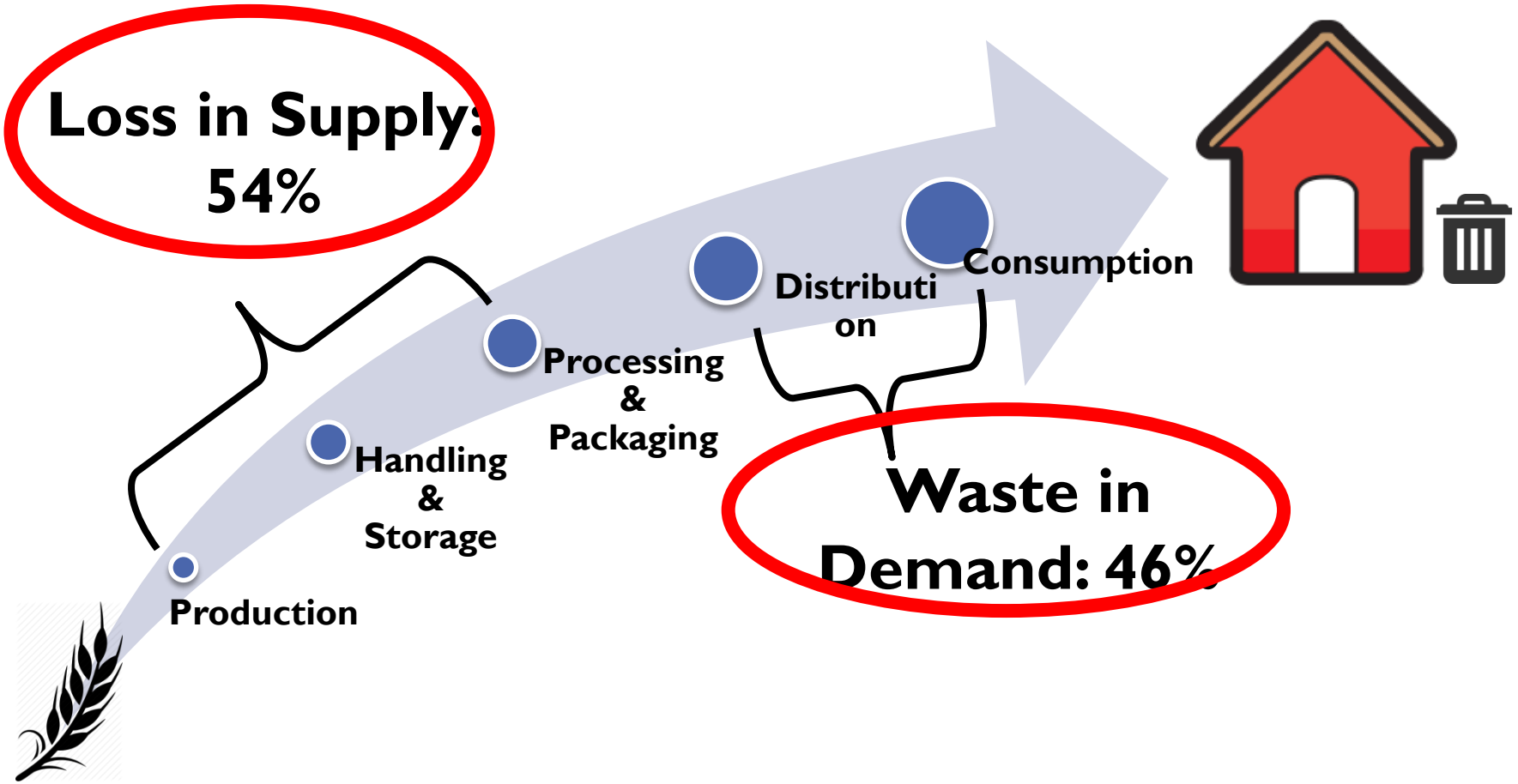
Outline

- Introduction

  MYP Outcome of 2013~2015
- Progress in 2016
  a. Food Waste Assessment
  b. Toolkits & Best Practices (Output from 2016 Expert Consultation, July 18-19)
  c. Summary & Recommendations
- Next Step

Introduction

FAO: Farm to Fork Waste Map



APEC Multi-Year Project

Purposes

- Identify key issues on reducing food losses and waste
- Seek best practices in private and public sectors
- Find practical solutions and enhance capacity-building

Work Plan (2013-2018)

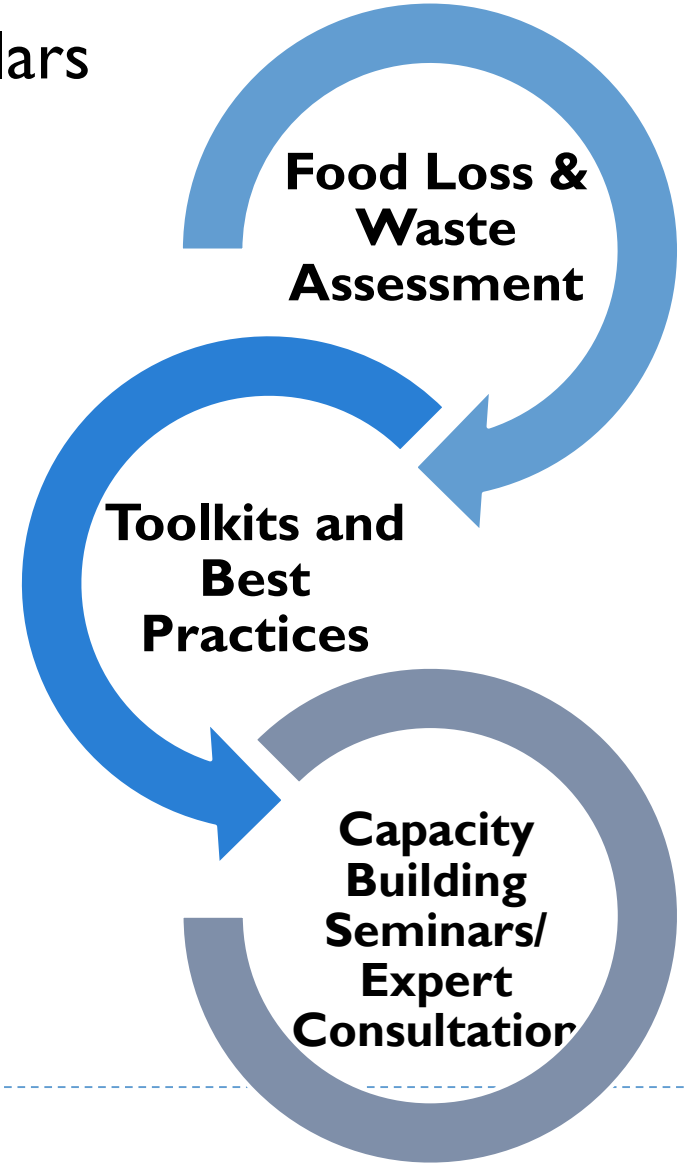
2013
- Preparation, Research, and Identification

2014/16
- Investigation of Food Losses and Waste

2017/18
- Actions and Inter-linkages

APEC Multi-Year Project

- 3 Pillars



- ✓ 2013 on Cereal Crops
- ✓ 2014 on fruit and vegetables
- ✓ 2015 on fishery and livestock
- ✓ 2016 on consumption wastes sequentially

Outcome from 2013-2015

Outcome-1 Food Loss & Waste Assessment

(1) Unified Methodologies

"Mass Flow Model (MFM) of FAO

- Measurable quantitative losses along the food supply chain starting with harvest until consumption by end users."

Stages	Definition
Production and Harvesting	Contains losses due to mechanical damage and/or spillage during harvest operation, crop sorting etc.
Handling and Storage	Contains losses due to storage and transportation between farm and distribution, and spillage and degradation during handling.
Processing and Packaging	Includes losses during industrial or domestic processing and packaging
Distribution and Marketing	Includes losses and waste in the market system, including wholesale markets, supermarkets, retailers, and wet markets.
Consumption	Includes all the losses and waste at the household level.

Source: Linpinski et al .(2013); Gustavsson et al., (FAO 2011)

Outcome-1 Food Loss & Waste Assessment

(2) Refinement for Fishery and Livestock

- **Model for Food Grain & F&V**

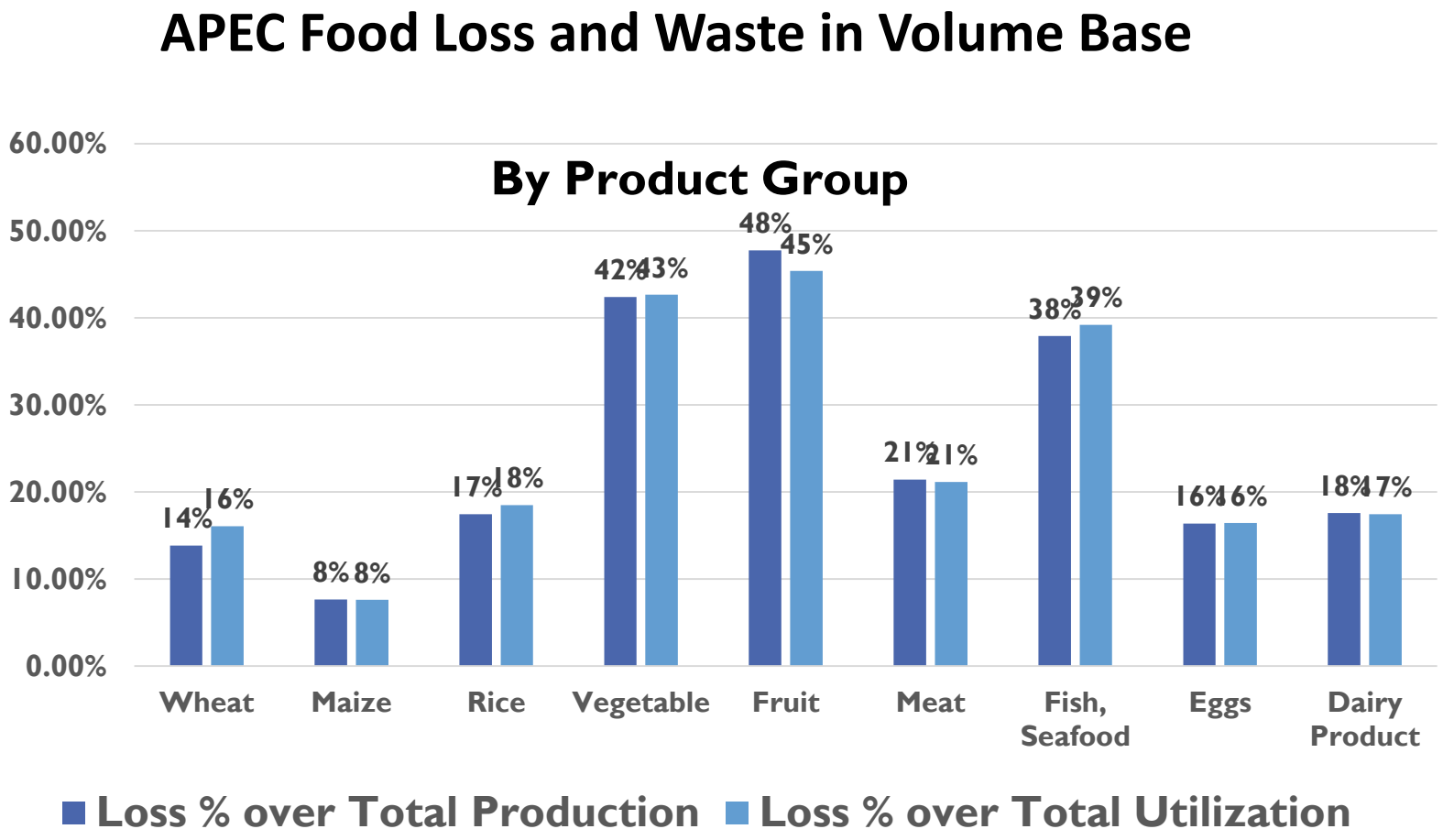
1.Production and Harvesting Loss$_i$	=	$((R \times L_1)/((1-L_1)) \times E$
2. Handling and Storage Loss$_i$	=	$R \times L_2$
3.Processing and Packaging Loss$_i$	=	$(C_i + F_i \times U_i) \times L_3$
4.Distribution and Marketing Loss$_i$	=	$F_i \times (1-U_i) \times L_{4\ for\ fresh} + \{(C_i + F_i \times U_i) \times (1-L_3)\} \times L_{4\ for\ processed}$
5.Consumption Loss$_i$	=	$F_i \times (1-U_i) \times (1-L_{4\ for\ fresh}) \times L_{5\ for\ fresh} + \{(C_i + F_i \times U_i) \times (1-L_3)\} \times (1-L_{4\ for\ processed}) * L_{5\ for\ processed}$

- **Model for Fish & Livestock**

Total Food Loss Equations for APEC Economy *i*		
1.Production and Harvesting Loss$_i$	=	$((C \times L_1)/((1-L_1)) \times E$
2. Handling and Storage Loss$_i$	=	$(C+A) \times L_2 \times E$
3.Processing and Packaging Loss$_i$	=	$(C+A) \times L_3 \times Ui$
4.Distribution and Marketing Loss$_i$	=	$((P \times F))/(1-L_5)) \times L_4$
5.Consumption Loss$_i$	=	$((P \times F))/(1-L_5)) - (P \times F)$

Outcome-1 Food Loss & Waste Assessment

(3) Estimation Results: APEC region as a whole



Outcome 2- Toolkits and Best Practices

cabdirect

Fruit and vegetable harvest mechanization; policy implications

Recommendations include the creation of complementary non-farm jobs for those with seasonal employment in agriculture, provision of educational and training opportunities for displaced farm workers, the establishment of a hierarchical job structure in agriculture, combined with vocational and skill training for those remaining in agriculture.

Night Picking

Fluorescent illumination can provide the intensity, uniformity, and color b
picking at daytime levels of performance. Cool-White fluorescent lamps
brightness on all crops evaluated, but color enhancement lamps (N-74 o
separation to detect ripeness and defects on cantaloupe and table grape

Influence of harvesting methods deciduous tree fruits

Management of the harvesting operation, whether manual or mechanica
quality of the harvested fruits. Proper management procedures include s
harvest in relation to fruit maturity and climatic conditions, training and su
effective quality control.

◄ 1\2 ►

PPP on Mango Export in Chinese Taipei

'Irwin' Mango Orchard at Tainan, Chinese Taipei

Traceability System– EAN Bar-Code

Mango Puree Processing

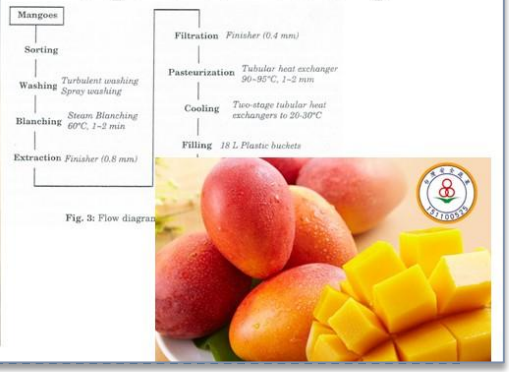


Fig. 3: Flow diagram

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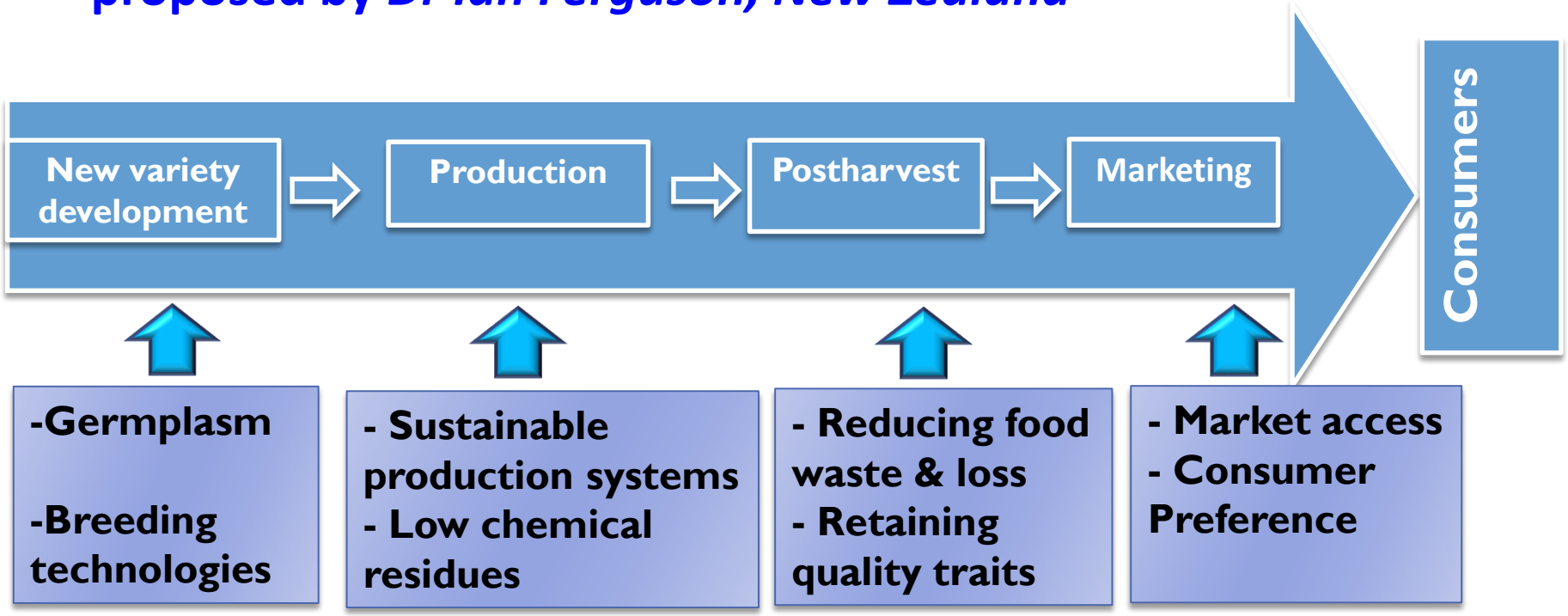
Outcome 2- Toolkits and Best Practices

(2) A Value Chain Approach: Input of Science-based Agricultural Services

- proposed by *Dr Ian Ferguson, New Zealand*



Source: Dr. Ian Ferguson (2015)'s presentation in **APEC Seminar on** ***Strengthening Public-Private Partnership to Reduce Food Losses in the Supply Chain of Fishery and Livestock,*** **Iloilo, Sept 27, 2015.** **http://apip-phlows.econ.sinica.edu.tw/index.php/seminar-reports/2015-myp/agenda**

Outcome-3 Capacity Building Activities

(1) 2013 Seminar on Food Grains

1st APEC Seminar on Food Grain
Taipei, Aug 5-8, 2013

Agenda

- Main Challenges of Food losses and Food Security
- Key Issues of PPP in Reducing Post-Harvest Losses
- APEC Best Practices
- Next Steps and Future Action Plans

- Achievements

Key Findings on Food Security

- Only 5% of agricultural R&D investment on post-harvest
- Promising post-harvest technologies and management options available
- Recycling for nonedible losses needs government support

Public-Private Partnership

- Public sector + Private sectors + NGOs & Academia
- Need to accelerate and support PPP initiatives
- Education of supply-chain actors Stakeholders + Consumers

Outcome-3 Capacity Building Activities

(2) 2014 Seminar on Fruits and Vegetables

2nd APEC Seminar on Vegetable and Fruits
Beijing, Sept 15, 2014

Agenda

- Main Issue in vegetable & fruit supply chain in APEC
- Best practice of enhancing PPP in vegetable & fruits
- Innovative technology and management
- Develop assessment methodology and dataset

- **Achievements**

Key Findings on Food Security

- Measuring food loss is challenging and data intensive
- Information exchange of best practices & traceable supply-chain management contribute to strategic approach development
- Loss prevention can be a priority to launch a regional PPP initiative

Public-Private Partnership

- PPP is important in food supply chain management for quality improvement, reducing postharvest decay, and food safety assurance
- Partnership could be costly and effort/time-consuming, so innovative models is needed to become successful and sustainable

Outcome-3 Capacity Building Activities

(4) 2015 Seminar on Fishery and Livestock

Knowledge-Sharing Activities in 2015

APEC 2015 APEC Seminar on Fishery and Livestock Supply Chain

Iloilo, Philippines, Sept 27, 2015

Agenda

- APEC fishery and livestock loss status and methods
- Best practice of enhancing fishery and livestock PPP
- Innovative technology and management
- Develop assessment methodology and dataset

- **Achievements**

Key Findings on Food Security

- A systematic approach is needed to investigate the multi-dimensional aspects of food loss including: genetics, production, food safety, postharvest quality, logistic process, infrastructure improvement, consumer behaviours
- Customized capacity building and infrastructural investment on energy-saving cold chain are essential for loss reduction in fishery and livestock

Public-Private Partnership

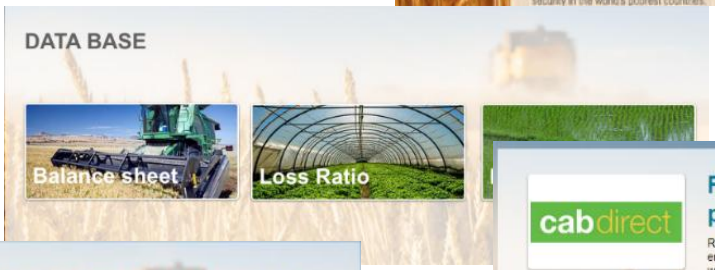
- Government need to provide economic incentive and adaptation mechanism for facilitating technology adoption and market access
- PPP requires not only government and industry but need to involve academics, the community and the general public for collaboration and awareness.

Outcome-3 Capacity Building Activities

(5) Information Platform

- APIP-PHLOWS
  - Open Data
  - As a Knowledge Bank
- Key features
  - Loss estimates
  - Toolkits
  - Best practices

QR code



Progress in 2016

1. Food Waste Assessment

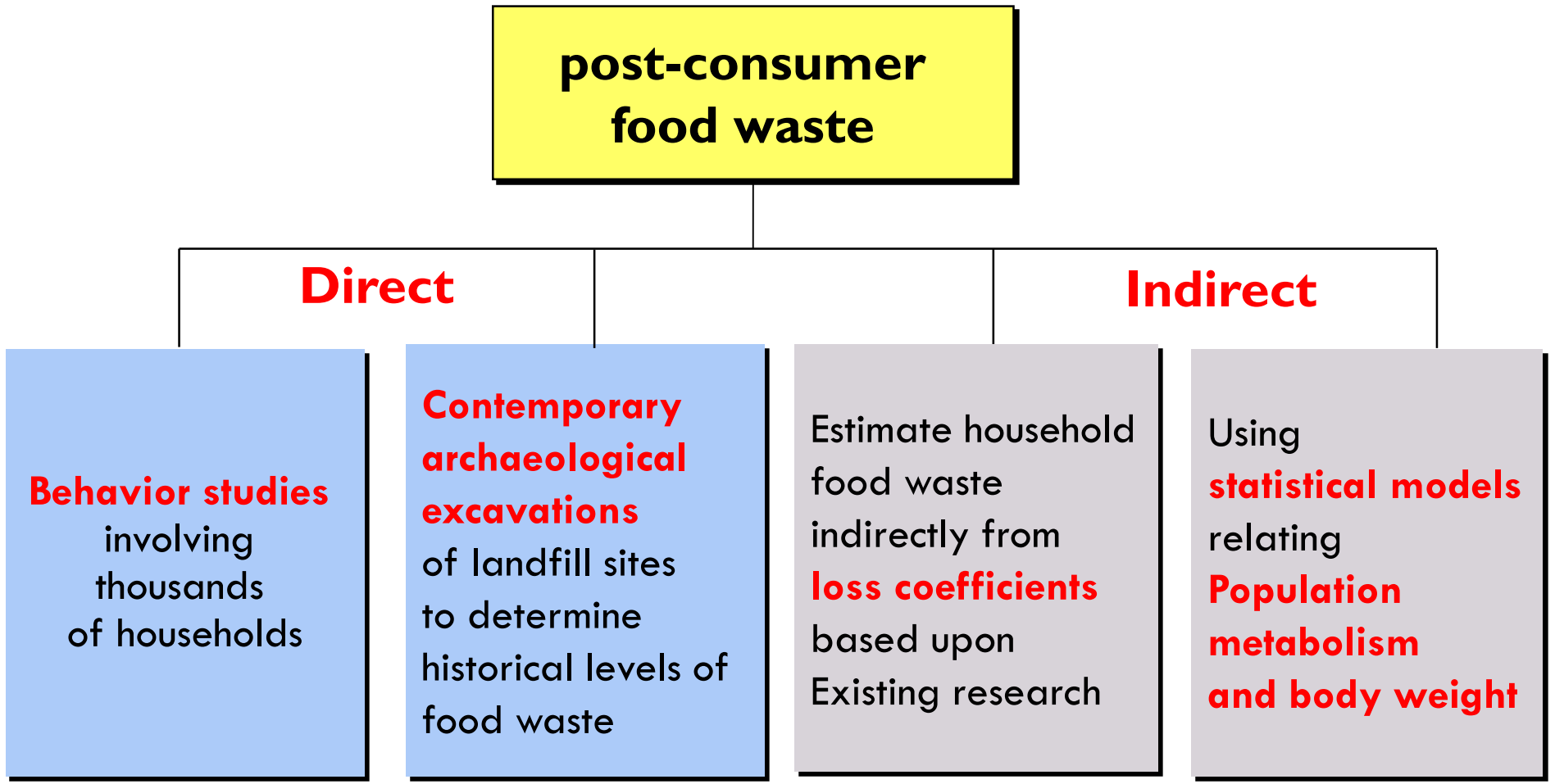
Definition of Food Waste

Source	Definition
UN FAO (FAO, 2011)	➢ "wholesome Edible material intended for human consumption arising at any point in the food supply chain that is instead discarded, lost, degraded or consumed by pests. ➢ Food waste is recognized as a distinct part of food loss because the drivers that generate it and the solutions to it are different from those of food losses. This does not include inedible parts of food not intended for human consumption (e.g. bones, rinds, pits/stones).
EU Waste Framework Directive	Any substance or object which the holder discards or intends or is required to discard
USDA	• food loss as the edible amount of food, postharvest, that is available for human consumption but is not consumed for any reason. • It includes cooking loss and natural shrinkage (eg, moisture loss); loss from mold, pests, or inadequate climate control; and food waste.

APEC-wide Food Waste % in Retail and Consumer using UN/FAO's Definition & Mass Flow Model

Key Analysis Sectors	Retail Waste	Consumption Waste
Wheat and Maize	0.73%	4.68%
Rice	1.74%	5.51%
Vegetables and Fruits	5.49%	10.55%
Meats (Red and White)	5.67%	9.49%
Fish and Seafood	13.51%	39.2%
Dairy Products	1.38%	9.9%

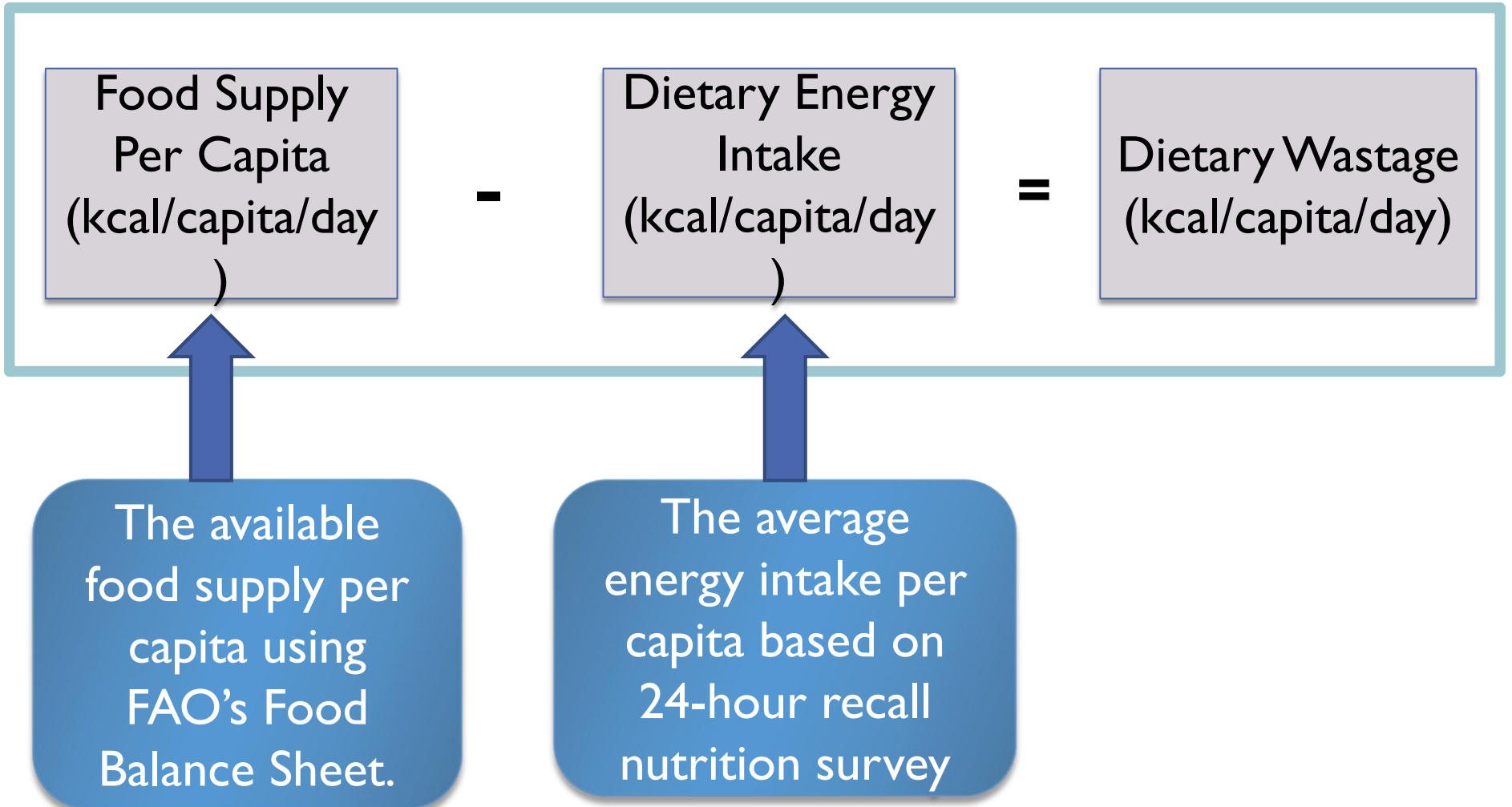
Post-Consumer Food Waste Methodologies: Review



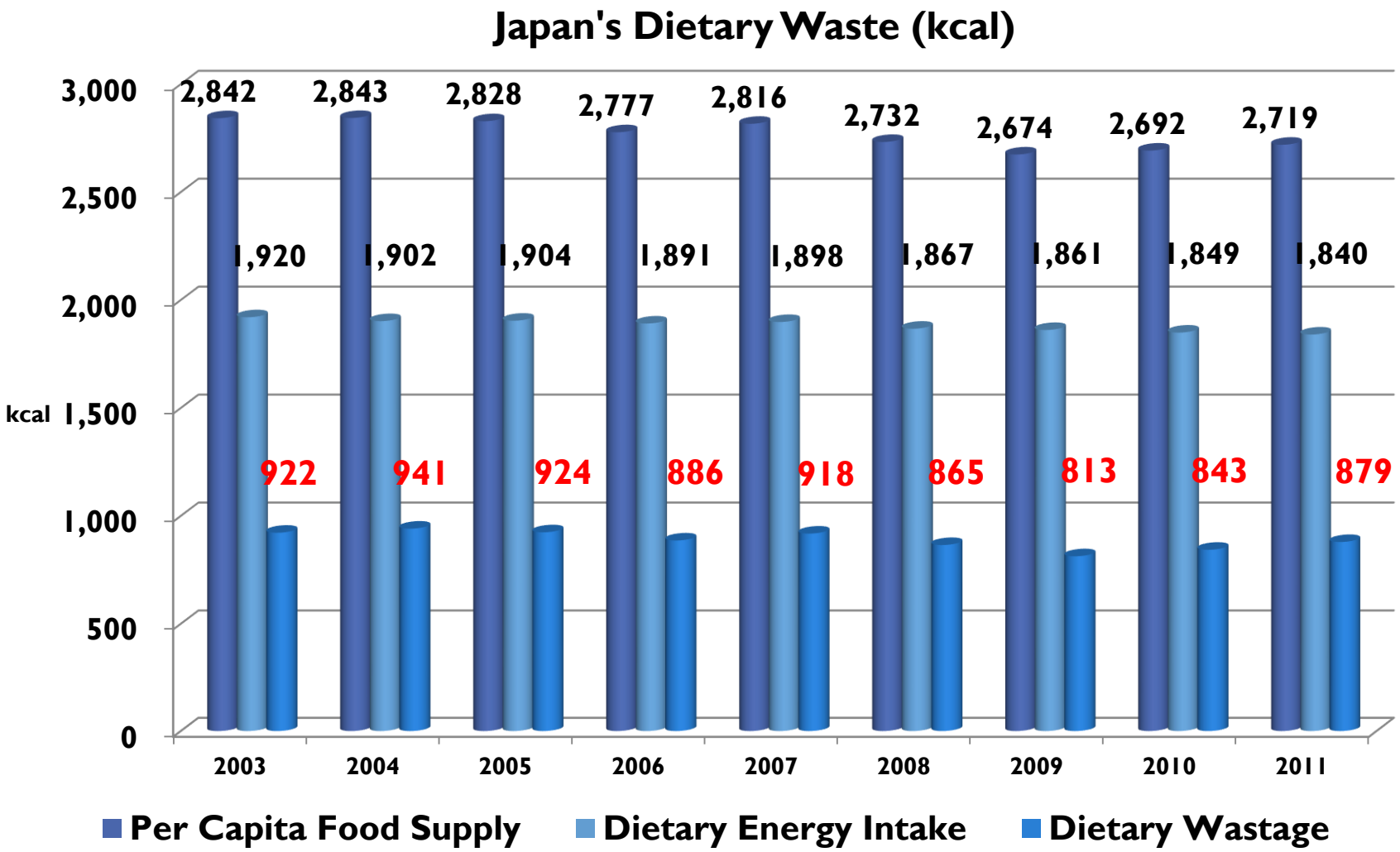
Methodology-1

- The methodology is based on FAO's working paper titled "Estimating household and institutional food wastage and losses" by Sibrian, Komorowska, and Mernies (2006).
- It should be noted that due to data availability, the kind of data used were modified.
- The intake data were individually compiled from the nutrition survey reports of respective economies.

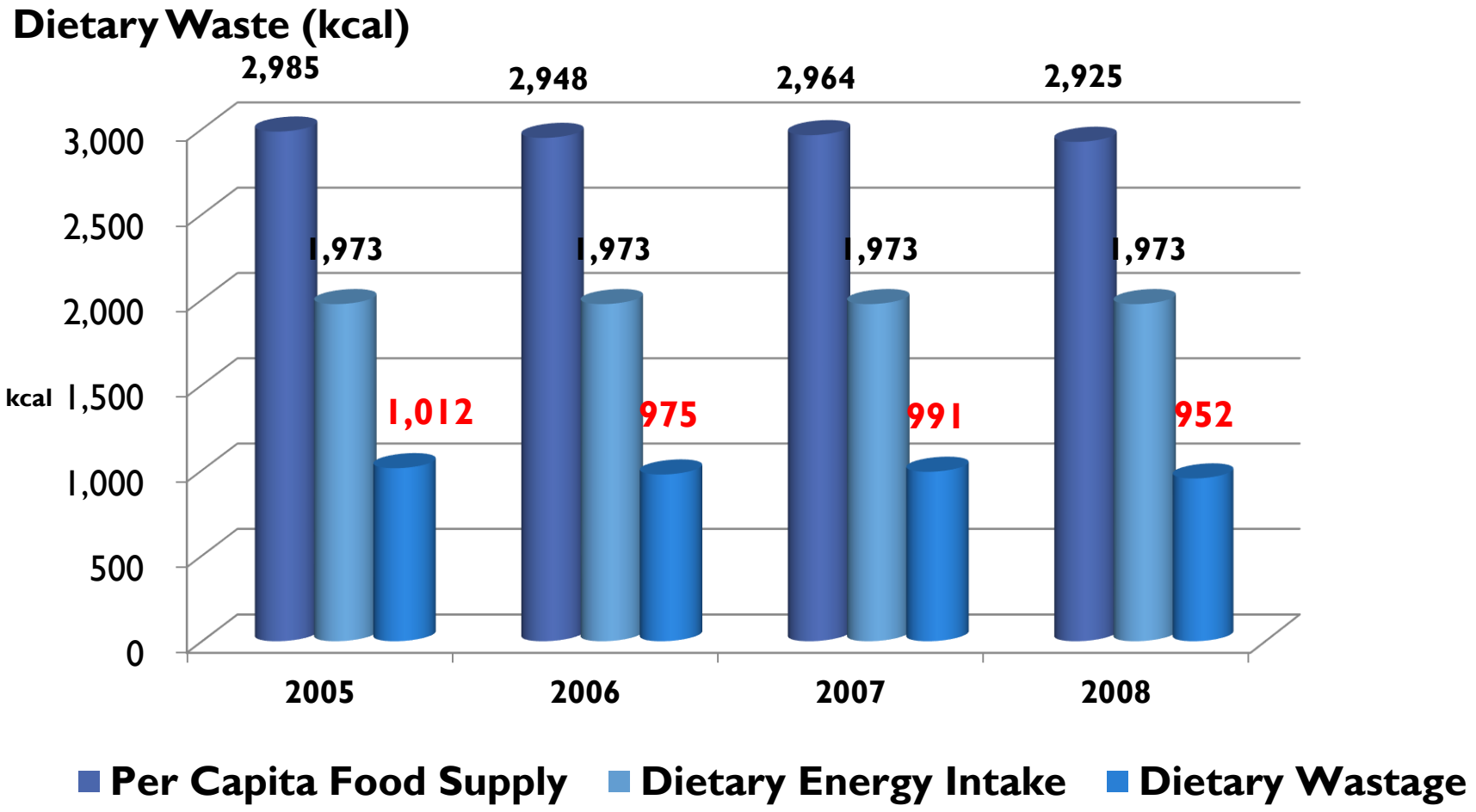
Methodology-2



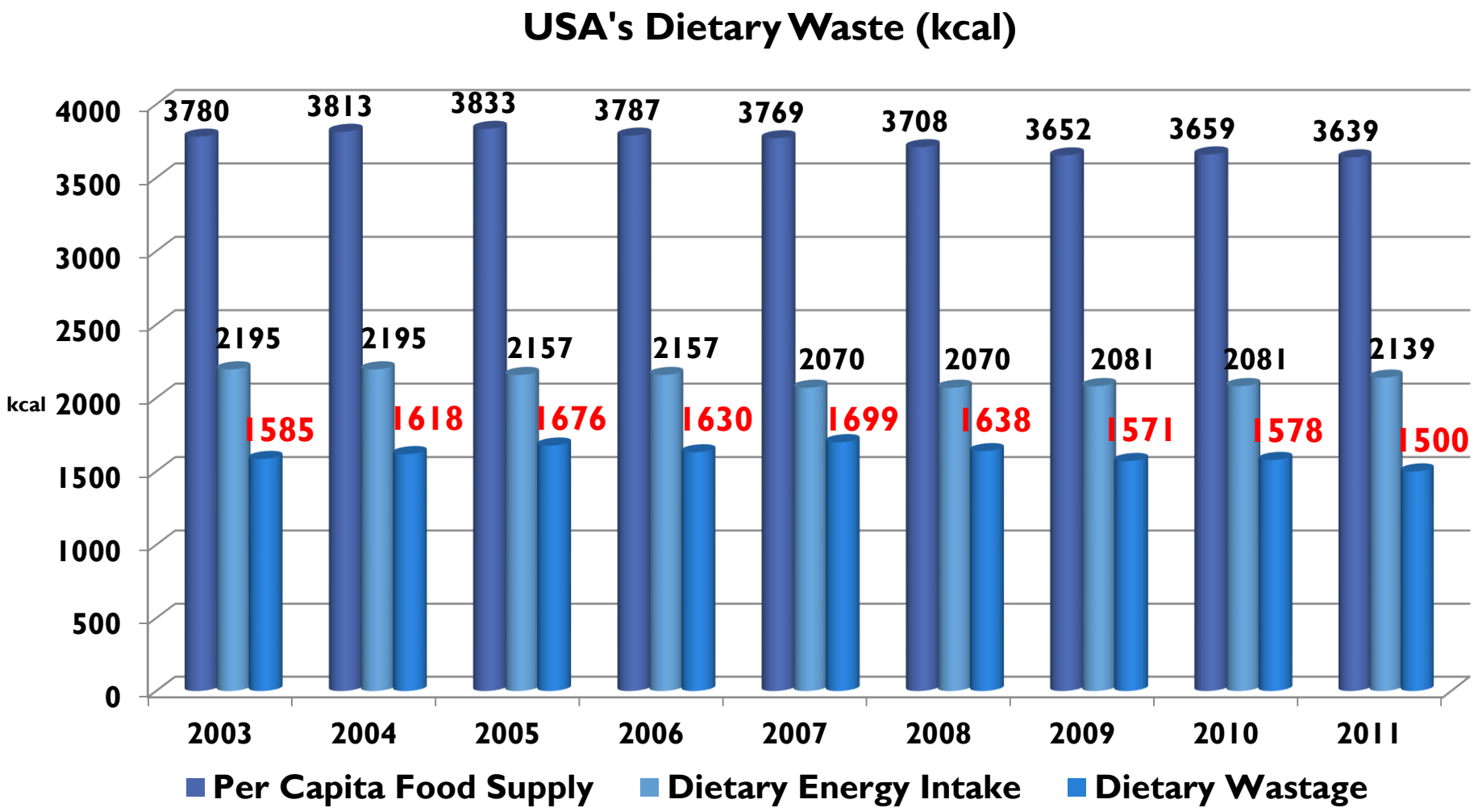
Japan-
Per Capita Food Waste in Kcal



Chinese Taipei-
Per Capita Food Waste in Kcal



United States-
Per Capita Food waste in Kcal



Comparison of 3 Sample Economies

- Based on the FAO paper, existing results of food waste estimates in terms of dietary energy ranges from 0 to 29% regardless of the definition used.
- On average, Japan wastes 30-32%, Chinese Taipei wastes 32-33%, while USA wastes about 41-45%.
  - All 3 economies are above global average level.
- It should be noted that
  - These estimates are high because we used the average available per capita food supply rather than the quantities of actually purchased food portions as the FAO.
  - Limitation➔
    - Cannot differentiate by food items
    - Cannot compare by economies

Progress in 2016

2. Toolkits & Best Practices (Outputs from 2016 Expert Consultations, July 18-19)

2016 APEC Expert Consultation on Food Loss and Waste at Retail and Consumer Levels, Taipei, July 18-19, 2016

1. Refine the assessment of food losses and waste
2. Understand consumers' food choices and the roles of retailers
3. Begin the dialogue on crafting solutions and identify potential barriers to policy formation/adoption

Output from Expert Consultation

(1) Awareness raising on the "Causes"

- ✓ Urbanization
- ✓ Changing diet

→ Opportunity cost of time

- ✓ Increasing globalization & diffusion of large-scale mass distribution,
- ✓ Culture of consumerism and abundance
- ✓ Purchase of excessive quantities induced by sales promotions
- ✓ Preparation of over-generous portions
- ✓ Increasing anxiety about food safety
- ✓ Little tolerance for visual imperfections
- ✓ Confusion around date labelling
- ✓ Lack of food management skills
- ✓ ..... etc

Output from Expert Consultation
(2) Awareness raising on the "Benefits"

An region-wide economic assessment using a multi-regional CGE (GTAP) database and model

- An economy-specific approach to combat food loss and waste will yield the highest efficacy.
- Upper and lower middle income MEs of APEC will experience positive effects in particular, as a decrease in food loss bolsters global competitiveness and food security.

Output from Expert Consultation

(3) Awareness raising on the "Fact"

The retailers' and consumers' role in the food waste issue is especially crucial

➔So the big question is:

"What can we do?"

Output from Expert Consultation

(4) Awareness raising on the "Unsolved Issues"

1. Quantifying retail and consumer food waste in APEC economies:

- ✓ **Definition** of loss and waste are often inconsistent as too are the data collection methods used
- ✓ Information is not always **shared** from the public & private sector

➔ **Transparency** of FLW data remains an issue due to the perceived commercial sensitivity of data

➔ **Limited data available** at retail and consumer levels in many of the MEs

Output from Expert Consultation

(5) Awareness raising on the "Unsolved Issues"

- **Multiple challenges with designing waste reduction policy/intervention measures for the APEC region:**
  - ✓ Diverse priorities for MEs at different levels of development
  - ✓ Different stakeholders in waste reduction have different priorities
  - ✓ Different ministries/agencies responsible for waste reduction between MEs but also within
  - ✓ Conflicting interests between waste reduction and other policies (e.g. promoting food safety)

Output from Expert Consultation

(6) Awareness raising on the "Solutions"

Multiple Solutions are now available

- Based on the experience sharing from the public and private sectors of MEs

Australia:
Food waste management

1 Supporting efficiency and innovation in agriculture

Key players: Australian Government, state and territory governments, primary producers, academic institutions.

2 Assessing food ordering, transport and storage practices

Key players: food and grocery retailers, primary producers.

3 Using packaging effectively and sustainably

Key players: food processing and manufacturing industries, state and territory governments, Standards Australia,

4 Encouraging partnerships between food and grocery retailers and charitable organisations

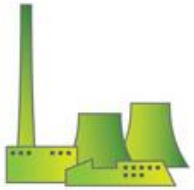
Key players: food and grocery retailers, food rescue organisations.

5 Conducting household education and community initiatives

Key players: state and territory governments, local governments, not-for-profit organisations

6 Diverting food waste from the commercial food sector

Key players: state and territory governments, commercial food sector, academic institutions, not-for-profit organisations.

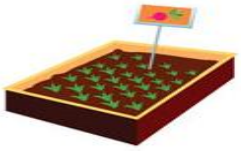


7 Investing in alternative treatment technology and infrastructure

Key players: state and territory governments, private sector, Australian Government.

8 Finding incentives for alternatives to disposing of food waste in landfill

Key players: state and territory governments, waste management sector, private sector.



9 Creating value from food waste

Key players: academic institutions, Australian Government research institutions, private sector.

A number of research and development activities are taking place to find the best value uses for food waste. Research organisations, including the CSIRO's Food and Nutrition group, are supporting the development and commercialisation of new bio-products.

10 Standardising data to measure food waste and track its reduction

Key players: waste management sector, state and territory governments, private sector, Australian Government.

Standardising waste data will allow more consistency between the states and territories and is supported by the food industry. The Australian Government can assess where national standards will make a difference, for example, where standards can be used to reduce the costs associated with meeting different state and territory requirements.

China:
Grain Security Project

- Source: The State Administration of Grain, PR China
  - Unblock logistics channels
  - Restore storage facilities
  - Complete the emergency supply system
  - Ensure grain and oils quality & safety
  - Enhance grain and oils market monitoring and early warning
  - Promote grain conservation and loss-reduction

Approx. 9% of grain production is lost

Indonesia:
Retail Voluntary Implementing Project

- Source: Agency for Food Security, Ministry of Agriculture, Indonesia

- Implement clearly data labelling particularly for expire date information
- Commitment to reduce food waste by implementing minimally processed particularly for fruits and vegetables (i.e fresh cut, salad)
- Food waste (including non-edible parts of foods) used for composting, to produce fertilizer or provide energy sources

Korea:
Weight-rate Disposal Scheme

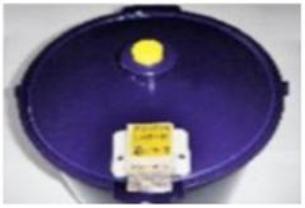
- Source: Ministry of Agriculture, Food and Rural Affairs, Korea

1. Dedicated bag

The waster purchases a food waste metering bag and disposes of it by himself/herself or into a hub container.

2. Payment chip

The waster attaches a chip or sticker on a separate container and disposes of the waste into the container. Fee incurred proportionally to the number of disposal (using a dedicated container, etc.)



3. RFID(Radio Frequency Identification) tag

The waster renders an RFID tag recognized and disposes of the waste → the information on the waster and his/her waste weight is automatically transferred to the central control system.

Malaysia:
GPL (Grading, Packaging & Labeling) System

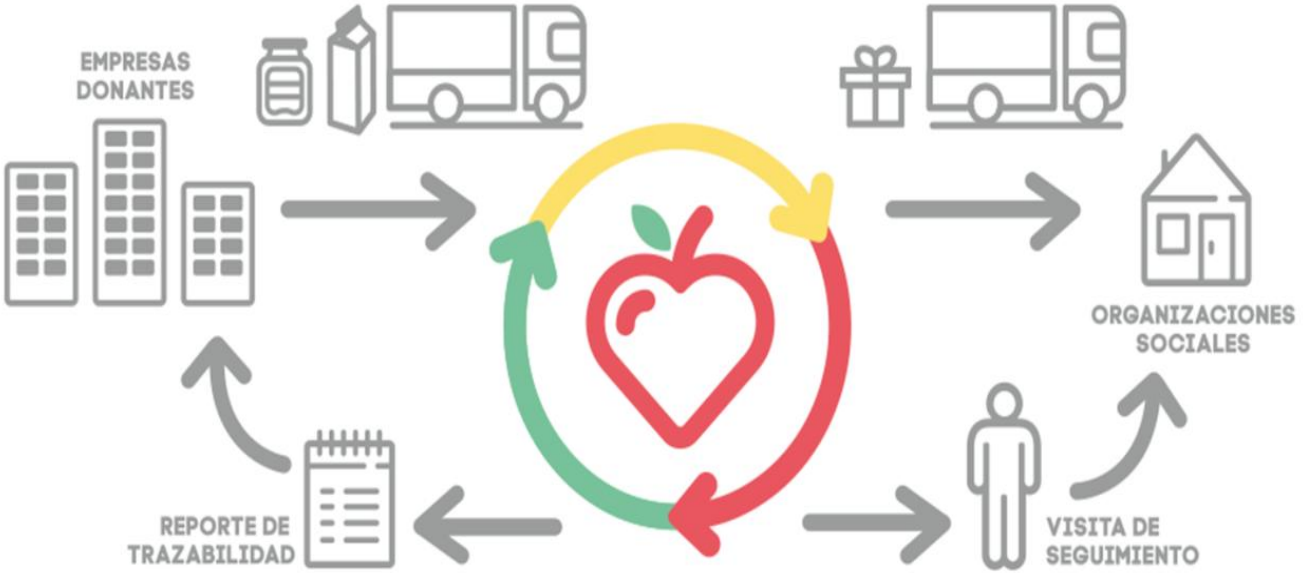
- Source: Horticulture Research Centre MARDI Serdang, Malaysia
- FAMA has launched the GPL system for adoption and implementation by farmers.
- The GPL system will be able to have traceability of all produce marketed.

- GPL Regulation – Packaging
- GPL Regulation – Labeling

Peru:
Food Bank

- Source: Office of Agricultural Policy and Regulation, General Office of Agricultural Policy, Peru

➢ Transfer products in good condition but lost commercial value by near expiry date, bad packaging, does not meet company specifications, and surplus production to social organizations, such as colleges, shelters, and popular dinners.



Viet Nam:
The "Eat up food" campaign to raise public awareness

- Consumers are encouraged to eat up their meal and then post the photos on the social network with hashtags like #anhetroi or #eatupfood.
- The campaign work with restaurants and hotels, for each successful share, there will be a donation to the "4000 meals for poor kids"

Sources: http://goo.gl/7UAwfU
http://goo.gl/Pmgo4F

Viet Nam: Restaurants encourage customers to stop wasting food

- A Vietnamese restaurant serves portions of noodles and rice can be customized by weights and encouraging customers to order only what they can finish.

Source: http://goo.gl/G6gG1J

Chinese Taipei
Sunset Market V.S. Super Market

Sunset markets :

Products that can't sold out in the morning can be sold with a cheaper price.

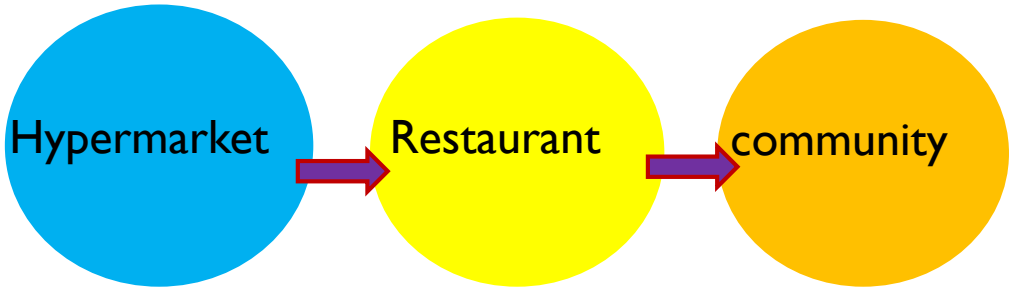
VS

Supermarkets:

Provide small package for consumer's choice to avoid over-buying and food waste.

Chinese Taipei:
Restaurant: Surplus food to ingredients

- The restaurant uses surplus food from hypermarket as ingredients, including foods that have just reached their printed expiration dates as well as fruits and vegetables with exterior blemishes.
- Delicious and cheap meals for low-income families in the community



Surplus food

Chinese Taipei:
Surplus food to ingredients

- A refrigerator outside the restaurant provides free expiring foods that people can take by themselves.

Chinese Taipei
Homemakers United Foundation

Zero Food Waste Actions

- Household Compost Programme
- Cherish Food Programme
- Green Food Education Campagin

- Compulsory trash and leftover sorting rules
- Food Education Basic Law

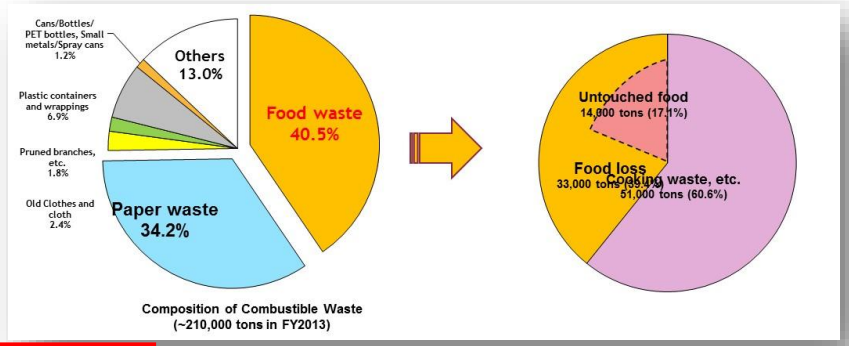
- HUCC: Pre-order System
- Green Food Community Programme

Output from Expert Consultation

Approach to Reducing Food Loss in Kyoto City

Source: Junko Katsumi, City of Kyoto, Japan

1. Household Waste Surveys supported by many people



"Shimatsu no Kokoro Ordinance" to halve the amount of waste

"3-KIRI Movement for Reduction of Food Waste"

Progress in 2016

3. Summary & Recommendations

Summary-1

1. Food Waste Assessment

- ✓ **Definition** of loss and waste are often inconsistent as are the data collection methods used
- ✓ **Information is not always shared** due to the perceived commercial sensitivity of this data
- ✓ **Limited data** available at retail and consumer levels in many MEs

2. Food Waste Reduction: Challenges

- ✓ **Diverse priorities** for MEs at different levels of development
- ✓ **Different stakeholders** in waste reduction have different priorities
- ✓ **Different ministries/agencies** responsible for waste reduction between MEs but also within
- ✓ **Conflicting interests** between waste reduction and other policies (e.g. promoting food safety)

Summary-2

3. **Impact:**
   - ✓ Food loss and waste reduction carries the potential to severely increase human welfare in a nutritional and economic aspect.
   - ✓ Reducing food loss and waste enables member economies to secure economic and social benefits - food/nutritional security enhancement, financial savings to households and poverty alleviation.

4. **Solution**
   - ✓ Food security and reducing food waste is a complicated issue that requires innovative solutions and coordination between both public and private sectors.
   - ✓ It is necessary to implement a set of food losses and waste standards for establishing a roadmap towards food loss/waste reduction, and for evaluating the effectiveness of reduction strategies.
   - ✓ Designing policy recommendations involves a comprehensive understanding of the costs and benefits of reducing food losses and waste, and many effective strategies for reduction involve both public and private cooperation.

Recommendation-1

1. **MEs make significant efforts to reduce food waste in order** to achieve our target of reducing 10% food loss and waste in 2020.
2. **Collaboration and coordination of APEC-wide initiatives on food loss and waste reduction including:**
   - ✓ the use of **coherent quantification methodologies,**
   - ✓ the **provision of support** to infrastructure investment,
   - ✓ the **provision of technical assistance**.
3. **Toolkit approach be used to help reduce food waste.**
   - ✓ Innovative ICTs and mobile APPs are promising tools to help collect reliable data; improve food waste management; and to educate consumers

Recommendation-2

4. Increase public-sector involvement to :

- ✓ gain public funding to investigate food loss and waste and to generate consumers awareness
- ✓ assist nations, cities and states to offer more programs and technical assistance to help with consumers' education
- ✓ define which waste reduction models work best and replicate them
- ✓ Incentivize retailers to report on food waste and create a beneficial business case to reduce food waste

Q: What can we do?

A: Yes, we can do it.

Next Step

1. **2016~2017 Workshop**
2. **Information Platform**

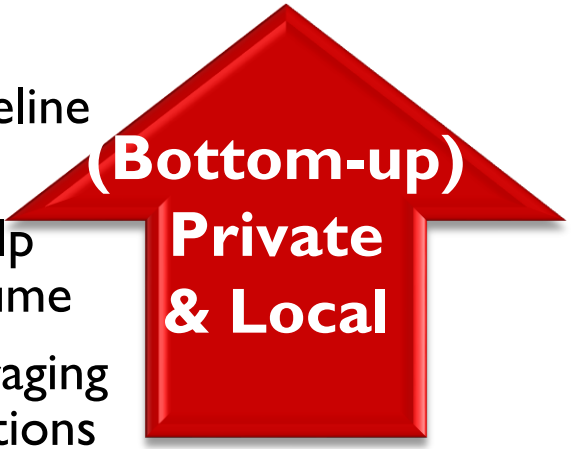
Focusing On Public-Private Partnership

- Provide guidelines for quantifying food loss and waste
- Support infrastructure investment in rural areas
- Support consumer education and raise awareness
- Incentivize private sector to become more efficient in supply chain management

-City government design effective food waste disposal guideline and management plan

- Private firms design new tools/products/ingredients to help consumers reduce food waste at home and not over-consume

-NGO and social media launch consumer campaign encouraging behavioral change and wiser purchase and management options



Next Step in 2017

Launch a **high-level meeting** to facilitate policy dialogue

Final report with policy recommendation and action plans

Disseminate project results via APIP online website

Actions and Inter-linkages

Activities-1

- **APEC-wide Inventory on:**
  - ✓ What are the existing government initiatives/programs for reducing food losses/waste?
  - ✓ What are the major implementation barriers?
  - ✓ How to ensure stakeholder engagement to implement these programs?

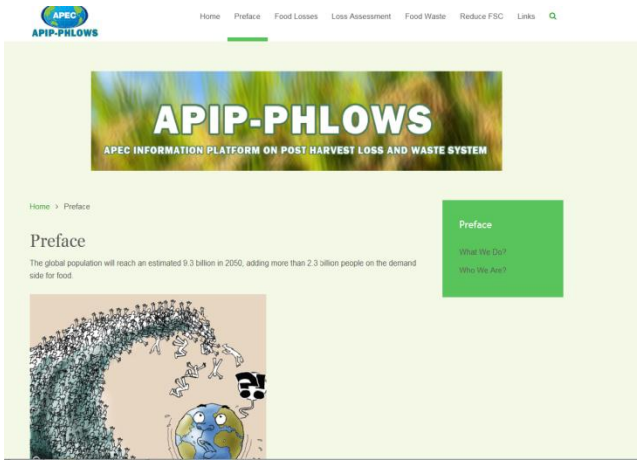
Activities-2

- **Policy dialogue on:**
  - ✓ Use of coherent quantification methodologies
  - ✓ Provision of support to infrastructure investment on upgrading the food supply chain
  - ✓ Provision of capacity building on measuring food loss and waste, and ways forward to enhance rural-urban linkages.

Activities -3: Information Platform

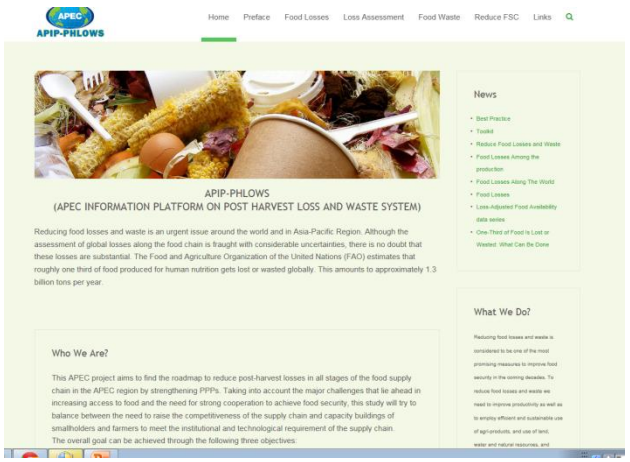
Phase I

- To serve as a repository of information on APEC strategic plans on food loss/waste reduction
- To connect interested stakeholders, to share information and best practices and build business



Phase II

- Content: Regulatory Reform Initiatives, Waste -reducing Projects/Programs, Toolkits/Best Practices
- Features: Social network, e-training, e-commerce for capacity building



Thank You

Comments Welcome