



**Asia-Pacific  
Economic Cooperation**

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# **Reducing Food Loss and Waste along the Food Value Chain in APEC during and post- COVID-19 Pandemic**

**APEC Policy Partnership on Food Security**

March 2022





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**APEC Policy Partnership on Food Security**

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## **APEC Project: PPFS 03 2020**

### **Prepared by**

Dr Ching-Cheng Chang

Research Fellow, Institute of Economics, Academia Sinica and  
Professor, Department of Agricultural Economics, National Taiwan University  
(NTU)<sup>1</sup>

Tel: +886-2-2782-2791 ext. 201

E-mail: [emily@econ.sinica.edu.tw](mailto:emily@econ.sinica.edu.tw)

Dr Shih-Hsun Hsu

Professor, Department of Agricultural Economics, NTU

Tel: +886-2-3366-2666

E-mail: [m577tony@gmail.com](mailto:m577tony@gmail.com)

Mr Jun-Song Yew

Research Assistant, Department of Agricultural Economics, NTU

Tel: + 886-2-3366-2666

Email: [song.900306@gmail.com](mailto:song.900306@gmail.com)

Dr Kenneth Dy

Post-doctorate fellow, Institute of Economics, Academia Sinica

Tel: +886-2-2782-2791 ext. 522

E-mail: [ken.dy04@econ.sinica.edu.tw](mailto:ken.dy04@econ.sinica.edu.tw)

### **Produced by**

Department of Agricultural Economics, NTU

Tel: + 886-2-3366-2666 | FAX: +886-2-2363-7372

Website: <http://apec-flows.ntu.edu.tw/>

### **For**

Asia-Pacific Economic Cooperation Secretariat

35 Heng Mui Keng Terrace, Singapore 119616

Tel: (65) 68919 600; Fax: (65) 68919 690

Email: [info@apec.org](mailto:info@apec.org); Website: [www.apec.org](http://www.apec.org)

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# Table of Contents

<b>Acknowledgement</b> .....	iii
I. Introduction.....	1
II. Summaries of Working Group Discussions.....	2
III. Results of Surveys .....	12
IV. Agenda.....	24
References .....	27

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## **I. Introduction**

According to the APEC Food Security Roadmap Towards 2020, APEC member economies were to strive to reduce food loss and waste (FLW) by an average of 10% compared with the 2011–2012 levels by 2020. Businesses working to reduce FLW would see their costs go down due to greater efficiency, while their margins increase by converting wasted food into new products. Moreover, according to our estimates, implementing the Roadmap was projected to yield an expected 55 billion in social economic value, generate 81,000 new jobs, recover 9.8 billion meals per year of food donations to nonprofits, reduce 8.7 trillion gallons per year of freshwater use, and avoid nearly 96 million tonnes of greenhouse gas emissions annually.

However, the COVID-19 pandemic in 2020 has created unprecedented massive disruptions in the food value chain. APEC's food systems are under stress because measures to contain the virus have spill-over effects on the movement of people and goods. Disruptions in supply chains from lockdowns, labor shortages, blockage on transport routes, and the closure of schools, restaurants and hotels have caused significant increases in FLW. For example, food waste per week per person during the pandemic in Canada increased about half a pound (Saba, 2020); while the US food-waste ratio was predicted to go up from 30% to 40% in 2020 (The world's food system has so far weathered the challenge of COVID-19, 2020). Images and reports of whole fields being plowed under and millions of gallons of milk being dumped during the pandemic and increased food insecurity raised serious questions about how the COVID-19 pandemic has impacted FLW. The 10% FLW reduction target specified in the APEC Food Security Roadmap Towards 2020 may not have been attained.

Tackling the problem of FLW calls for a mixture of strategic measures, such as collaboration throughout the food supply chain, cross-border movement for emergency services and cargo flows, and adoption of digital technologies like internet of things (IoT), artificial intelligence (AI), big data, and blockchain on food value chain management through Public-Private Partnership (PPP). This may enhance the resilience of the food value chain, and contribute to food security and the attainment of a sustainable and efficient food system in the Asia-Pacific region.

To better promote the minimization of FLW during the COVID-19 pandemic, Chinese Taipei conducted the “Workshop Reducing Food Loss and Waste along the Food Value Chain in APEC during and post COVID-19 Pandemic”. This virtual workshop was held from 30 June to 2 July 2021 via Microsoft Teams. It aimed to serve as a platform for both the public and private sectors of APEC economies. Prior to the workshop, a pre-meeting survey was conducted to learn about how APEC economies have responded to the pandemic insofar as FLW is concerned. An evaluation survey was also distributed to participants after the workshop. Results of these two surveys are summarized below.

Apart from the Opening Session, Individual Economy Reports and a Recommendation and Closing Session, this three-day program consisted of 10 main sessions, which included supply chain dynamics, digital and e-commerce opportunities, best practices and innovative technologies, APEC agenda on FLW beyond 2020, and recommendations to the APEC Food Security Roadmap. See [Chapter IV](#) for the more detailed agenda.

There were a total of 137 registrants from 14 member economies, including Chile; Indonesia; Japan; Republic of Korea; Malaysia; New Zealand; Papua New Guinea; Peru; Philippines; Singapore; Chinese Taipei; Thailand; United States; and Viet Nam. Out of 137 participants, 71 (or 52%) were females.



Figure 1.1 Workshop group photo



Figure 1.2 Opening remarks guests group photo

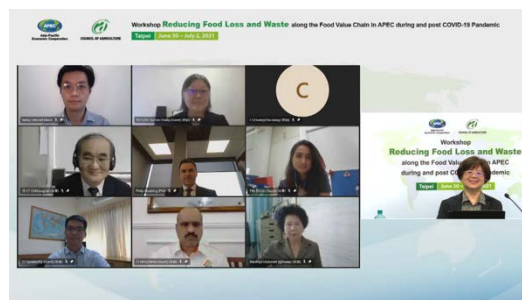


Figure 1.3 Workshop group photo

## II. Summaries of Working Group Discussions

### 2.1 Opening Session

The opening remarks were given by Mr Philip Houlding, APEC PPFS Chair, New Zealand; Dr Su-San Chang, APEC Agricultural Technical Cooperation Working Group (ATCWG) Lead Shepherd, Chinese Taipei; Mr Teddy Pavon, PPFS Program Director, APEC Secretariat; and Mr Chih-Hung Lin (on behalf of Mr Vincent Chia-Rong Lin, Project Overseer, Chinese Taipei).

Mr Houlding highlighted the APEC Food Security Roadmap Towards 2030, which is the key task of the PPFS this year, and to be completed by the Food Security Ministerial meeting in August. In this context, he thanked Chinese Taipei for the leadership in the aspect of food loss and waste.

After greeting all the participants, Dr Su-San Chang underscored the common goal of



APEC region towards sustainable agri-food systems by promoting technical cooperation among member economies and other international organizations, with the aim of enhancing the capacity of agriculture and related industries to contribute to economic growth, food security, sustainable agriculture and social wellbeing in the region. She also highlighted that FLW reduction is among the priorities of the ATCWG's Strategic Action Plans and would like to strengthen the cross-fora cooperation with the PPFS on relevant issues towards the common goal of establishing a sustainable and resilient agri-food system in the region.

Mr Teddy Pavon reiterated the importance of food security in APEC in the face of food price volatility. The disruption in the food value chain during the COVID-19 pandemic has posed a challenge to the management of FLW. It is vitally important, he said, to take advantage of new technologies to enhance resilience.

Finally, Mr Chih-Hung Lin briefly introduced the themes of three-day workshop. He expressed his hope that the workshop will provide concrete suggestions for member economies to achieve food security beyond 2020.

## **2.2 Keynote Speech**

### **Reducing Food Loss and Waste: Challenges and Opportunities for APEC**

Dr Maximo Torero Cullen, Chief Economist, Food and Agriculture Organisation (FAO)

Dr Torero briefed everyone on the challenge of food security across the globe. The world is producing enough food to feed the whole world in terms of daily caloric needs. An estimated 3 billion people in the world do not have regular access to safe and nutritious food in 2019, of which 690 million suffer from chronic hunger. The pandemic has worsened this by an additional 132 million more. In contrast, more than 2 billion people suffer from overweight or obesity.

He emphasized the opportunity of garnering a triple win—increased food security, reduced Greenhouse Gas (GHG) emissions and natural resource use; and improved production and economic growth. According to the Food Waste Index report (UN Environment Programme – UNEP, 2021), an estimated 17% of total global food production was wasted in 2019—11% in households, 5% in food service and 2% in retail. Now, FLW accounts for approximately 6% of the global greenhouse gas emissions. He cited 2015 FAO report, which showed that FLW accounted for about 6% of global GHG emissions. From a food supply chain (FSC) perspective, resources (land, labor, water, energy and other inputs) are used from farm to fork, i.e., from upstream to downstream stages of the supply chain. This also increases GHG emissions unnecessarily. These are the hidden costs when food is lost or wasted. He further noted that FLW that occurs towards the end of the FSC results in more GHG emissions.

He also gave examples of how to reduce FLW across the supply chain, especially in

the processing stage. He stressed the importance of several key areas such as scientific research, government incentives for innovations especially for farmers, PPP, knowledge sharing among economies, and consumer education, especially young people.

### **2.3 Supply Chain Dynamics Responding to COVID-19**

The presentation slides of each speaker are available on:

<http://apec-flows.ntu.edu.tw/report-detail.aspx?seq=26>

#### **Food Consumer Response and Supply Chain Dynamics during COVID-19**

Dr Dawn Thilmany, Colorado State University; President of Agricultural & Applied Economics Association (AAEA)

Dr Thilmany explained the trend towards e-commerce and at-home eating, especially in the US and Australia, although she touched upon China, Japan and Republic of Korea as well. Dr Dawn Thilmany explained the trend towards online food purchases (most likely remaining in the long-term) and at-home eating (likely a temporary adjustment), especially in the US. As for APEC economies, she notes that growth of online share in Australia mimics that of the US, but Asian markets (China, Japan and Republic of Korea) are moving more quickly. She also spoke about the trend of buying local foods in the US during the COVID-19 pandemic.

She also gave the U.S. Department of Agriculture's Farmers to Families Food Box program as an example of how the US addressed FLW and ease hunger during COVID-19.

#### **Building Resilient Food System amidst COVID-19: Responses and Lessons from China**

Dr Kevin Z. Chen, Zhejiang University; International Food Policy Research Institute

Dr Chen explained the COVID-19 disruptions along the food supply chain in China. On the supply side, the shock came from labor shortage, limited storage capacity of the farmer and facility shutdowns. His own sources showed that more than 820 million people are suffering from hunger and more than two billion people lack essential micronutrients, while the same number is also overweight or obese, and more than 144 million children are stunted. He also shared the Global Report on the Food Crisis which reports that 135 million people were already in extreme hunger. And COVID-19, he said, is expected to add another 130 million food-insecure people.

He provided an extensive list of policy responses that their government implemented to address these issues. He also touched upon the e-commerce in China. He also introduced what International Food Policy Research Institute (IFPRI) is doing to deal with global poverty and nutrition problems caused by the pandemic. He also gave concrete suggestions on how economies can build resilience to face future global supply chain emergencies. Finally, he underscored the importance of maintaining an

open international trade and the value of financial support for supply chain actors.

## **2.4 Mitigating Food Waste Responding to COVID-19**

### **Challenges on Reducing Food Waste under COVID-19 in New Zealand**

Dr Miranda Miroso, University of Otago

Dr Miroso focused on the disruptions to the food supply chain caused by COVID-19 in New Zealand. She presented eight challenges and corresponding solutions that New Zealand has done to address them. New Zealand exports 85% of all its agricultural output, which feeds over 40 million people worldwide. In March 2020, New Zealand entered a month-long lockdown that was widely regarded as one of the strictest in the world. Despite this, agricultural activities were largely able to continue to produce and export because they were classified as essential services.

Nevertheless, they faced several challenges. First, lockdowns caused a massive shift in their consumption channels. With regard to FLW, they enjoined company innovations and partnerships to be more agile, and sought redistribution of FLW. Second, there were still suffered heavy losses in exports and short supply of imported inputs. Government provided financial support for international air-freight carriers and encouraged diversification of export markets. Third is the backlog in meat processing plants, which they alleviated through import substitution, encouraging surplus supply to be cut and frozen and government purchases. Fourth was labor shortages, which they solved by extending work visas, adjusting work schemes, and pushing automation. Fifth, on household waste, they ramped up education. Sixth was the twin short-term spike in FLW and foodbank demand. Government funded the efforts to redirect food from the primary sector to food banks. Seventh, they endeavored to devise long-term solutions to address food insecurity and FLW. The final challenge she raised was how to upcycle biological by-products.

### **Optimizing the Cold Chain in Australia to Achieve FLW Reduction**

Mr Mark Mitchell, Australian Food Cold Chain Council

Mr Mark Mitchell shared his decades experience in cold chain management. In particular, he gave concrete points on how to lessen food loss by optimizing the cold chain such as following the International Organization for Standardization (ISO) refrigeration standards, keeping the temperatures right, ensuring the goods are locked and secure, monitoring door openings, alert systems when deviations occur, and complete documentation of the whole journey. He also highlighted the paramountcy of optimizing cold chain as part of a quality management system, and training cold chain professionals to reduce food loss.

He cited figures that showed Australians losing and wasting about 7.6 million tons per annum across the FSC, with households contributing the most (32%), followed by

primary sector (22%), processing stage (17%) and hospitality industry (16%).<sup>2</sup> Along the cold chain alone, the total value of FLW reaches a staggering AU\$3.8 billion.

He dwelled on other issues as well. First, from 2019 to 2020, the percentage of food insecure Australians seeking food relief at least once a week increased doubled from 15% to 31%. Although charities are seeing demand for food relief become more erratic and unpredictable, overall numbers are up by an average of 47%. Second, Australian Government is currently offering \$6000 cash bonus to anyone entering the farm industry. This is a longer-term approach to make farm work more attractive to people of all ages. International workers are also granted incentives under the new agricultural visa. Third, on PPP, he shared the 2021/22 milestones of Stop Food Waste Australia, which will also launch the Australian Food Pact in August 2021. Their target is 50 signatories by June 2024 were projected income into the impact of two \$2.5 million a year to fund FLW initiatives within Australia.

## **2.5 Digital and E-Commerce Opportunities Responding to COVID-19**

### **E-commerce's Fast-Tracking Diffusion and Adaptation in Asia**

Dr Thomas Reardon, Michigan State University

Dr Reardon talked about the transformation of food value chains, and also the rise of e-commerce before and during COVID-19. First, he spoke about the supermarket revolution which took off in the United States around 1920–1930s, but around 1980–1990s in Asia and Latin America. Although the demand side drivers of the supermarket revolution in developing Asian and Latin American economies were similar to those that occurred in the US, they occurred more intensively and quickly. These include: (1) shoppers wanted to save time; (2) ever easier to get to supermarkets; (3) ever harder to get to wet-markets; (4) food safety shocks drove shoppers to supermarkets; and (5) human disease risks in wet-markets. The supply-side drivers include: (1) technology & business organization change “fast-tracked” by transfer from earlier innovators (in US/Europe); (2) supermarket diffusion “fast-tracked” by intensive foreign direct investment (FDI) & competitive domestic investment; (3) supermarket penetration “fast-tracked” by adapting to dense cities; (4) supermarket competitiveness with traditional retail “fast-tracked” by procurement system modernization; (5) procurement change “fast-tracked” by help from supply chain partners.

Then, he spoke of the shift towards digital computer revolution and the e-commerce (business to consumer – B2C), which began as early as the 1990. The drivers include: (1) intensifying urban congestion; (2) rapid spread of smartphones/computers; (3) role of human disease (again) but bigger on demand-side drivers; (4) technology transfer; (5) pivoting by supermarkets and e-commerce. He also noted that, before COVID-19,

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<sup>2</sup> “National Food Waste Strategy – Feasibility Study Announcement,” Food Innovation Australia Limited (FIAL), <https://www.fial.com.au/blogs/post/national-food-waste-strategy-feasibility-study-announcement>.

small medium enterprises (SMEs), farmers, wholesalers had already adopted e-commerce and B2B facilities in some member economies. Examples include: (1) SMEs selling through Facebook; (2) SMEs use delivery intermediaries with apps like Swiggy with small restaurants in India; (3) farmers in Malaysia and Indonesia; and (4) wholesalers becoming e-procurement firms like Ninjacart in India.

Finally, he avers that e-commerce was accelerated by COVID-19, and predicts that e-commerce will probably continue in rapid expansion.

### **E-commerce and delivery intermediaries: A Case of Chinese Taipei**

Mr Yi-Khim Tan, Association of Input-Output Studies

Mr Yi Khim Tan shared the development of e-commerce and delivery intermediaries in Chinese Taipei during COVID-19. Before the year 2000, Chinese Taipei had developed e-commerce and logistics service industry. The pandemic in Chinese Taipei had been relatively mild, but in recent months, there was a shock in the FSC. Significant impact started from mid-May 2021. Under alert level 3, school, shops, and working places closed. Data from *Google Mobility* shows that 20% of people stayed at home. Many firms, including e-commerce firms, supermarkets for material supplies, launched their vegetable box service in the first or second week. Apart from *Uber food* and *Food Panda*, even taxi drivers supported all kinds of delivery. The adjustment in business operations (including cold chain storage, delivery volume and time, and quality control) and consumer practices increased FLW in the ensuing short-term period. To minimize FLW, he suggested setting up common standards for containers and food safety (Risk Priority Number of Failure Modes and Effects Analysis – RPNs of FMEA, to classify hazard and risk of food system). He also opined that picking goods from the shop instead of home delivery may reduce FLW. He encouraged connecting with food banks to reduce FLW. Finally, he urged consumers to plan their purchases and be more responsible in their consumption practices.

### **2.6 Best Practices and Innovative Technologies on Reducing FLW**

**Ecobuy with SDGs, Mr Zaif Siddiqi, NTT DOCOMO Inc.**

Mr Siddiqi introduced their Ecobuy mobile application which motivates consumers to buy products nearing the expiration date by awarding them points. He stated that, NTT DOCOMO not only provides Mobile-ICT solutions, but also contributes to development of sustainable society. The target of Ecobuy is FLW reduction at the retail stage. Consumers can also use Ecobuy reward points in conjunction with NTT DOCOMO's other point systems. He also outlined the benefits of Ecobuy for companies like complementarity with applications that consumers are already familiar, good public relations (consumers want to buy from retailers working to reduce FLW), and other features such as push functions. Finally, he unveiled the prospects of Ecobuy, including concierge service, seamless user experience, and facilitating smart

cities.

### **Food Recovery—Response to COVID-19, Ms. Marilyn Su, Carrefour Foundation**

Ms Su shared how their company tackles FLW through innovative solutions. They are also the biggest retailer in Chinese Taipei, and their ambition is to become the leader of food transition in the area. Their vision, she said, is to build a strong resilient network for food donations.

They have worked with food banks and 44 suppliers since 2014 to minimize FLW through food donations, among other things. They donate all the unsold food items to food banks. In 2017, they started to sponsor a food bank in the South of Chinese Taipei and set up an online sharing platform. They also built a food donation network with food suppliers in 2019. Last year, they arranged for food collection boxes in their head office and established a food supply alliance.

During the COVID-19 pandemic, they cooperated with non-governmental organization (NGOs) to help disadvantaged families; collaborated with some suppliers to donate food; initiated a mobile food truck for aboriginal tribes; delivered goods to visually impaired and the foreigner students in need; partnered with China Airlines to help them turn their unsold airline cuisine into frozen products and sell the same in the supermarket; supported sellers of unsold pineapples; and conducted consumer education on shopping habits to avoid hoarding behavior. She also mentioned other strategies they implemented to minimize FLW: discounting for ugly or near-expiration food items; turning surplus items into animal feeds; and donating lunchboxes to frontline workers in hospitals.

### **Reducing FLW along the Food Value Chain: An Experience from Nestlé Viet Nam**

Mr Truong Hoàng Phuong, Nestlé Viet Nam

In line with the principle of circular economy, Mr Phuong shared their company's innovative way of reducing food loss by using all of their waste coffee grounds to supply 70% of the fuel source for steam generation. In fact, all their factories have achieved “zero waste to landfills” since 2015. They are guided by the United Nations Sustainable Development Goals (UN SDG) and have committed themselves to the Champions 12.3 10x20x30 initiative of World Resource Institute.

He gave other examples of how they applied circular economy. *NESCAFÉ NATIV Cascara* upcycles coffee berries that surrounds coffee beans into a new unique beverage. This also provides farmers with a new revenue stream. *PURINA* uses surplus brewery grains to make dog food. *INCOA* chocolates are made entirely from the cocoa fruit, using the beans and pulp as the only ingredients and therefore not adding any refined sugar. He also cited their natural compost in Singapore, which used coffee grounds from capsules mixed with sawdust, vegetable waste, yeast, soil and fertilizers. And finally, a soup product under their *Maggi* brand uses vegetables that would have

otherwise remained unsold due to their appearance and gone to waste. Since 2011, they have also been training farmers in Viet Nam to harvest coffee beans more efficiently.

## **2.7 APEC ME and Survey Report**

### **Chile**

In 2020, they set National Commission of FLW under the Ministry of Agriculture of Chile. The said commission's goal includes governance strategic alliances, knowledge and innovation, communication and awareness. They also adopted a strategy for organic waste launched in March 2021. The goal is to increase municipal organic waste recovery from 1% to 66 % by 2040 by reducing household food waste and composting the organic waste.

Chile also has a proposed bill that included the prohibition of destroying or discarding food suitable for human consumption, perishable or non-perishable, that has lost commercial value. The food must be delivered by the producers/marketers to intermediate organizations (neighborhood associations, churches, NGOs and the like), or to final recipients (natural persons).

Due to the coronavirus pandemic, the poverty rate in Chile increased from 10.7% to 10.9%. In this context, the National Commission of FLW has supported the development of "Micro Food Banks" installed in street markets. These Micro Food Banks recover food suitable for human consumption, that had been donated by the farmers to be given to social organizations that help feed those in need. On average, they recover about 300 kilograms of fruit and vegetables per day.

### **Chinese Taipei**

COVID-19 has directly impacted the FSC in Chinese Taipei: lack of labor, sudden increase in online food purchases, need for more storage, etc. In response, Chinese Taipei helped farmers upgrade their dry and low temperature storage facilities, facilitate application of smart agriculture and other post-harvest techniques. In addition, the government helped create consumer friendly packaging to ensure products reach consumers safely. Chinese Taipei also continuously disseminates the idea of smart purchase (avoid over-shopping, try to plan ahead). Finally, the Council of Agriculture has finalized a Food and Agriculture Education Law, which includes FLW among its projects.

### **Thailand**

Their government supported entrepreneurs in using cold chain to extend shelf life of perishable products. They also helped the food delivery operators reduce plastic waste. Food sharing projects were initiated, which helped alleviate food insecurity and reduce FLW.

## **APEC Survey Report on COVID-19 Impact on Food Supply Chain and Responses,**

Dr Kenneth Dy, Academia Sinica

*The results of the survey are reported in the next chapter.*

### **2.8 APEC Agenda on FLW Beyond 2020**

#### **Reducing FLW: Setting a Global Action Agenda**

Mr Brian Lipinski, FLW Protocol at WRI

Mr Lipinski first shared two of the more well-cited publications of WRI: (a) Reducing Food Loss and Waste: Setting a Global Action Agenda, and (b) Reducing Food Loss and Waste: Ten Interventions to Scale Impact.<sup>3</sup> On the former, he shared some best practices on the production stage only since time was limited. But for the latter, he went through each of the ten interventions. He emphasized that though economies, especially within APEC, are quite diverse, these ten are still applicable to certain extents.

#### **Reducing Food Waste Roadmap to 2030: ReFED Insights Engine**

Ms Dana Gunders, ReFED

Ms Gunders started by introducing her organization. ReFED is a non-profit organization in the US working to end food loss and waste across the food system by advancing data-driven solutions to the problem. She explained their process of analysis in coming up with their ReFED Insights Engine and Roadmap to 2030.<sup>4</sup> She then proceeded to explain the seven key action areas in their roadmap, which are grouped into three: prevention (optimize the harvest, enhance product distribution, refine product management, maximize product utilization, reshape consumer environments); rescue and recycling. She shared some of the top solutions they have gathered and explained their impacts in terms of net financial benefit, gallons of water saved, tons of GHG emissions reduction, number of meals recovered, and jobs created. Finally, she demonstrated how to use the insights engine on their website.

### **2.9 Recommendations to APEC Food Security Roadmap Beyond 2020<sup>5</sup>**

#### **Dr Witsanu Attavanich, Kasetsart University**

Dr Attavanich organized his comments based on SMART (specificity, measurability, achievability, relevance and time constraints). But he focused mainly on the first one. He provided suggestions on specific points such as what actually needs to be done,

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<sup>3</sup> (a) "Reducing Food Loss and Waste: Setting a Global Action Agenda," World Resource Institute, <https://www.wri.org/research/reducing-food-loss-and-waste-setting-global-action-agenda>, and (b) "Reducing Food Loss and Waste: Ten Interventions to Scale Impact," World Resource Institute, <https://www.wri.org/reducing-food-loss-and-waste-ten-interventions-scale-impact>

<sup>4</sup> <https://insights.refed.com/> and <https://refed.com/food-waste/the-solutions>

<sup>5</sup> The roadmap being prepared is actually "APEC Food Security Roadmap Towards 2030".



what results are expected and why they are important, who should be in charge and who else should be involved, and what are required given specific constraints. On measurability, he voiced the concern about cost of developing a database, especially for developing economies. He also raised the possibility of having a common APEC database. He also discussed the previous 2014 roadmap toward 2020. He noted some points like capacity building, knowledge, information, capital infusion and digital tools. He also shared the initial results of the FLW survey they did in Thailand. Finally, he emphasized the need for interim progress targets towards 2030.

#### **Dr Jean Buzby, U.S. Department of Agriculture**

Dr Buzby presented a conceptual model of the current proposed draft, and discussed them by key areas. Then, she shared two things that the US did: federal interagency collaboration to reduce FLW among Food and Drug Administration (FDA), Environmental Protection Agency (EPA) and the United States Department of Agriculture (USDA); and the US FLW 2030 Champions program, which is a joint initiative by USDA and EPA.

#### **Ms Dana Gunders, ReFED**

Ms Gunders gave brief comments. She explained that the more specific the indicator is, the more responsible people will become. She also highlighted the significance of sharing documents.

#### **Dr Tony Hsu, NTU**

Dr Hsu gave an overview of the FLW seminars that APEC has been holding since 2013, as well as the three pillars that guided these efforts: assessment, toolkits and best practices in PPP, and capacity building seminars and consultations. He reiterated the benefits of reducing FLW. With regard to the roadmap, (1) he insisted on the 10% average reduction rate target across APEC economies, (2) aligning with UN SDG 12.3, and (3) following the UN Food Loss Index and Food Waste Index computation. Finally, he described three important documents as reference: APEC Food Security Roadmap towards 2020, APEC action plan for reducing FLW, and APEC Food Security Business Plan (2014–2020).

### **2.10 Next Steps & Closing Remarks**

#### **Dr Ching-Cheng Chang, Academia Sinica**

Dr Ching-Cheng Chang presented the recommendations that have been gathered throughout the three-day workshop. She also recapped several key points raised during the workshop. She made some final remarks on the need for resilient food system, challenges thereof and current trends in the food value chain; and how all these considerations can contribute to drafting an APEC Action Plan for Reducing FLW.

## **Dr Su-San Chang, Lead Shepherd, ATCWG**

Dr Su-San Chang called for the efforts of member economies to achieve a plausible plan and believes that technology can play a significant role among it. She further reiterated that, in the post-pandemic era, the habits of consumers, online purchasing, cold chain, tracking technologies all are important issues. One needs to minimize the wasting of food and make sure the temperature for food is good. Furthermore, initiatives such as Ecobuy can be a suitable model for others. Finally, she expressed her hope that all the economies have learned a lot from these three days.

## **Mr Vincent Lin, Project Overseer, Council of Agriculture**

Mr Lin expressed his pleasure for a fruitful workshop. He further encouraged all the economies to design effective ways to meet the FLW targets of SDG 12.3.

### **III. Results of Surveys**

There were two surveys conducted within the project period: the “APEC Minimizing Food Loss and Waste Survey” and the “APEC Project Evaluation Survey.” The former was designed to gather information on the challenges and measures implemented in different APEC economies with regard to FLW during COVID-19, as well as how digital and information technologies could contribute to this effort. Then, after the 3-day workshop, the latter survey was distributed among the workshop participants to gather their opinions on the project.

#### **3.1 APEC Minimizing Food Loss and Waste Survey**

In this section, the results of the survey will be presented. A more in-depth analysis is discussed on a separate comprehensive survey report, available in <http://apec-flows.ntu.edu.tw/publication.aspx>.

The team was able to gather a total of 87 responses from 17 economies. Oceania and South American economies are completely represented. Table 3.1 and Table 3.2 show the breakdown of the respondents according to economy, continent and sector. Majority of the respondents are from Asia (71%) and from government (67%).

Table 3.1 Respondents by Member Economy (ME)

<b>Member Economy</b>	<b>Number</b>	<b>Member Economy</b>	<b>Number</b>
Australia	1	Papua New Guinea	5
Chile	2	Peru	6
China	1	The Philippines	7
Indonesia	2	Singapore	3
Japan	5	Chinese Taipei	22
Republic of Korea	4	Thailand	7
Malaysia	9	United States	1
Mexico	5	Viet Nam	2

New Zealand	5		
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Table 3.2 Respondents by Sector and Continent

	Government	Private or NGO	Academic	Total
Asia	45	12	5	62
Oceania	4	6	1	11
South America	6	1	1	8
North America	3	2	1	6
<b>Total</b>	<b>58</b>	<b>21</b>	<b>8</b>	<b>87</b>

Figure 3.1 presents the FLW-related policies and programs that the respondents have encountered in their respective economies before COVID-19. Note that some of these are ongoing during the pandemic. The highest is food waste recycling at 52%, followed not far behind by postharvest facility support (49%), capacity building for FLW (49%) and improved handling and transportation management (47%). Only 24% of the respondents said they have come across an economy-wide legislation—the lowest among all the choices.

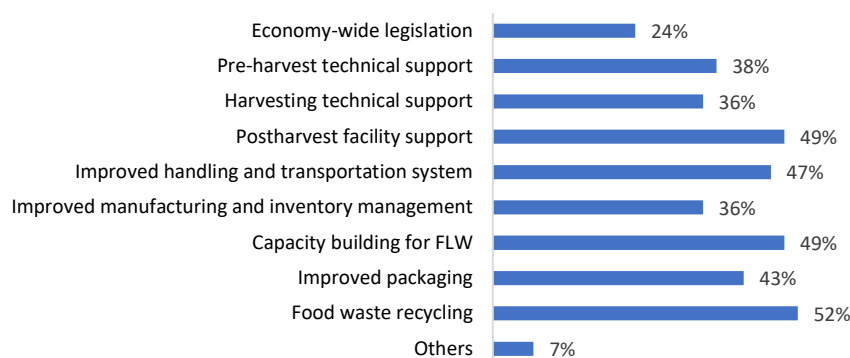


Figure 3.1 Food Loss and Waste Policies before COVID-19

Next, they were asked about the challenges in policy formulation and policy implementation. Figures 3.2 and 3.3 present the results. The most daunting challenges are with regard to measurement, information and awareness.

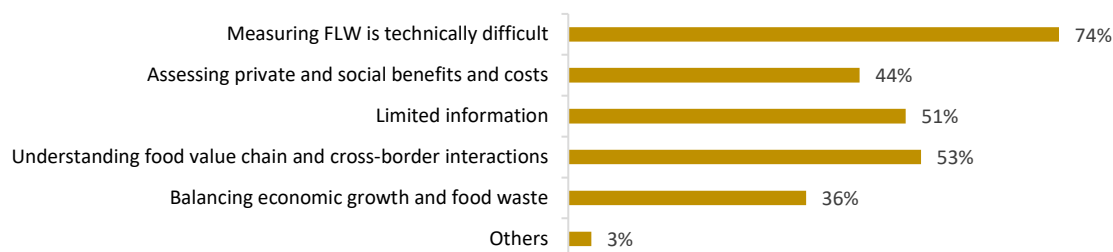


Figure 3.2 Challenges in FLW Policy Formulation

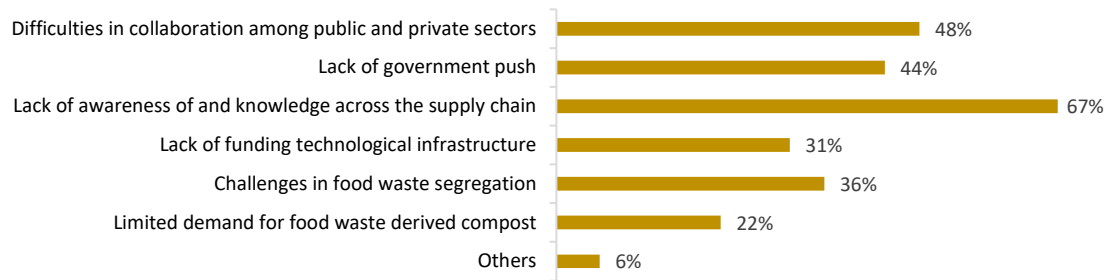


Figure 3.3 Challenges in FLW policy implementation

Respondents were asked about the impact of COVID-19 on FLW of different commodity groups. Respondents almost unanimously ticked fruits and vegetables (79%) among 8 commodity groups (see Figure

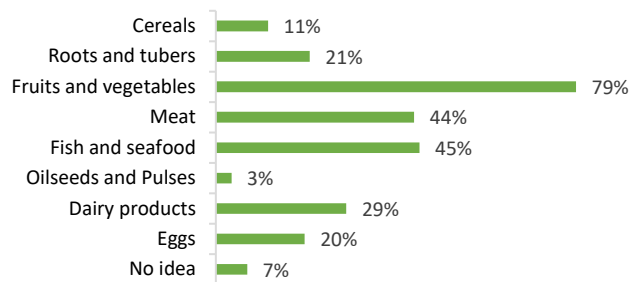


Figure 3.4 Commodity Groups affected by COVID-19 (FLW aspect)

3.4).

Next, respondents were asked about the impacts of COVID-19 on the food supply chain (FSC). Results are divided into six parts; one for each of the stages of the FSC and one for overall and other impacts. The responses for each are depicted in Figures 3.5 to 3.10.

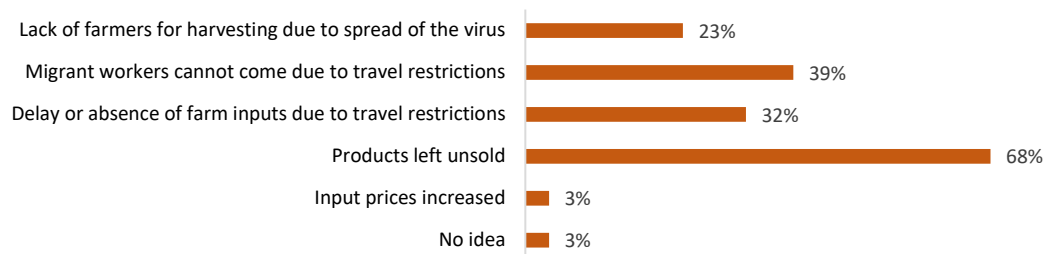


Figure 3.5 COVID-19 impact or challenges in the agricultural production stage

The first stage is production, where a large percentage of respondents (68%) indicated that the main impact of COVID-19 on FLW is to leave products unsold. Apart from losing the harvested/slaughtered/caught agricultural products, some are left unharvested either because there are no workers or because it is more economical to keep them there since they wouldn't be sold anyway.

The second stage of the FSC is post-harvest handling and storage. The highest is delays in travel time or obtaining permits for crossing borders within an economy (71%). In Peru, for example, Yungay farmers lost 6,000 tons of strawberries due to

transport problems (FAO, 2020, p.6). This was a problem especially at the beginning, but many economies have established special lanes for food to travel without restrictions across the economy. Almost half of the respondents (48%) also ticked lack of cold storage facilities.

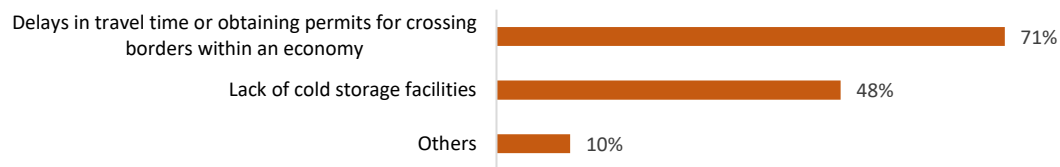


Figure 3.6 COVID-19 impact or challenges in the post-harvest and storage stage  
The next stage of the FSC is processing. Most of the items are self-explanatory. But two items may need clarification. Repackaging problems due to limitations in facility or legal restrictions have caused some problems that's also related to FLW.

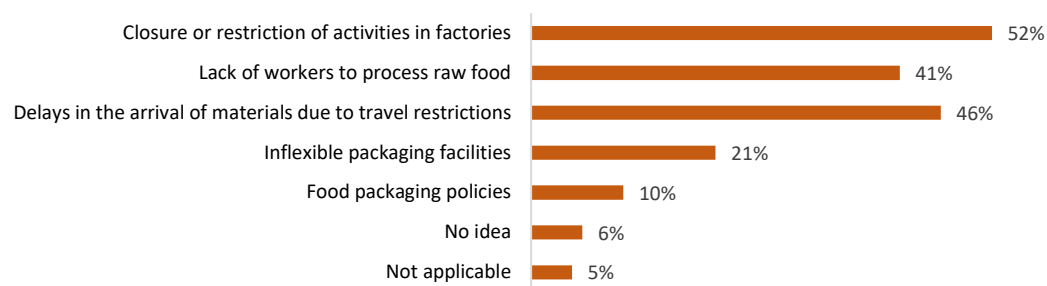


Figure 3.7 COVID-19 impact or challenges in the processing stage

In the distribution stage, most respondents (51%) agree that food wasted due to restrictions on supermarkets, wet markets and other retailers have been affected most by COVID-19. Closure of such markets left many products unsold.

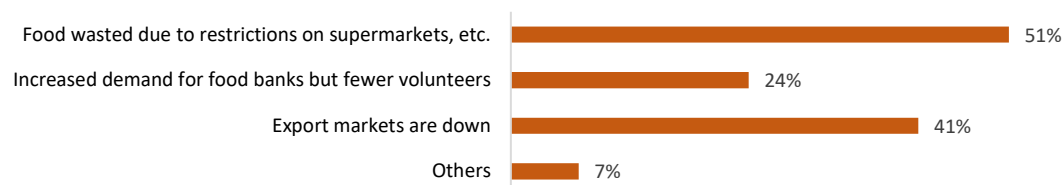


Figure 3.8 COVID-19 impact or challenges in the distribution stage

A considerable percentage of respondents (41%) also ticked "Export markets are down". Apart from the obvious reason that importing economies have tightened up their borders, there is also the fear that SARS-CoV-2 is transmitted through packaging from imported goods. Also, in the distribution stage, food banks have seen a rise in demand for their services, but unfortunately have fewer volunteers. Overall, only 24% of the respondents ticked this item.

The last stage of the FSC is consumption stage, which is the most important because the rate of food wastage is higher than the rate of food loss—17% as opposed to 14%, respectively, in the latest reports of UNEP (2021) and FAO (2019). And reports from

different APEC economies show that food waste comprises the bulk of household waste.

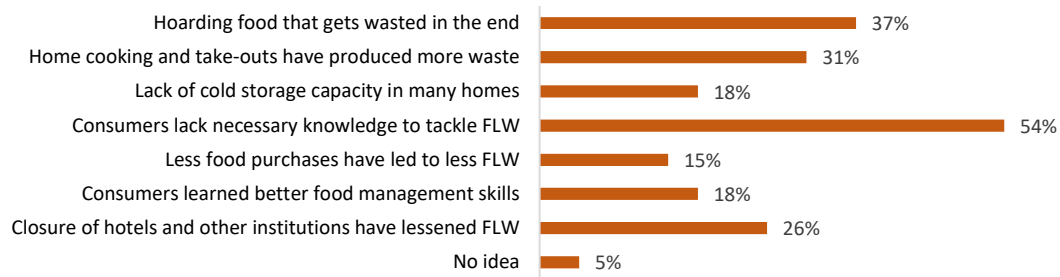


Figure 3.9 COVID-19 impact and challenges in the consumption stage

The largest concern is again the consumers' lack of necessary knowledge to tackle FLW (54%). Going back to the top of the list, the first item in this stage is the hoarding of food, which increases food waste not only because they may get wasted in the end, but also because it causes a disruption in the supply chain. And this makes it harder for businesses to predict their inventory needs, which can further cause food loss upstream.

Next, the proliferation of ready-to-eat food and home cooking has caused a lot of food waste (not to mention packaging waste) according to some respondents. Moreover, restaurants may have overproduced which got wasted in the end. However, the effects of this on FLW are yet unclear, as one respondent said. As the pandemic drew on, some households have learned to managed food waste better (e.g., cooking better, bringing shopping lists and recycling leftover food, composting). However, among survey respondents, such positive effect must have been less felt. Those who reckoned that more food waste was generated due to home eating (31%) is more than those who believed that consumers have learned better food management skills (18%).

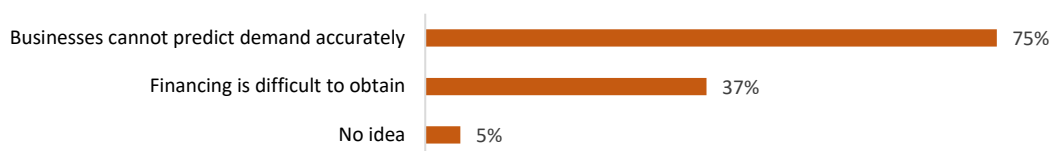


Figure 3.10 COVID-19 general and other impacts

This survey also asked about general and other impacts. The most important challenge is the difficulty of predicting demand.

Nevertheless, most of the respondents are slightly more positive in their general expectation on FLW in the

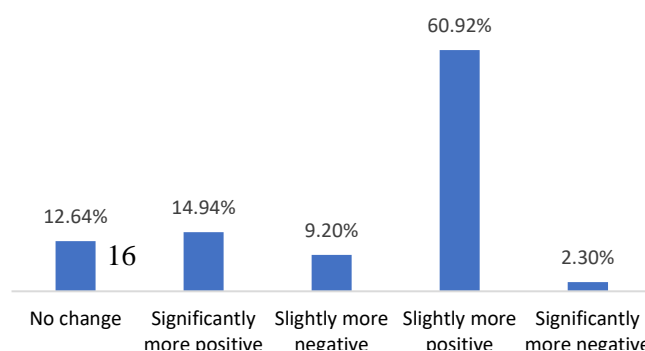


Figure 3.11 General Expectations over FLW in the next 2 years

next two years (61%). This is true even after removing economies where the pandemic hit with relatively less force. Figure 3.11 shows the overall result. In the follow-up interviews, people who said they were slightly more positive cited the ongoing efforts to fight the pandemic as their reason for being optimistic.

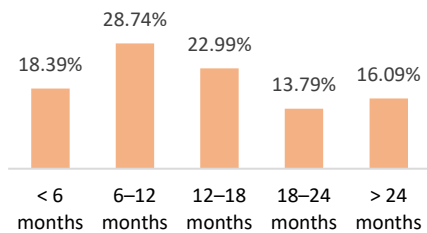


Figure 3.12 Expected recovery time of FSC after COVID-19

Figure 3.12 shows the results for expected recovery time of FSC after COVID-19. It shows that most of them (29 %) believe that the FSC will recover within 6 to 12 months after COVID-19. Government respondents mostly believe the recovery to happen in 6 to

12 months (35%), whereas non-government respondents (including academics) gauge the situation less optimistically. About 28% of respondents from these two cohorts think it will need 12 to 18 months, and another 21% think it be over two years before the FSC fully recuperates.

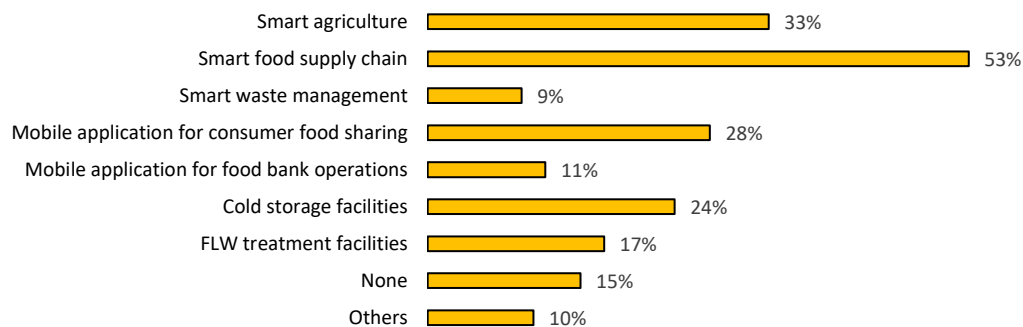


Figure 3.13 Infrastructures and technology used to minimize FLW

Finally, this survey asked about the infrastructures or new technologies they employed to minimize FLW during COVID-19. Nevertheless, some of the answers here also pertain to actions before the pandemic. Most of the respondents (53%) ticked smart food supply chain as their main tool to combat FLW. This includes e-commerce, using AI or IoT to plan food inventory, food quality assessment, date labelling food products, food pricing and promotion, etc. Many of the economies relied on e-commerce to get harvests from farms to consumers. Smart agriculture is likewise considerably high (33%).

### 3.2 APEC Project Evaluation Survey

After the workshop, we distributed the “APEC Project Evaluation Survey” to participants and received 53 responses from 12 economies. Table 3.3 shows the breakdown of the respondents according to economy. Majority of the respondents are

from Asia (91%), followed by South America (4%), North America (4%), and Oceania (2%).



Table 3.3 Respondents by Member Economy

Member Economy	Number	Member Economy	Number
Chile	1	Peru	1
Indonesia	3	The Philippines	7
Japan	3	Singapore	2
Republic of Korea	1	Chinese Taipei	23
Malaysia	5	Thailand	4
New Zealand	1	United States	2

It is shown that with the implementation of this project, participants received better understanding of the challenges of reducing FLW during by COVID-19, and also the best practices on managing FLW by using innovative technologies to enhance coordination of our food value chain. Almost all respondents agreed the content was well organized and easy to follow, and the materials distributed were useful.

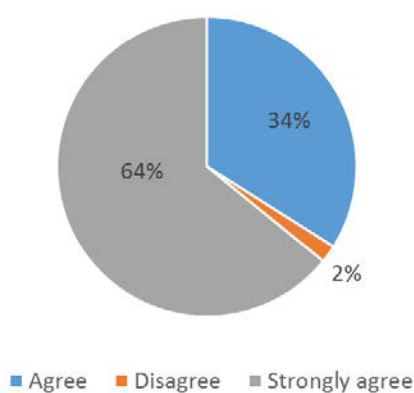


Figure 3.14 The content was well organized and easy to follow

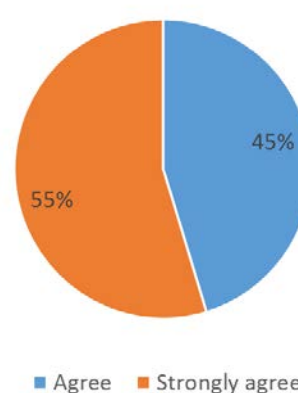
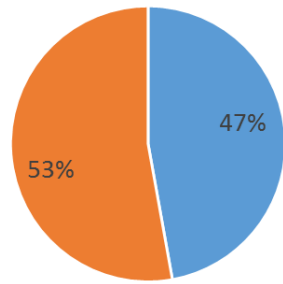


Figure 3.15 The materials distributed were useful

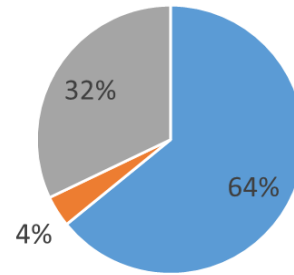
As Figures 3.14 and 3.15 show, 98% of respondents agree the content was well organized and easy to follow (64% of strongly agree), and 100% of respondents agree the materials distributed were useful (55% of strongly agree).

When asked whether this workshop achieved its intended objectives, about 53% of the participants who answered strongly agrees, as shown on Figure 3.16. Regarding whether gender issues were sufficiently addressed during the implementation, above 96% of the respondents agreed that it is adequately addressed (32% of strongly agree), as Figure 3.17.



■ Agree ■ Strongly agree

Figure 3.16 The project achieved its intended objectives

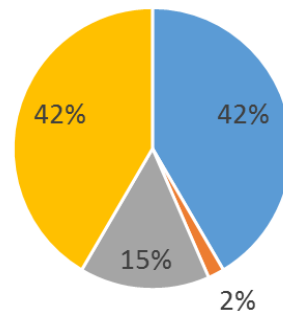


■ Agree ■ Disagree ■ Strongly agree

Figure 3.17 Gender issues were sufficiently addressed during implementation

Moreover, most of the respondents thought the workshop was relevant to their economy. As Figure 3.18 shows, only 2% of respondents thought this workshop not much relevant. Finally, this survey also asked the respondents what needs to be done next by APEC, and what should be improved in this workshop. According the respondents, 14 respondents hoped similar projects to continue running in the future, including topics on target, measurement, and action plan for reducing FLW. On improvements to this workshop, 16 respondents thought the timing is not enough in this workshop. All the answers are presented on Tables 3.4 and 3.5.

Overall, most respondents are satisfied with the implementation of this project. This project marks an important step in APEC towards addressing the COVID-19 challenges on the state of FLW, and also sharing best practices on managing FLW through innovative technologies to enhance coordination of our food value chain. Most of the respondents recommended to continue organizing this project and related workshops in the future.



■ Mostly relevant ■ Not much relevant  
■ Somewhat relevant ■ Very relevant

Figure 3.18 How relevant was this project to you and your economy

Table 3.4 What needs to be done next by APEC

No	What needs to be done next by APEC? Are there plans to link the project's outcomes to subsequent collective actions by fora or individual actions by economies?
1	APEC members would continue the implementation of this issue, and unite members to ensure implementation results by setting new APEC regional targets.
2	the issue of post-epidemic
3	Provide link on the outcomes and build models
4	More webinars
5	APEC may urge the government to be more active in the fight against FLW, even with or without COVID-19, FLW is a problem that we all must reduce and eventually eliminate.
6	Link work between working groups and develop economy-specific road maps for the reduction of FLW.
7	Action plan to reduce food loss and waste
8	Other economies who have not reported on their respective strategies to reduce losses may present/share their individual actions
9	No related plans so far.
10	more knowledge sharing and actual project collaboration
11	APEC should organize FLW meeting/forum at higher governmental position
12	APEC PPFS and ATCWG need to organize follow-up actions in promoting the capacity building and cooperation actions in FLW reduction among APEC Members with a view to achieving the goal of SDG 12.3 and the attainment of long lasting food security in APEC.
13	Take a hard, critical look at current approaches and definitions. Reducing FLW for its own sake is not enough. Moreover, definitions across the region vary. For example, Japan only uses the term food loss
14	I think that first the participants from each [ <i>economy</i> ] who attended the Workshop should be organized and the plans devised must be presented to the APEC Authorities of the economy.
15	Maybe introduce some excellent organizations about addressing FLW
16	the planning is well organized, actions next
17	There should be setting clear target for APEC roadmap2030.
18	Technology of agricultural products or food preservation. Share research profile or results.
19	Circular agriculture
20	Strategies for governments to commit and concrete plans to reduce food waste

21	Support to the small-scale fisherfolk
22	I would appreciate if there would be a follow-up workshop to measure food loss and waste, which aims to harmonize the methodology for the economy in measuring food loss and waste
23	fund more projects about FLW and food security in line with the newly drafted AFSR 2030
24	Assist developing economies to gather reliable data on postharvest losses along the value chain and development of effective and practical strategies to address such.
25	Why don't we focus on issues that are not represented in statistics? For example, in Japan, FLW in the food manufacturing industry is statistically surveyed, and the government is conducting many policies. However, there are no statistics on on-site food waste in agriculture. Food loss in the agriculture sector will be a huge loss considering the resources inputs, but it is overlooked.
26	Evaluating the adaption of experiences done in other economy. Mostly collective action.
27	We hope for such linkaging to ain collective action y economies.
28	Knowledge promotion and education
29	sustain current programs
30	penetrate to experices and recommendations to all the economies.
31	Casual face-to-face discussion
32	continue the project
33	Capacity building on indicators of food loss and waste
34	I think the project's outcomes are very useful to keep the topic of FLW alive in the economies agenda, and especially to inform government and policy makers to take actions sooner than later.
35	Invite other APEC economy to participate in the project that already had developed the modelling.
36	The COVID-19 pandemic of my economy is mitigating now. The lockdowns will be gradually lifted. It's necessary to make the work plan to prevent the FLW from compensatory consumption.
37	apec reducing flw target post 2020
38	If resources allow, there could be a pool of FLW minimization experts and trainers that can go to different economies to give advice.
39	The outcomes of this project can offer suggestions for the PPFS to build toward to the drafting of the APEC Food Security Roadmap towards 2030.
40	Knowledge promotion and education

Table 3.5 How could this project have been improved

No	How could this project have been improved? Please provide comments on how to improve the project, if relevant.
1	Because of the Covid-19 epidemic, it is a pity that only online meetings can be held. I hope that after the epidemic, it can return to normal and hold face-to-face meetings again
2	create more issues relevant
3	Maybe provide platform for continuous exchanges of information.
4	More presenters
5	An opporrunity for small breakout group discussions might have been useful to gather even more inputs.
6	More time for interactive session
7	More time for discussion
8	less introduction messages; much time wasted. better moderators to manage time better. speaker can answer in chat box. better if speaker can control ppt; less time saying ""next slide please""."
9	More participation from the technologists (AI, robotics, IoT's along food chain production)
10	Some of the PPTs were not uploaded before the meeting, which were also not uploaded during the meeting. I hope those can be provided.
11	More presentations by people critical of FLW and how it is currently approached. We need debate and challenges to grow.
12	not relevant
13	The project was well organized, however it remains to coordinate with each APEC Authorities of <i>[an economy]</i> and follow up on it. My congratulations.
14	great enough
15	private- public collaboration
16	Encourage more appricable for small farmer and SME
17	Some IT issues made it difficult to see presentations and hear speakers at times
18	Like cold chain. Extend shelf life.
19	international conference for case discussion
20	Maybe a pre-conference workshop on food waste issues, government policies in <i>[Chinese Taipei]</i> , for the <i>[Chinese Taipei]</i> participants

21	The project needs more attention to support to the fisherfolk
22	I think inviting speakers from various expertise and fields can provide a wider perspective and insight to participants, including from the government, academia, the private sector, even from successful community champion
23	More case studies on developing <i>economies</i>
24	How about holding a small workshop beforehand to deepen the discussion?
25	Thank you for your dedication.
26	More sharing of proven strategies particular for developing economies.
27	provide the more concrete successful paradigm on reducing food loss and waste.
28	continued sharing of practices and info among economies
29	Wish next time will have real meeting face-to-face, together with on-line in order to share more participants.
30	The workshop should be continued. Keep in touch after the workshop."
31	invite more economy to share their practical experiences
32	Give more time
33	more breakouts for discussion
34	I think we need to do more seminars open to the general public. It is a lot of excellent information that still no reach to the population in general.
35	Hands on training to the project. Please guide other <i>economies</i> especially Malaysia. Thank you.
36	If it were face-to-face, there could be a real workshop like case analysis (e.g., one of the cases from FAO website introduced by Dr Torero). Participants bring the case home, then meet the following day to discuss in groups. The success of this depends on the facilitators.
37	This workshop is perfectly designed.

## IV. Agenda

**Dates:** 30 June – 2 July 2021, 09:00am - 12:00pm (CTT / UTC+8)

**Location:** Microsoft Teams: <http://bit.ly/2021APECFLW>

**Organiser:** Council of Agriculture

**Host economy:** Chinese Taipei

<b>Day 1: 30 June 2021 (Wednesday)</b>	
08:30 – 09:00	<b>Login and system checks</b> <ul style="list-style-type: none"> <li>- Delegates to login using the assigned usernames</li> <li>- Check of audio and visual connections</li> <li>- Connection confirmation, Familiarization with ‘Chat’ function</li> </ul>
09:00 – 09:20	<b>Session 1 – Opening (MC)</b> Welcome and Opening Remarks <ul style="list-style-type: none"> <li>- Representative from the Council of Agriculture</li> <li>- Mr Philip Houlding, Chair, PPFS</li> <li>- Dr Su-San Chang, Lead Shepherd, ATC Working Group</li> <li>- Mr Teddy Pavon, Program Director, APEC Secretariat</li> <li>- Mr Vincent Lin, Project Overseer, Council of Agriculture</li> </ul> Group Photo
09:20 – 9:50	<b>Session 2 - Keynote Speech</b> “Reducing Food Loss and Waste: Challenges and Opportunities for APEC” <ul style="list-style-type: none"> <li>- Dr Maximo Torero Cullen, Chief Economist, FAO</li> </ul> Moderator: Mr Vincent Lin, Project Overseer, Council of Agriculture
09:50 – 10:00	Rest Break
10:00 – 11:00	<b>Session 3 – Supply Chain Dynamics Responding to COVID-19</b> “Food Consumer Response and Supply Chain Dynamics during COVID-19” <ul style="list-style-type: none"> <li>- Dr Dawn Thilmany, Colorado State University; President of AAFA</li> </ul> “Building Resilient Food System amidst COVID-19: Responses and Lessons from China” <ul style="list-style-type: none"> <li>- Dr Kevin Z. Chen, Zhejiang University; International Food Policy Research Institute</li> </ul> Moderator: Dr Hung-Hao Chang, NTU
11:00 – 12:00	<b>Session 4 – Mitigating Food Waste Responding to COVID-19</b> “Challenges on Reducing Food Waste Under Covid-19 in New Zealand” <ul style="list-style-type: none"> <li>- Dr Miranda Miroso, University of Otago</li> </ul> “Optimising the Cold Chain in Australia to Achieve FLW Reduction.” <ul style="list-style-type: none"> <li>- Mr Mark Mitchell, Australian Food Cold Chain Council</li> </ul> Moderator: Dr Hung-Hao Chang, NTU
	<b>Closing of Day 1 (MC- What is planned for Day 2)</b>

<b>Day 2: 1 July 2021 (Thursday)</b>	
08:30 – 09:00	<b>Login and system checks</b> <ul style="list-style-type: none"> <li>- Delegates to login using the assigned usernames</li> <li>- Check of audio and visual connections</li> <li>- Connection confirmation, Familiarization with ‘Chat’ function</li> </ul>
09:00 – 09:10	<b>MC – Recap, Objectives for Day and Draft Recommendations from Day 1</b>
09:10 – 10:00	<b>Session 5 - Digital and E-Commerce Opportunities Responding to COVID-19</b> “E-commerce's Fast-Tracking Diffusion and Adaptation in Asia” <ul style="list-style-type: none"> <li>- Dr Thomas Reardon, Michigan State University</li> </ul> “E-commerce and delivery intermediaries: A Case of Chinese Taipei” <ul style="list-style-type: none"> <li>- Mr Yi-Khim Tan, Association of Input-Output Studies</li> </ul> Moderator: Dr Ta-Te Lin, NTU
10:00 – 11:00	<b>Session 6- Best Practices and Innovative Technologies on Reducing FLW</b> “Ecobuy with SDGs” <ul style="list-style-type: none"> <li>- Mr Zaif Siddiqi, NTT DOCOMO Inc.</li> </ul> “Food Recovery- Response to COVID-19” <ul style="list-style-type: none"> <li>- Ms Marilyn Su, Carrefour Foundation</li> </ul> “Reducing Food Loss and Waste along the Food Value Chain: An Experience from Nestlé Viet Nam” <ul style="list-style-type: none"> <li>- Mr Truong Hoang Phuong, Nestlé Viet Nam</li> </ul> Moderator: Dr Ta-Te Lin, NTU
11:00 – 11:10	Rest Break
11:10 – 12:00	<b>Session 7- APEC ME and Survey Report</b> Member Economy Progress Report and Information Sharing (non-mandatory) <ul style="list-style-type: none"> <li>- 3 mins for each economy</li> </ul> “APEC Survey Report on COVID-19 Impact on Food Supply Chain and Responses” <ul style="list-style-type: none"> <li>- Dr Kenneth Dy, Academia Sinica</li> </ul> Moderator: Dr Ching-Cheng Chang, Academia Sinica Dr Tony Hsu, NTU
<b>Closing of Day 2 (MC- What is planned for Day 3 )</b>	



<b>Day 3: 2 July 2021 (Friday)</b>	
08:30 – 09:00	<b>Login and system checks</b> <ul style="list-style-type: none"> <li>- Delegates to login using the assigned usernames</li> <li>- Check of audio and visual connections</li> <li>- Connection confirmation, Familiarization with ‘Chat’ function</li> </ul>
09:00 – 09:10	<b>MC – Recap, Objectives for Day and draft Recommendations from Day 2</b>
09:10 – 10:00	<b>Session 8: APEC Agenda on FLW Beyond 2020</b> <i>(Review of reducing FLW in APEC 2020 Food Security Roadmap, SDG Target 12, and Global Action Agenda)</i> <p>“Reducing FLW: Setting a Global Action Agenda”</p> <ul style="list-style-type: none"> <li>- Mr Brian Lipinski, FLW Protocol at WRI</li> </ul> <p>“Reducing Food Waste Roadmap to 2030: ReFED Insights Engine”</p> <ul style="list-style-type: none"> <li>- Ms Dana Gunders, ReFED</li> </ul> <p>Moderator: Dr Ching-Cheng Chang, Academia Sinica</p>
10:00 – 11:20	<b>Session 9: Recommendations to APEC Food Security Roadmap Beyond 2020</b> <i>(Discuss Recommendations for New APEC Roadmap--- which include:</i> <ul style="list-style-type: none"> <li>– adopting a suite of Specific, Measurable, Achievable, Relevant and Time based (SMART) goals and objectives for APEC FLW Reduction Beyond 2020;</li> <li>– confirming that FLW reduction can be an adaptive and mitigation option to strengthen food security and alleviate pressure on climate, water and land</li> </ul> <ul style="list-style-type: none"> <li>- Dr Witsanu Attavanich, Kasetsart University</li> <li>- Dr Jean Buzby, U.S. Department of Agriculture</li> <li>- Ms Dana Gunders, ReFED</li> <li>- Dr Tony Hsu, NTU</li> <li>- Mr Brian Lipinski, FLW Protocol at WRI</li> </ul> <p>Moderator: Mr Philip Houlding, Chair, PPFS</p>
11:20 – 11:30	Rest Break
11:30 – 12:00	<b>Session 10: Next Step &amp; Closing Remark (MC)</b> <p>“Collated Recommendations”</p> <ul style="list-style-type: none"> <li>- Dr Ching-Cheng Chang, Academia Sinica</li> </ul> <p>“Closing Remarks”</p> <ul style="list-style-type: none"> <li>- Dr Su-San Chang, Lead Shepherd, ATCWG</li> <li>- Mr Vincent Lin, Project Overseer, Council of Agriculture</li> </ul>
<b>CLOSE WORKSHOP</b>	

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