Workshop on Strengthening Standard Knowledge on Women Culinary Food Safety and Its Food Waste Management in Supporting the Domestic Tourism

APEC Sub-Committee on Standards and Conformance

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Asia-Pacific
Economic Cooperation

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Executive Summary

This report synthesises outcomes from the APEC SCSC–endorsed workshop Strengthening Knowledge of Women's Culinary Food Safety Standards and Food Waste Management in Support of Domestic Tourism, organised by Indonesia's National Research and Innovation Agency (BRIN) through Research Centre for Testing Technology and Standard. The event advanced women-led culinary MSMEs by sharing practical pathways to implement international food safety standards (e.g., ISO 22000 family, GHP/HACCP) alongside food-waste reduction practices, aligning with APEC priorities on women's economic integration and the SJ-SJ Action Plan. This workshop was co-sponsored by China; Peru; and Viet Nam.

Held 22–23 July 2025 in Denpasar, Bali, the workshop convened speakers from five economies and participants from seven economies—about 60% of participants were women—reflecting the initiative's inclusive focus. Sessions covered ISO governance and the ISO 22000 family; differences in public and private standards; MSME-friendly compliance strategies; metrology's role in trustworthy testing; Viet Nam's mandatory food-stall assessment approach; and China's anti-food-waste standardization for catering services.

Key takeaways emphasized that food safety is a shared responsibility spanning regulators, industry, and consumers; that ISO 22000-based systems plus pragmatic PRPs/GHP can be scaled for street food, catering, and micro-enterprises; and that measurement traceability and accredited testing are foundational to credible certification and market access. Case examples (e.g., Huluning Bali; Restu Mande) showed how SNI/ISO-aligned practices, capacity building, and phased upgrades (equipment, hygiene, documentation) translate into better quality, certification readiness, and women's economic empowerment. A short participant feedback survey (n≈20) reported strong satisfaction (scores >4/5 across aspects) and preference for offline (≈60%) or hybrid (≈30%) formats in future iterations, indicating demand for hands-on content and practitioner exchange.

Six policy recommendations were derived from the workshop and survey: (1) Lower the compliance barrier for MSMEs; (2) Mainstream international standards participation; (3) Strengthen measurement credibility; (4) Adopt risk-based oversight for street foods; (5) Integrate food-waste standards in food service; and (6) Build a culture of food safety through education.

The conclusions of the project reaffirm the workshop underscored that harmonized standards, credible measurement, and MSME-oriented implementation are pivotal to safer, more sustainable culinary tourism—advancing women's economic participation and domestic tourism quality across APEC. Continued collaboration among economies, standard-setting bodies, regulators, academia, and industry is essential to scale these outcomes region-wide.

Introduction

Project Overview

The APEC workshop "Strengthening Knowledge Women's Culinary Food Safety Standards and Food Waste Management in Support of Domestic Tourism" was held 22–23 July 2025 in Denpasar, Bali, convened speakers from five economies and participants from seven economies, with women comprising roughly 60% of attendees—reflecting the event's focus on women-led culinary enterprises. Discussions centred on practical pathways to improve food-safety practices and food-waste management for small and micro food businesses to bolster the quality and sustainability of domestic tourism.

Through plenary remarks, technical talks, and Q&A, the workshop enabled knowledge exchange on strengthening documentation, hygiene, and targeted training for small vendors—particularly street-food operators—so that standards become more accessible and feasible to implement at micro-enterprise scale. The audience included policymakers, industry practitioners, and academics, ensuring both policy relevance and operational practicality.

Scope and Relevance of the Project

The two-day, in-person program emphasized risk-based, low-cost interventions and capacity building to close gaps in vendor documentation and hygiene, while also encouraging data-driven oversight (e.g., simple random inspections, targeted education, and building vendor databases). The importance of affordable quality assurance (including laboratory analysis suited to small industry) and integrating food-safety education into school curricula were highlighted as long-term enablers of safer culinary ecosystems. Participant feedback (≈20 respondents) indicated satisfaction scores above 4/5 across all aspects and a preference for offline (≈60%) or hybrid (≈30%) formats—signalling strong demand for hands-on learning and peer exchange.

Target Beneficiaries and Stakeholders

The project was designed to benefit a wide range of stakeholders in APEC economies, particularly:

- **Government officials and regulators** working on public health, market surveillance, and MSME support, especially those shaping inspection models and targeted training for small vendors;
- **Standards, conformity assessment, and quality infrastructure actors** (e.g., program trainers, labs) focused on making assurance and testing affordable and appropriate for micro and small enterprises;
- **MSMEs and street-food vendors,** as the primary implementers of practical hygiene, documentation, and food-waste practices that raise safety and consumer trust;
- **Researchers, academics, and industry practitioners** who translate workshop guidance into curricula, training modules, and scalable business processes.

Overall, the workshop's scope—grounded in real-world constraints of small food businesses—supports safer culinary tourism by improving vendor capabilities and aligning stakeholder efforts around practical, measurable upgrades in food safety and food-waste management.

Objective

Projective Objective

This project aims to increase knowledge and understanding of food safety and food waste management based on international standards, share experiences and best practices on success stories of women's empowerment programs through culinary entrepreneurship in the APEC economy and provide recommendations for the APEC program on women's capacity building through culinary entrepreneurship.

The project sought to:

- Promote alignment with international food-safety and traceability standards—including ISO 22000 (FSMS), ISO 22002-1/-2 (PRPs for general food and catering), ISO 22003 (requirements for certification bodies), and ISO 22005 (traceability)—as the baseline for consistent GHP/HACCP implementation;
- Facilitate knowledge sharing across APEC economies on standards, regulatory approaches, and certification systems that are practical for small-scale enterprises and street-food vendors;
- Build institutional and technical capacity through targeted training, improved documentation, hygiene practices, and accessible quality assurance/testing—particularly for micro and small vendors—to enable safe, effective implementation; and
- Strengthen cross-economy trust and comparability in conformity assessment by promoting objective, consistent audits (ISO 22003) and transparent international standardization and accreditation mechanisms (ISO, ABs, IAF), thereby reducing technical barriers and supporting smoother market access.

Workshop Objective

The workshop aimed to:

- Provide a platform for policymakers, regulators, MSME representatives, and technical experts to exchange best practices on food-safety standardization (HACCP, ISO 22000, FSSC) and food-waste management in support of culinary tourism and street-food sectors;
- Enhance awareness of international standards and explore strategies for local adaptation and implementation—emphasizing practical documentation, hygiene, and low-cost interventions suitable for micro and small vendors;
- Discuss legal and institutional frameworks needed to support vendor oversight, safety, and certification readiness, including differences in monitoring/ enforcement across APEC economies and areas for strengthening domestic systems;
- Encourage collaborative capacity building in food-safety regulatory systems—targeting government stakeholders at all levels—through targeted training, risk-based inspections, vendor databases, and supporting tools (e.g., chatbots) to sustain improvements;
- Serve as a pilot model for future APEC capacity-building programs in food safety and standardization, informed by participant feedback showing strong satisfaction and clear preferences for effective formats.

Background Paper

Implementation of Food Safety for Business Actors in The APEC Region

Introduction

Food safety is a critical aspect of public health, particularly in urban areas, where changing social behaviours have significantly reduced the time available for home cooking. As a result, ready-to-eat foods, restaurant meals, cafeteria offerings, and street food vendors have become popular alternatives for meeting the dietary needs of urban populations. However, this shift raises concerns regarding the food's quality and safety, including poor food handling practices, using contaminated raw materials, cross-contamination during food preparation, excessive preparation time before serving (exceeding four hours), and improper storage and reheating temperatures. These factors can lead to nutrient loss, food spoilage, and an increased risk of foodborne illnesses (Adane et al., 2018; Salleh et al., 2017; Valero et al., 2016).

The consumption of spoiled food has serious health implications, commonly referred to as foodborne diseases. Foodborne diseases arise from the ingestion of food contaminated by physical, chemical, or biological hazards due to poor production, handling, or storage practices (Al Mamun & Fazal, 2018). To prevent such illnesses, the implementation of food safety measures is essential. Food safety encompasses properly handling food and beverages at every stage of the production chain to minimize the risk of foodborne diseases (Scallan et al., 2011).

In general, the activities within this initiative aim to assess the implementation of food safety practices adopted by micro, small, and medium enterprises (MSMEs) and street food businesses in the APEC region. This initiative also seeks to identify appropriate methods based on guidelines, best practices, and international standards, such as ISO, to ensure food safety by applying Hazard Analysis and Critical Control Points (HACCP) and Good Manufacturing Practices (GMP). These methods are expected to be effectively adapted for small-scale food businesses, particularly in the informal sector. Furthermore, a mapping process is conducted to identify challenges in adopting food safety management systems within the APEC region. This approach aims to develop appropriate strategies for effectively implementing food safety management in small-scale food enterprises.

Literature Review

General Overview and Challenges in APEC Economies

Food safety for micro, small, and medium-sized enterprises (MSMEs) and street food vendors is a critical issue with direct implications for public health on a global scale. Currently, an estimated 2.5 billion people worldwide consume street food daily, reflecting the increasing popularity of street food over the past few decades (Abrahale et al., 2019) . These food businesses typically operate within the informal sector, where food safety regulations may not be strictly enforced. Many vendors frequently change locations, operate temporarily, and lack official permits, making them less monitored and often overlooked in food safety inspections (Auad et al., 2019).

In general, the level of knowledge, attitudes, and practices (KAP) regarding food safety among street food vendors in the APEC region demonstrates a high awareness and understanding of the importance of maintaining food safety (Azanza et al., 2000; Liu et al., 2014; Lubos, 2014; Ma et al., 2019; Samapundo et al., 2016). However, many vendors still struggle to implement proper hygiene practices fully. Analysis indicates that this is largely due to the lack of adequate KAP training provided to food vendors (Alamo-Tonelada et al., 2018; Labao et al., 2024). Studies have found that only about 6% of surveyed food vendors had received food safety training from authorized institutions. In contrast, another study reported that approximately 95% of vendors had not received proper food safety training, leading

to inadequate food safety and hygiene practices (Samapundo et al., 2016). Training has been proven to play a crucial role in shaping the behavior of MSME and street food entrepreneurs. Vendors who have received formal training are significantly more likely to comply with food safety standards compared to those who have not undergone training (Huynh-Van et al., 2022).

Another critical aspect often overlooked in food safety literature is the role of women. Their central role in food preparation and sales places them at the frontline of ensuring hygiene practices and compliance with food safety standards. Empowering women food vendors through targeted training and access to resources improves hygiene practices and reduces foodborne risks. It also contributes to household income and better community nutrition outcomes. Women-led MSMEs dominate the traditional food market sector. This highlights the importance of integrating gender perspectives into food safety interventions to strengthen both public health protection and women's economic empowerment (Bold et al., 2013). Thus, including women's roles in food safety management is essential for building sustainable and inclusive food systems within the APEC region.

Consumer Awareness of Food Safety

Awareness of the importance of food safety should not be limited to MSME and street food vendors but must also be emphasized among consumers. Currently, most consumers are reported to have a general understanding of the importance of food safety (Ma et al., 2019; Minh, 2017; Ngoc & Thanh, 2015). However, their awareness of the risks of foodborne diseases and proper hygiene practices remains insufficient.

One of the most effective ways to enhance long-term food safety awareness among food vendors and consumers is through practical implementation. Educational materials should focus on the dangers of bacterial contamination and food additives commonly found in MSME and street food products. By incorporating food safety education at the elementary school level, children can develop a high level of awareness from an early age, fostering a sustainable and long-term understanding of food safety (Riyanto et al., 2017).

Challenges in Sanitation Infrastructure for Street Food Vendors

Another critical issue that warrants attention is the inadequate sanitation infrastructure at street food vending locations, including access to clean water, waste disposal systems, and overall environmental hygiene. Research findings indicate that most street food vendors lack proper handwashing facilities and frequently prepare food in unsanitary environments without appropriate waste disposal systems or protection against flies and dust (Abdul Aziz et al., 2023; Frash et al., 2004; Yiamjanya & Wongleedee, 2013).

Vendors with fixed locations generally have greater financial capital and tend to comply more strictly with food safety practices compared to those who operate in temporary or mobile setups. The lack of adequate sanitation infrastructure ultimately contributes to food contamination (Argente et al., 2020; Origenes et al., 2022; Thi et al., 2021). Food samples from street vendors have been collected and analyzed to assess this issue, revealing alarming levels of microbial contamination. One study reported a high prevalence of contamination by Staphylococcus aureus and Escherichia coli in street food, pathogens known to cause foodborne illnesses such as gastroenteritis (Cho et al., 2011).

Bridging the Gap Between Food Safety Knowledge and Implementation

The discrepancy between food safety knowledge and its implementation among food business operators highlights the need for more practical monitoring programs to ensure that vendors effectively adhere to food safety standards. Evidence suggests

that business licensing and food handling permits may not be consistently enforced, contributing to variations in hygiene and food safety practices (Siau et al., 2015).

Although many vendors know food safety regulations and the importance of sanitation permits, some still lack the required health certification (Azanza et al., 2000; Calopez et al., 2017). This indicates that local authorities are insufficiently enforcing food safety regulations. Therefore, it is recommended that regulatory bodies or local governments implement regular inspections and strengthen regulations to ensure compliance with food safety standards. Stricter enforcement of sanitation regulations will ultimately help minimize the risk of contamination in street food (Abdul Aziz et al., 2023; Calopez et al., 2017; Labao et al., 2024; Liu et al., 2014; Minh, 2017; Ngoc & Thanh, 2015; Samapundo et al., 2016; Siau et al., 2015)

Scientific Publication Analysis

A bibliometric analysis of food safety in the APEC region was conducted to identify and analyze scientific literature published between 2015 and 2024. The Scopus and Web of Science (WoS) platforms were selected as they are considered the largest databases launched by Elsevier (Burnham, 2006), featuring research papers, including journals and conference proceedings. The initial search used the keyword "food safety", with a filter applied to APEC economies. The search yielded 55 articles from Scopus and 33 from WoS, after which duplicate entries were removed. A global search on Google Scholar was also performed, retrieving 195 articles related to food safety implementation. These references from Google Scholar were identified, mapped, processed, and analyzed using Microsoft Excel.

A bibliometric analysis was performed on the selected articles, focusing on titles, authors, publication years, journals, and keywords. This method was used to identify publication trends and distribution, the most relevant affiliations, keyword frequency, and thematic mapping. The collected data were then visualized in graphs and diagrams to systematically illustrate trends and relevant patterns. This methodology can systematically describe a comprehensive overview of the APEC region's food safety system literature development.

Key Objectives

Strengthening the Contribution of MSMEs in Facilitating Food Access, Distribution, and Availability

By aligning with the APEC 2020 Food Safety Risk Communication Guidelines, micro, small, and medium enterprises (MSMEs) can enhance their role in food access, distribution, and availability, ensuring that food remains safe, reliable, and widely accessible across APEC economies. The APEC Food Safety Cooperation Forum (FSCF) Initiative also highlights the need to build the capacity of MSMEs in implementing effective food safety management systems.

APEC must ensure that MSMEs comply with food safety standards, which will contribute to safer food distribution. This can enhance food availability by increasing MSMEs' ability to access larger markets and adapt to food safety regulations, ultimately reinforcing the food supply chain.

Promoting a Robust Food Safety System Across APEC Member Economies

Government engagement in establishing and enforcing regulatory frameworks to oversee food safety practices is a critical factor. Analysis from scientific publications indicates that the enforcement and monitoring of food safety standards among food business operators—especially MSMEs—remain weak. A clear gap exists in licensing requirements and hygiene regulations for food processing facilities.

Furthermore, guidance documents for achieving food safety standards are often incomplete, and the existing documents are not yet fully aligned with internationally recognized guidelines or best practices. Some APEC economies lack dedicated food safety documents, while others do not have a food code that provides practical guidelines for complying with established food safety regulations.

The APEC cooperative network can offer optimal solutions through collaborative approaches among regulatory bodies, particularly in identifying and prioritizing food safety needs. Greater collaboration within APEC economies—involving scientific associations, food safety regulators, and science-based food safety systems—can help ensure that regulatory frameworks do not become trade barriers but instead facilitate economic growth.

Workshop Summary

The APEC SCSC Workshop on *"Strengthening Knowledge of Women's Culinary Food Safety Standards and Food Waste Management in Support of Domestic Tourism"* was held to foster multilateral cooperation among APEC economies in promoting sustainable and safe culinary practices. The workshop provided a platform for sharing domestic strategies, international regulatory trends, and technical progress in food safety standards and food waste management. Through active participation from government agencies, standards development, technical experts, researchers, and academic representatives. The workshop enabled meaningful discussions on harmonizing standards, strengthening women's capacity in culinary sectors, and advancing sustainable domestic tourism across the Asia-Pacific region.

Opening Remarks

The workshop began with welcoming remarks by key officials from Director of Implementation System for Standards and Conformity Assessments National Standardization Agency of Indonesia (BSN).

Speaker: Mrs. Konny Sagala, Director of Implementation System for Standards and Conformity Assessments National Standardization Agency of Indonesia (BSN).

Ms. Konny Sagala formally opened the two-day workshop in Bali (22–23 July), welcoming participants and acknowledging Prof. Bambang Prasetya, Yoko Tembo (JISC/ISO TC 34 SC 17), and Prof. Lilik Eka Radiati. Hosted by Indonesia's National Research and Innovation Agency (BRIN) under APEC's Sub-Committee on Standards and Conformance, the event is sponsored by Indonesia with support from China; Peru; and Viet Nam. The workshop advances APEC goals on women's economic integration by strengthening standards literacy for women-led culinary MSMEs and improving food-waste management to bolster domestic tourism. Over two days, participants will share knowledge and apply international/regional standards (e.g., ISO 22000 and GMP) through practical, solution-oriented sessions. Ms. Sagala emphasized collaboration, food-safety as a non-negotiable priority, responsible waste reduction, and translating global standards into tangible benefits for communities.

Presentation Highlights Day 1

Presenter: Mrs. Yoko Tembo, Japanese Industrial Standards Committee (JISC)
ISO/TC 34/SC 17, Management systems for food safety

Yoko Tembo emphasized the pivotal role of international food-safety standards in protecting consumers and enabling fair trade across borders. She outlined ISO's hierarchical system—ISO/TC 34 (Food), SC 17, and Working Groups—through which consensus-based texts advance from WG drafts to International Standards via staged ballots (PWI→NP→WD→CD→DIS→FDIS→IS), strict timelines, and five-year reviews. She highlighted the ISO 22000 family as an integrated toolkit: ISO 22000 for risk-based FSMS integrating HACCP; ISO 22002 PRPs (including 22002-2 for catering); ISO 22003 for consistent, credible certification; and ISO 22005 for supply-chain traceability. Tembo underscored the global transparency chain—ISO sets the norms; the IAF coordinates accreditation bodies that accredit certification bodies; and programme owners (e.g., FSSC 22000, BRCGS, IFS) are benchmarked by GFSI—enabling mutual recognition and market confidence. She contrasted public (mandatory, science-based)

and private (voluntary, adaptive) standards and stressed balancing management and control via PDCA while embedding Food Defence, Food Fraud, and safety culture. She closed by calling for practical localization—especially for catering, street food, and food trucks using ISO 22002-2 and regional Codex guidance—so MSMEs can implement credible, auditable hygiene practices.

Presenter: Ir. Didik M. Rofiqi MSi Lead Auditor for ISO 22000 & HACCP

Didik Rofiqi framed safe, nutritious food as a fundamental right—anchored in the 1992 FAO/WHO declaration—and grounded practice in the Codex Code of Hygienic Practice across the supply chain. He cast food safety as a shared responsibility spanning consumers, producers, and governments, a point made especially salient in APEC—a cooperative forum encompassing ~41% of the world's population, ~55% of global GDP, and ~49% of trade. Regulations, however, diverge markedly across APEC due to legal systems, economic development, policy priorities, and socio-cultural norms; this yields different limits, labelling and testing requirements, processing controls, and enforcement strength (e.g., Chinese Taipei bans methyl p-hydroxybenzoate, ethylene oxide, and benzoic acid in instant noodles, and Japan bans BHA/BHT, while Indonesia still permits these preservatives). He positioned international schemes along a continuum of scope and rigor: HACCP focuses on technical process control at critical points; ISO 22000 extends to a risk-based food safety management system with continual improvement; and FSSC 22000 layers on Food Fraud and Food Defence. Although not legally mandated by APEC member economy governments, these schemes are frequently required in B2B and global supply chains, making adoption commercially decisive. Rofiqi concluded by urging practical harmonization that respects religious and cultural acceptability, alongside stronger monitoring and enforcement—measures that would streamline regional trade and investment while bolstering consumer trust and public health.

Presenter: Ms. Ni Nyem Ratih Amerta Sari Rahayu Huluning Bali Cooperative

Ni Nyem Ratih Amertasari, founder of Huluning Bali (VCO, est. 2023), is building a women-led MSME in Desa Bukit by shifting to mechanized production in 2024 to improve efficiency and quality while creating inclusive jobs. Leveraging the village's abundant coconuts, the enterprise addresses female underemployment and local livelihoods. Virgin Coconut Oil is extracted from fresh coconuts without chemicals or high heat; Huluning's process keeps temperatures ≤100 °C to preserve clarity, nutrients, aroma, and flavor. Early challenges (capital, production know-how, limited marketing) were met through community training and adoption of CPPOB (GMP) practices, leading to SNI certification. Certification strengthened consumer trust, partnerships, and market access, while product lines expanded (traditional coconut cooking oil, VCO soap, derivatives). Core values: quality, integrity, and community benefit beyond profit.

Presenter: Ms. Nenden Rospiani Restu Mande Rendang

Restu Mande is adapting to a new government requirement to sterilize at 121 °C (from 100 °C), recalibrating equipment and repeating trials to meet the standard without degrading texture or taste. Production validation includes annual calibration and shelf-life tests at ambient temperature: beef up to 12 months, chicken 8 months, fish 6 months. BPOM provides technical guidance and oversight, while BSN supports method

changes and product registration; the firm aims to progress to ISO 22000/FSSC 22000 once 121 °C is consistently achieved. Halal certification (BPJPH) covers the full chain—halal-certified slaughterhouses with qualified Muslim slaughterers, halal-certified ingredients, and DNA testing for risk items (e.g., gelatin). Exports to the US, UAE, and Congo were initiated via ministry-facilitated trade fairs, with buyers commonly requiring HACCP. Given certification costs, the company is prioritizing its catering, restaurant, and packaged lines. A women-focused supply partnership with farmer groups in Cibiru Wetan secures chili inputs and advances local empowerment. BPOM's role in process validation was reaffirmed during Q&A; sector-wide adoption of 121 °C is ongoing.

Presentation Highlights Day 2

Presenter: Mr. Kurnia Ramadhan, Ph.D, Program Chair Department of Food Technology, Universitas Bakrie, and Vice Chair Indonesian Association of Food Technologists

Moderator Ms. Prof. Lilik Eka Radiati (Malang, East Java) opened the session and introduced keynote speaker Kurnia Ramadhan, Ph.D (Food Technology; BSc IPB, MSc Malaysia, PhD UK; faculty at a Jakarta private university). Dr. Kurnia presented the application of international standards for safe food preparation and how food safety enables export opportunities. He defined food safety per Codex Alimentarius—food that does not cause adverse health effects—and outlined key hazards: physical, chemical, and microbiological (often invisible yet impactful). Citing WHO's Five Keys to Safer Food, he emphasized practical Good Hygiene Practices (GHP) for micro and small businesses, noting HACCP is more complex and requires prerequisites. He stressed hygiene across the entire supply chain and clarified stakeholder roles, with BPOM as Indonesia's lead authority. In discussion, he urged early food-safety education in school curricula to build foundational literacy among future food handlers and entrepreneurs.

Presenter: Kittiya Shearman, Ph.D Head of Chemical Metrology and Biometry Department National Institute Metrology

The speaker underscored the role of National Metrology Institutes (e.g., Thailand's NIMTY, est. 1998) in making laboratory results comparable worldwide through calibration, primary methods, reference materials, and proficiency testing—under the global framework led by BIPM (150th anniversary marked on 20 May). NIMTY supports food safety via international comparisons (APMP/BIPM) and projects on toxic elements, pesticide/veterinary drug residues, and emerging nano-/microplastic measurements. It produces ISO 17034–compliant certified reference materials for food matrices (seafood, spices, rice, water), contaminants (e.g., aflatoxin), veterinary drugs, halal testing (porcine DNA mixes), GMO, and sugar-industry needs. With consumers increasingly vigilant and vocal on social media, regulatory compliance (HACCP, GHP, traceability/recall, labelling, contaminant limits, packaging, import/export controls) is now a market differentiator; non-compliance brings severe sanctions. Businesses should map applicable laws and authorities, classify products, pursue accredited training (e.g., GMP/GHP, ISO 22000, SCCP), and use expert auditors—amid a positive shift toward more highly educated food entrepreneurs in Thailand.

Presenter: Dr. Tran Thanh Son National Institute for Food Control (NIFC) Viet Nam

Dr. Tran Thanh Son (NIFC, Viet Nam) outlined Viet Nam's mandatory assessment system for street-food stalls, combining a standard inspection track with an alternative pathway that accepts ISO/HACCP certificates for direct hygiene certification. Operators submit business details and compliance documents, receive permits, undergo on-site inspections, and, if compliant, are certified. A 2019 review found >60% health-check violations and >50% gaps in risk confirmation, prompting a five-pillar response: (1) stronger enforcement and incentives, (2) targeted education and training, (3) infrastructure upgrades (facilities, safer handling), (4) public awareness campaigns, and (5) technology adoption (risk analysis, smart cooking, cold chain, IoT). Food safety governance is coordinated across three ministries (Health; Industry & Trade; Agriculture & Environment) with shared training roles. Viet Nam is revising its 2010 Food Safety Law to address online markets and shifting to risk-based inspections aligned with international best practice (Australia; Canada; U.S.) to better protect public health and empower vendors and consumers.

Presenter: Liu Peng Associate Researcher, China National Institute of Standardization

Liu Peng (CNIS) presented China's standards-based approach to cutting food waste under the 2021 Anti-Food Waste Law, pairing regulation with practical controls for catering businesses and online platforms. Against a global backdrop of ~670 million people hungry and ~931 million tons of annual food waste, the standards require: (1) clear anti-waste objectives and accountable personnel; (2) menu design with portion-size options, nutrition info, and anti-waste prompts; (3) forecast-based procurement and cooking, creative use of trimmings, and portion guidance; (4) post-meal measures such as waste-tracking systems, take-away options, and consumer incentives; (5) platform nudges and responsible handling of undelivered/unsold food (discounts or donations); and (6) ongoing training plus public education, including schools. The aim is a cultural shift toward awareness and accountability, aligning industry practices and consumer behavior with sustainability goals and offering a model other economies can adapt.

Presenter: Deri Siswara Consultant at IPB University

Deri Siswara (IPB University consultant; Perbanas Institute lecturer in machine learning) presented a survey of food-safety implementation among APEC MSMEs and street vendors. With MSMEs making up ~98% of firms (about half in food), the study (n=59: 50 operators, 9 regulators) found partial alignment with ISO 22000:2018 planning requirements (Clauses 4–6) but significant gaps in licensing and documentation—<50% held valid distribution permits, and many lacked records on ingredient expiry, pest control, and worker health checks. Clause 7 shortcomings included limited routine health screening, hygiene training, and infrastructure; Clause 8 showed weak packaging/labeling compliance. About 24% did not conduct periodic evaluations, and feedback loops were rare. While most economies have regulations and licensing, fees vary, inspection results are seldom public, and training is often generic. Conclusions: strengthen documentation, hygiene practices, and targeted training. Recommendations: proactive government support, more transparent oversight, and regulator-led, vendor-specific capacity-building to embed continual improvement in small food businesses.

Key Discussions and Outcomes

The workshop consolidated multi-economy perspectives from China; Indonesia; Japan; Thailand; and Viet Nam, with MSME case studies, on strengthening food safety and reducing food waste in support of domestic tourism. Key points are summarized below:

■ Indonesia

BSN opened the workshop (22–23 July, Pulauhan coast, Bali), aligning the agenda with the APEC women's economic integration mandate and APEC SCSC, and focusing on practical uptake of ISO 22000, GMP and related guidance to empower women-led culinary MSMEs.

Case study—Restu Mande: adapting to a new 121 °C sterilization critical point under BPOM oversight; progressing toward ISO 22000/FSSC 22000; integrating halal assurance across the chain; pursuing exports via trade fairs; and prioritizing catering, restaurant, and packaged lines while collaborating with women farmer groups for chilies.

MSME enablement: BSN flagged cost-relief mechanisms (e.g., remote inspections, reduced lab-test frequency).

■ Japan

Overview of the ISO 22000 ecosystem and the global "transparency chain": ISO standards → programme owners (e.g., FSSC 22000/BRCGS/IFS) → GFSI benchmarking → IAF accreditation of certification bodies—enabling credible, mutually recognized certification worldwide.

Emphasis on integrating management and control layers (FSMS, HACCP, PRPs) alongside Food Defence, Food Fraud, and safety culture.

■ Thailand

NIMT/NIMTY highlighted metrology's role in trustworthy testing: international comparisons on contaminants and residues (e.g., fipronil sulfone, metronidazole, nanoparticles), and production of ISO 17034 certified reference materials—including matrices for seafood, grains, aflatoxin, veterinary drugs, and porcine DNA for halal testing.

■ Viet Nam

Mandatory assessment of food stalls: operators can undergo standard inspections or present ISO/HACCP certificates for direct issuance; 2019 reviews exposed >60% health-check and >50% risk-confirmation gaps, prompting a five-pillar response—enforcement/incentives, training, infrastructure, public awareness, and technology. Current risk-ranking approach prioritizes oversight under resource constraints.

■ China

Anti-Food Waste framework: domestic standards operationalize the 2021 law across catering and platforms—portion-size options and reminders, improved prep and waste tracking, responsible handling of unsold food, and mandatory training/public education—to shift culture and cut waste.

■ Cross-cutting outcomes

Recognition that APEC's scale and regulatory diversity demand shared responsibility and collaboration; examples included divergent additive limits and varying HACCP/ISO requirements across economies.

Capacity-building priorities for MSMEs and street food: targeted training, basic documentation and hygiene practices, and data-driven continuous improvement (including low-cost inspections and AI/chatbot support). Participant feedback on the workshop was strongly positive (average scores >4/5), with suggestions to fine-tune topics/scheduling.

These discussions collectively underscored that harmonized, credible standards and practical support for MSMEs can accelerate safer culinary tourism and women's economic participation across APEC.

Participant's Feedback and Evaluation

The evaluation of the APEC workshop on strengthening women's culinary food safety standards and food waste management in support of domestic tourism showed highly positive results. Participants gave an average score of 4.55 out of 5, with 91.9% agreeing or strongly agreeing with key aspects of the workshop. The content was considered highly relevant, especially for women-led MSMEs, street-food vendors, and regulators. Many participants reported a clearer understanding of ISO 22000, HACCP, and good hygiene practices, as well as improved skills in documentation, labeling, and food-waste reduction. Presentations were described as clear, well-structured, and supported by credible data and case studies. Technical and logistical arrangements also received strong approval. Constructive feedback suggested adding more interactive and hands-on learning, allowing more time for discussion, providing deeper MSME-focused modules with step-by-step guidance, and strengthening follow-up through toolkits, peer exchange, and mentoring. Participants also preferred offline or hybrid formats to enhance networking, cultural exchange, and practical demonstrations. Overall, the findings confirm that the workshop met its objectives, delivered tangible capacity-building benefits, and offered valuable guidance for future APEC initiatives to strengthen food safety, empower women entrepreneurs, and promote sustainable culinary tourism.

Recommendations

Building on the presentations and discussions in the APEC workshop on food safety, women-led culinary MSMEs, and food-waste reduction, the following recommendations aim to help APEC economies build practical, harmonized, and future-ready systems.

1. **Adopt and align international food-safety schemes**
   Encourage voluntary uptake and recognition of ISO 22000, HACCP, and FSSC 22000 (incl. Food Fraud/Defence) for market access—especially B2B/export channels—while keeping legal mandates flexible. Use FSSC as a comprehensive, globally trusted pathway where supply chains require it.

2. **Institutionalize risk-based inspection with dual compliance pathways**
   For street-food vendors and micro-operators, combine a standard inspection track with an "equivalency" route that accepts ISO/HACCP certificates for direct hygiene certification; scale inspection frequency by risk history and vendor category.

3. **Strengthen metrological traceability and reference materials**
   Invest in NMI-led calibration, inter-laboratory comparisons (APMP/BIPM), and ISO 17034 certified reference materials to raise test reliability and comparability for contaminants, residues, and emerging nano/microplastics.

4. **Targeted MSME capacity-building, not generic training**
   Prioritize vendor-specific modules (GHP basics, record-keeping, personal hygiene) and embed **WHO "Five Keys to Safer Food"** in adult training and school curricula to lift baseline literacy over time.

5. **Make documentation and hygiene "minimum packages" mandatory**
   Require simple, standardized logs for worker health checks, pest control, ingredient expiry, and cleaning schedules; provide templates and spot-checks to improve consistency.

6. **Close gaps in packaging/labelling and feedback loops**
   Enforce basic labelling for ready-to-eat foods and require periodic self-evaluation/complaint tracking to prevent stagnation and drive continuous improvement.

7. **Lower compliance costs for MSMEs**
   Scale **remote inspections** and adjust lab-testing frequency where risk permits; pair with time-limited vouchers or pooled testing to keep small firms compliant.

8. **Integrate halal assurance where relevant**
   Support end-to-end halal certification (BPJPH) with risk-based verification (e.g., porcine DNA) and alignment with slaughterhouse and ingredient

controls.

9. **Build export-readiness pathways**
   Use trade-fair pipelines (sampling → buyer qualification) and require baseline HACCP or equivalent for overseas buyers; offer coaching on target-market standards.

10. **Operationalize anti-food-waste standards in food service**
    Roll out menu portion options and prompts, forecast-based prep, waste-tracking, take-away for leftovers, and platform nudges; complement with staff training and school education to shift culture.

11. **Coordinate across ministries and raise public awareness**
    Formalize multi-ministry roles (health, trade/industry, agriculture/environment), build food-safety centers, and run public campaigns with private-sector partners.

12. **Increase transparency of oversight outcomes**
    Publish aggregated dashboards of inspection/testing results to strengthen accountability and consumer trust while protecting vendor privacy.

13. **Deploy practical technologies where they matter most**
    Phase in risk analysis, smart-cooking devices, cold-chain controls, and IoT **sensors** for higher-risk categories and dense vendor clusters.

14. **Use proportional, staged compliance for micro-vendors**
    Apply flexible rules (registration + training first; graduated inspections) to avoid harming livelihoods while steadily lifting standards.

15. **Support thermal process upgrades for shelf-stable foods**
    Provide technical assistance (e.g., BPOM/BSN) for validation at **121 °C** sterilization, annual equipment calibration, and shelf-life studies to maintain quality and safety.

Implementing these measures—anchored in recognized standards, credible testing, MSME-friendly compliance, and cultural change—will improve consumer protection, enable trade and tourism, and empower women-led culinary enterprises across APEC.

Conclusion

The workshop affirmed that strengthening standards literacy and practical food-waste reduction in women-led culinary MSMEs is pivotal to safer products, stronger consumer trust, and more resilient domestic tourism. Anchored under APEC SCSC and hosted in Bali over two days, sessions focused on applying ISO 22000/ICCP/GMP in accessible ways for small operators, with participants giving consistently positive evaluations (all average scores >4/5). Priorities emerging from presentations and Q&A include closing gaps in basic documentation and hygiene practices, adopting low-cost, risk-based interventions (e.g., simple random inspections, targeted instruction), and leveraging digital tools (data registries, AI/chatbots) to sustain continuous improvement. A complementary push on food-waste standards—menu portioning, tracking, take-away options, and public education—was highlighted as a necessary cultural shift that aligns safety with sustainability.

Key takeaways include:

- Women-led MSMEs and street-food vendors need standards translated into simple, auditable practices; applying ISO 22000/ICCP/GMP pragmatically can unlock market access while remaining feasible for micro-operators.
- The most persistent gaps are documentation, routine hygiene, and targeted training; regulators should prioritize these “minimum packages” first.
- Risk-based, low-cost interventions—including basic random inspections, vendor databases, and AI/chatbots for real-time guidance—can raise compliance without imposing heavy burdens.
- Food-waste prevention requires operational measures (portion guidance, waste tracking, take-away) and public/school education to drive a cultural shift alongside safety gains.
- Participant feedback confirmed high satisfaction with content and delivery, with suggestions to tune topics and scheduling for even greater impact.

It is clear that a stepwise, cooperative approach will be essential. APEC economies are encouraged to:

- **Institutionalize MSME-friendly toolkits**: one-page SOPs, hygiene checklists, and templated logs (cleaning, pest control, worker health, expiry tracking) as entry-level compliance.
- **Operationalize risk-based oversight** with light-touch random checks, vendor registries, and **digital guidance (AI/chatbots)** to scale support where inspectors are scarce.
- **Align to credible schemes** (ISO 22000/ICCP/GMP) while tailoring to street-food contexts; use these as market enablers rather than blanket mandates.
- **Invest in awareness and education**, including integrating food-safety and food-waste topics into **school curricula** and community outreach to sustain behavioral change.
- **Maintain post-workshop momentum** via structured cross-ministry coordination under APEC SCSC, continued knowledge sharing, and iterative agenda-setting responsive to participant feedback.

By advancing these actions, APEC can translate international standards into practical, inclusive improvements on the ground—accelerating safer culinary tourism, reducing waste, and expanding the economic participation of women-led food enterprises across the region.

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APPENDIX A (Participant's Feedback survey form)

"Participant's Feedback – Workshop for Strengthening Knowledge of Women's Culinary Food Safety Standards and Food Waste Management in Support of Domestic Tourism" Denpasar, Bali — July 22–23, 2025

In relation to the successful completion of the Workshop themed *"Strengthening Knowledge of Women's Culinary Food Safety Standards and Food Waste Management in Support of Domestic Tourism"*, we kindly request your feedback and suggestions regarding the event.

Your input will be highly valuable for us in evaluating and improving future activities.

* Indicates required question

1. Name *

2. Email address (Please ensure that your email address is written correctly) *

Workshop Feedback Form

Kindly provide your assessment of this workshop activity using a scale from 1 to 5.

Please use the following scale for your responses:

1 – Strongly Disagree / Strongly Inappropriate
2 – Disagree / Inappropriate
3 – Neutral
4 – Agree / Appropriate
5 – Strongly Agree / Strongly appropriate

3. The topics covered are applicable to my job responsibilities *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

4. This workshop contributed to a better understanding of Food Safety Standards and Food Waste Management on my part *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

5. I found the presented material to be helpful and informative *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

6. I was able to understand the material with ease. *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

7. The workshop content was substantiated with trustworthy data, research findings, and reputable sources. *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

8. The presenter conveyed the material in a clear and comprehensible way *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

9. The workshop's technical aspects, such as sound, image, and video quality, were well-managed and ran effectively. *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

10. The schedule of the activity was well-suited to the participants' needs. *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

11. I am generally satisfied with the way this workshop was carried out. *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

Workshop Feedback Form

12. Suggestions and Input concerning the Workshop *

13. Which topic do you consider relevant or needed for the upcoming workshop? *

14. Would you prefer the next workshop to be held in an offline, online, or hybrid format? *

Mark only one oval.

- ◯ Online
- ◯ Offline
- ◯ Hybrid

15. What aspects of this workshop still need improvement? *

APPENDIX B (Workshop Evaluation and Participant Feedback)

Participants in the APEC workshop on strengthening women's culinary food safety and reducing food waste for domestic tourism gave very positive feedback. The main goal was to assess the workshop's effectiveness, relevance, and delivery. The evaluation also identified areas for improvement and ideas for future projects. Organizers used both quantitative ratings (1–5 scale) and qualitative comments to measure satisfaction, knowledge gains, and gather suggestions.

Overall, participants were highly satisfied with the workshop. Quantitative responses showed a positive assessment, with an average score of 4.55 out of 5. Agreement was high, with 91.9% agreeing or strongly agreeing. Materials and technical support received the highest ratings (4.64). Knowledge gain was also high (4.59). These results reflect qualitative feedback, which found the content to be relevant, practical, and directly applicable to jobs in culinary MSMEs, street-food businesses, and the tourism sector. Participants reported that the sessions enhanced their understanding of food safety requirements, including ISO 22000, HACCP, GHP, food waste reduction, hygiene basics, documentation, labelling, and waste tracking. Presentations and facilitation earned much praise. Sessions were clear, well-organized, and engaging. Some wanted more examples, a slower pace, or more discussion time. Technical and organizational quality was also rated highly—video/audio, calendar, and scheduling. Time management was generally excellent, though some wanted stricter time limits.

Feedback indicated that the workshop provided benefits beyond personal learning. Participants identified how to use ideas in their organizations. Most intend to incorporate workshop learnings into MSME and vendor training, pilot simple documentation tools, and implement labelling practices for ready-to-eat food. The novelty of this practice highlights the need for better portioning and reducing leftovers. For future workshops, participants rated face-to-face and blended formats highest. They valued in-person interaction, networking, and hands-on demonstrations. They also appreciated a hybrid model for scalability and keeping experiential elements. Participants recommended incorporating more experiential activities, such as team assignments, field visits, and peer benchmarking events. They also want clearer MSME-focused guidance through step-by-step checklists, infographics, and case studies from various economies.

Post-learning support is necessary, including online Q&A sessions, document sharing, mentoring, and toolkits. Engage a broader set of stakeholders—regulators, municipalities, associations, and buyers—to bring diverse perspectives and greater impact. The evaluation confirmed that the workshop met its objectives: participants were highly satisfied and intend to apply the new knowledge they gained. Proposals for interactive formats, MSME-targeted modules, and issue follow-up will inform future APEC capacity building programs. Integrating these findings will enhance food safety, advance women in the culinary sector, and support sustainable tourism in APEC economies.

APPENDIX C (Workshop Agenda)

Workshop on Strengthening Standard Knowledge on Women Culinary Food Safety and Its Food Waste Management in Supporting the Domestic Tourism SCSC_102_2024T

Hotel Pullman Legian Beach Bali 22 – 23 July 2025
Time zone: GMT+7

DAY ONE **22 July (Tuesday) – Workshop Presentation and Discussion**		
08:30 – 09.00	Registration	
09:00 – 09.15	Opening Day 1 Opening greetings by MC	**MC:** Novitasari Research Center for Testing Technology and Standard, BRIN, Indonesia
09:15 – 09.30	Report of PO	
09:30 – 09.45	**Opening Speech:** Ms Konny Sagala Director of Implementation System for Standards and Conformity Assessments, BSN	
09:45 – 10.00	Take a break	
First Session		
10.00 – 10.30	**Development and Implementation of Standards for Food Safety** Ms Yoko Tembo Japanese Industrial Standards Committee (JISC) ISO/TC 34/SC 17, Management systems for food safety	**Moderator:** Prof. Bambang Prasetya Research Professor, Research Center for Testing Technology and Standard, BRIN, Indonesia
10.30 – 11.00	**Existing Food Safety Regulations in APEC Economies and International Food Safety Regulations** Ir. Didik M. Rofiqi MSi Lead Auditor for ISO 22000 & HACCP	
11:00 – 12.00	Q&A and Discussion	
12.00 – 13.00	Lunch Break	**MC**

Second Session		
13:00 – 13.30	**Inspiring Stories of Women in Running a Culinary Business "VCO Entrepreneurs' Journey to Success and Empowerment"** Ms. Ni Nyem Ratih Amerta Sari Rahayu Huluning Bali Cooperative	**Moderator:** Ms Konny Sagala Director of ISSCA, BSN
13.30 – 14:00	**Challenges in Implementing Food Safety Regulations: SME's Restu Mande** Ms. Nenden Rospiani Restu Mande Rendang	
14:00 – 15:00	Q&A and Discussion	
15.00 – 16.00	Announcement	**MC**

DAY TWO 23 July (Wednesday) – Workshop Presentation and Discussion		
Third Session		
09:00 – 09.30	Registration for Certificate and Announcement	**MC**
09.30 – 10.00	**Implementation of International Standards for Safe Food Preparation** Kurnia Ramadhan, Ph. D Program Chair Department of Food Technology, Universitas Bakrie, and Vice Chair Indonesian Association of Food Technologists	**Moderator:** Prof. Lilik Eka Radiati Professor at the Faculty of Animal Science, Brawijaya University
10.00 – 10.30	**Business Actors' Perspectives on Mandatory Food Safety Regulations** Kittiya Shearman, Ph. D Head of Chemical Metrology and Biometry Department National Institute Metrology	
10:30 – 11.30	Q&A and Discussion	
11.30 – 13.00	Lunch Break	**MC**
Four Session		
13.00 – 13.30	**Case Study of APEC Economies** **"Viet Nam Mandatory Implementation of The Food Stall Assessment"** Dr. Tran Thanh Son National Institute for Food Control (NIFC) Viet Nam	**Moderator:** Dr. Teguh Pribadi A. Researcher, Research Center for Testing Technology and Standard, BRIN, Indonesia
13.30 – 14.00	**Introducing The Product of Formulating Domestic Standards to Prevent Food Waste** Liu Peng Associate Researcher, China National Institute of Standardization	
14.00 – 14.30	**Implementation Study of Food Safety in MSMEs and Street Food Businesses in The APEC Region** Deri Siswara Consultant at IPB University	
14.30 – 15.30	Q&A and Discussion	
15.30 – 16.00	Evaluation Survey	
	Closing Remark	

APPENDIX D (Data Analysis of Food Safety Questionnaire for Food Business Actors)

Introduction

To obtain an overview of the implementation of food safety practices carried out by food business operators in micro, small, and medium-sized urban areas. This survey was conducted on business operators who sell food on the roadside, in community food courts (pujasera/food court), and small restaurants. The survey was conducted in cities with high population density, intense economic activity, and significance as tourist destinations. Data collection employed both quantitative and qualitative methods. The quantitative method was implemented through a questionnaire survey, distributed digitally via Google Forms and physically to be completed directly by business operators. Verification of responses was conducted through photographic documentation of the food vendor alongside their food stall or establishment, to ensure the authenticity of the data collected. The qualitative method involved direct interviews with food business operators to obtain deeper insights into their perceptions (either as owners or employees) regarding implementing food safety practices.

Fifty-one food business operators from several cities participated in this activity. The questionnaire consisted of 84 questions covering a range of topics, including business ownership status, operational management, evaluation and planning processes, resource allocation, adequacy of facilities and infrastructure, influence of the social work environment, quality control for food ingredients and products, human resource competencies, operational procedures for food production, and mechanisms for handling customer feedback. Completing the questionnaire took approximately 25 to 30 minutes. For some respondents, interviews were conducted concurrently with questionnaire completion, during which key points were recorded or noted, with the respondents' prior consent.

Results and Discussions

The following section presents the results of the survey that was conducted. Table 1 provides a representation of the demographic data of the collected sample. A total of 51 food business operators participated as respondents. Of the respondents, 53% were female and 47% were male. Regarding educational background, 26% had completed higher education (college/university level), 31% had completed secondary education (senior high school), and 7% had only completed lower secondary (junior high school) or primary education. Most respondents had been engaged in the food business for more than three years, totalling 29 individuals, while only 10 respondents reported having less than one year of experience in this field. Additionally, 61% of the data were obtained from business owners, while the remaining 39% were employees involved in managing the food business operations.

Table 1. Demographic data of respondents

Demographic Factors	Frequency					
City	A	B	C	D	E	F
number of respondents	16	12	11	8	2	2
	31%	24%	22%	16%	4%	4%
Gender	Female			Male		
	27			24		
	53%			47%		
Educational Attainment	Master's Degree	Bachelor's Degree	Associate degree	Senior High School	Junior High School	Primary School
	1	8	4	31	5	2
	2%	16%	8%	61%	10%	4%
Business Location	Privately Owned Land			pujasera/food court		
	40			11		
	78%			22%		
Duration of Employment	Less than 1 year		1–3 years		More than 3 years	
	10		12		29	
	20%		23%		57%	
Position in the Business	Owner			Employee		
	31			20		
	61%			39%		

The chart presented in Figure 1 illustrates the commitment of food business operators to implementing food safety within their business operations. This commitment is reflected in several indicators, including the possession of official business licenses, the designation of specific personnel responsible for sourcing raw materials, and the existence of documented guidelines or procedures related to the safety and quality of food products offered. Based on the survey data, 57% of respondents indicated that food

business operators demonstrated a firm commitment to implementing food safety practices, 31% received a good score, and only 12% were rated as adequate.

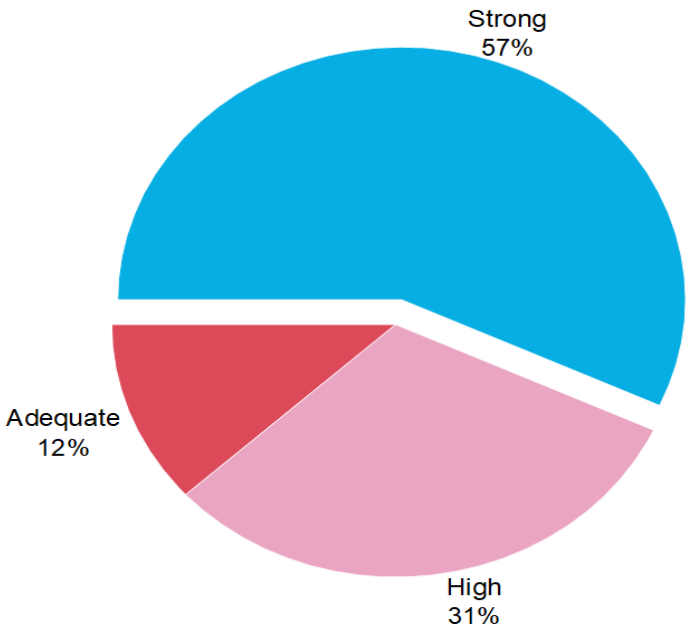

Figure 1. Commitment of food business operators to implement food safety

The following data provides an overview of one of the key components of any management system, namely planning. Food business operators are expected to identify food safety issues arising from customer feedback and subsequently conduct evaluations based on this feedback while conducting food business activities. Figure 2 illustrates that only 34 respondents demonstrated good planning practices, which included receiving customer feedback and conducting corresponding evaluations. Meanwhile, 10 respondents partially implemented these practices, and 7 respondents reported no planning mechanisms to identify potential food safety risks during food sales or any action plans to mitigate such risks.

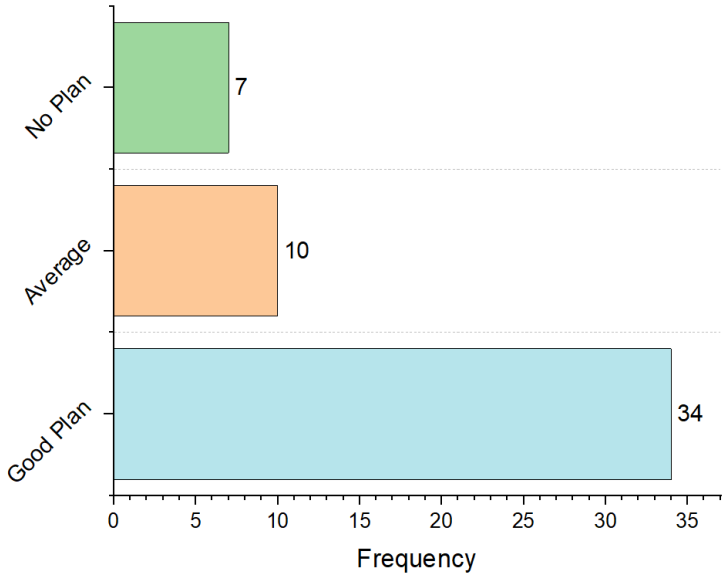

Figure 2. Implementation of planning among food business operators

The next group of questions relates to human resources, particularly individuals or employees providing services within the food business. This group of questions describes the level of awareness of resources in implementing food safety during the preparation and serving of food to customers. This is indicated using attributes to maintain cleanliness such as the use of gloves, aprons, head coverings, and mouth masks, as well as routines to maintain cleanliness such as hand washing, the use of special attributes when at the business location, and removing accessories (rings, watches, etc.) when preparing food ingredients. Figure 3 shows that more than 60% of respondents demonstrated good or higher levels of awareness in applying food safety practices during food production processes. Meanwhile, *competency* refers to the ability of the owner or staff to fulfill their roles by assigned responsibilities. This is related to the specific division of tasks, knowledge of food safety practices, and experience in the food business. Most respondents have a sufficient and good level of competence, with 20 and 22 respondents, respectively. There are 6 respondents with insufficient competence, 1 with low competence, and 2 with high competence.

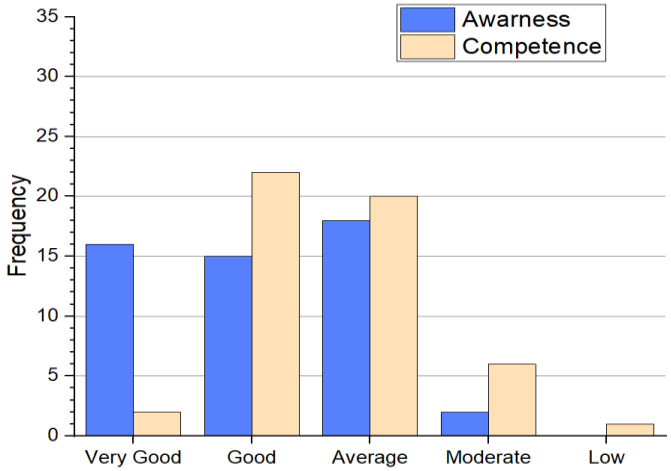

Figure 3. Distribution of data on food safety awareness and relevant competencies among food business operators

Infrastructure as a form of resource also plays a significant role in the implementation of food safety practices. This includes the availability of clean water, proper drainage systems, adequate sanitation equipment, and the strategic placement of tools and equipment to prevent contamination. According to the survey results, 76% of respondents were found to have excellent infrastructure, while 16% reported having good infrastructure. In contrast, 6% of respondents had only adequate infrastructure, and 2% were operating under poor infrastructure conditions, as illustrated in Figure 4

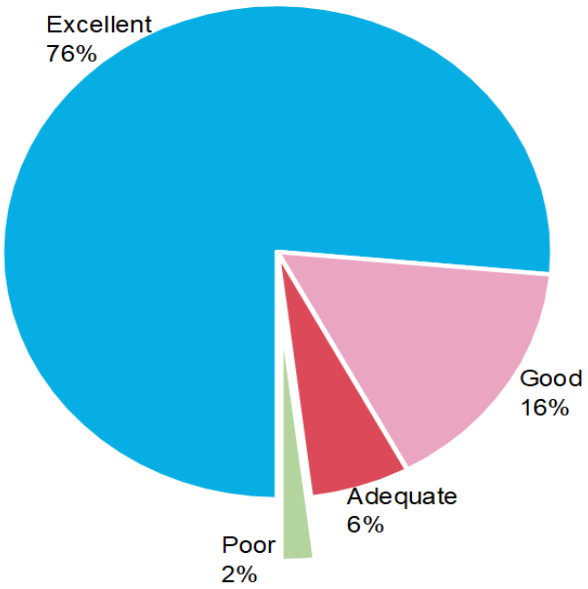

Figure 4. Infrastructure conditions supporting the implementation of food safety practices

In addition, the survey questions also cover the working environment conditions that ensure business operators can run their businesses effectively. Not only related to infrastructure, such as adequate lighting levels and the availability of handwashing facilities, but also to professional relationships between owners and employees or employees-employees. In general, the survey results in Figure 5 indicate that the respondents have a good business environment, with 44 respondents. Meanwhile, only 1 respondent stated that the work environment was lacking, and 6 respondents had a sufficient work environment.

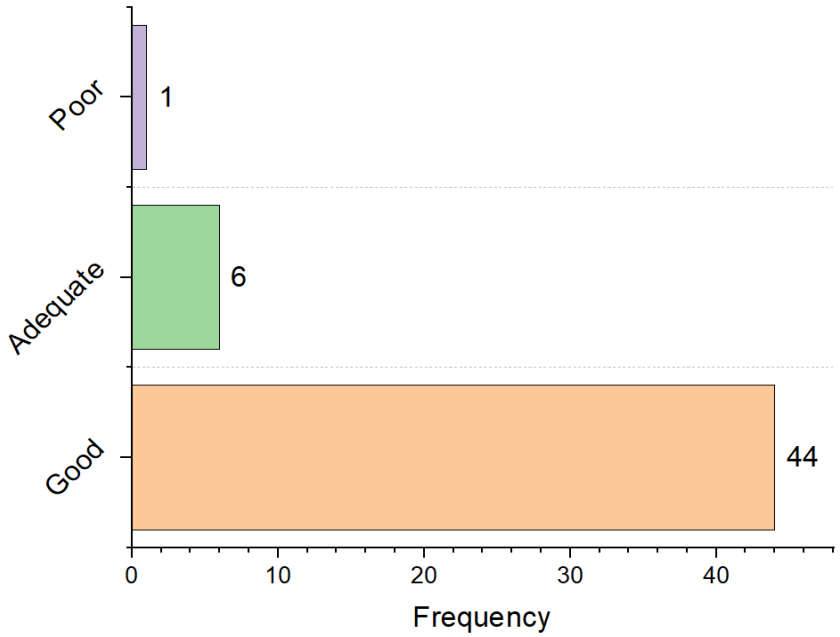

Figure 5. Environmental conditions at food business premises

The next group of survey questions focused on quality control of food ingredients and the management and storage of raw materials. This included aspects such as handling substandard or non-compliant food ingredients, using water for food preparation or

cooking, storing unused ingredients for long-term operations, and treating spoiled or damaged food items. Overall, respondents demonstrated good quality control practices. Only 6% of respondents reported poor quality control, while 29% had adequate control, 43% reported reasonable quality control, and 22% demonstrated excellent quality control practices, as illustrated in Figure 6.

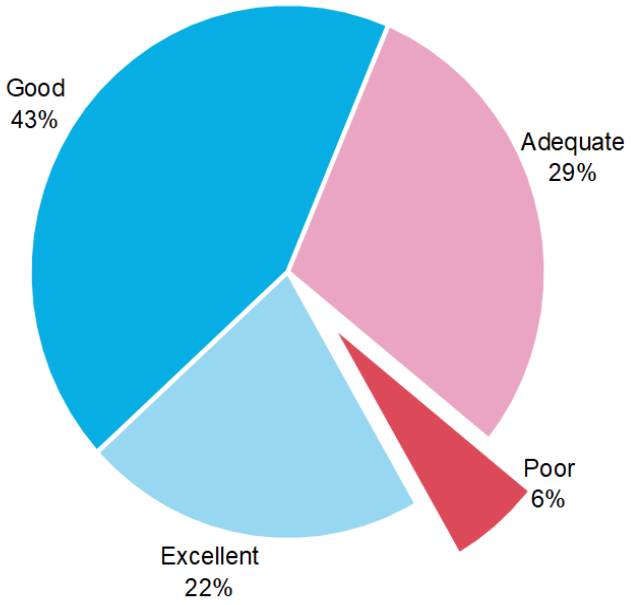

Figure 6. Implementation of quality control for food ingredients by food business operators

Control measures in written documentation represent one of the key elements in implementing a sound food safety system within food businesses. In addition to supporting compliance, documentation facilitates more effective management of raw materials, human resources, and infrastructure. Survey results presented in Figure 7 indicate that more than 50% of respondents have not yet implemented any form of written record-keeping or documentation in their business operations. Only 22% of respondents reported establishing written documentation practices, while another 22% implemented effective data recording systems.

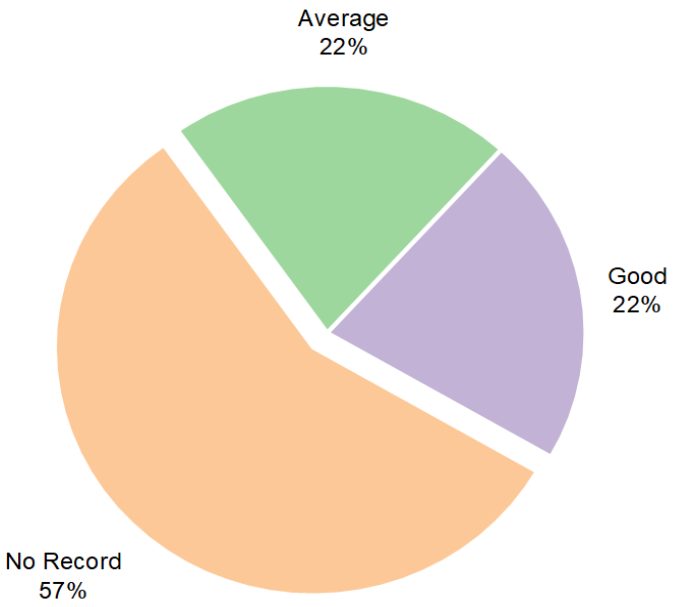

Figure 7. Implementation of documentation as a quality control measure in food businesses

The implementation of food safety practices in business operations is illustrated in Figure 8, where food business operators' routine behaviors or habits during the preparation or cooking processes serve as key indicators in this study. In addition, the survey also aimed to assess the extent to which monitoring mechanisms are applied during business operations, ensuring that food products sold meet both quality standards and are safe for consumption. Survey results indicate that respondents have implemented food safety practices effectively in the day-to-day operation of their food businesses.

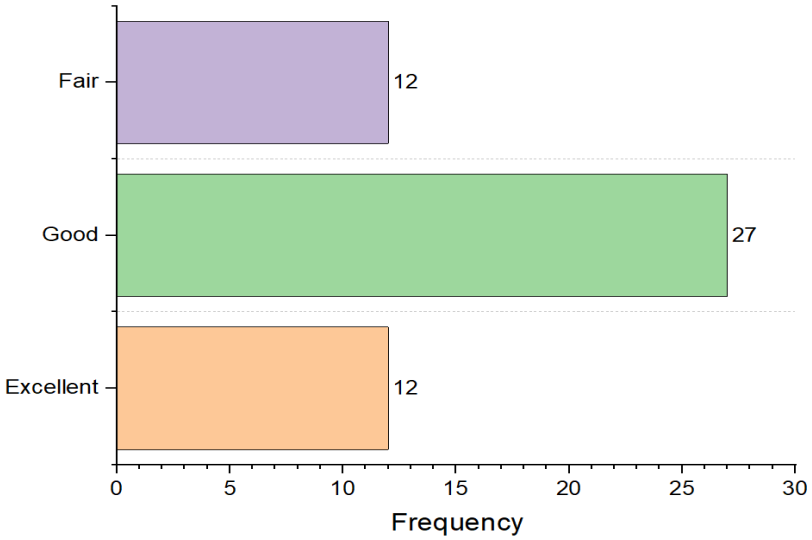

Figure 8. Implementation of food safety in food business operations

Analysis of the survey data on overall food safety implementation indicates a correlation with the respondents' length of work experience. The one-way ANOVA test revealed a significant difference in the application of food safety practices across different work experience categories, as indicated by an F-value of 2.300 and a P-value of 0.0496. In the category of respondents with less than 100 months of work experience, the median score was lower than in other categories, with a broader distribution of scores, as illustrated in Figure 10. This suggests a high degree of variability in food safety

implementation during the early stages of business operation. In the 100–200 months category, the data show a more concentrated range of scores, indicating a more consistent and improved application of food safety practices. Meanwhile, some data points were identified as outliers in the category of respondents with more than 200 months of experience, although a higher median score was observed. These outliers reflect cases where, despite having extensive work experience, confident respondents demonstrated relatively low levels of food safety implementation.

	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	2	228.54197	114.27098	3.20018	0.04958
Error	48	1713.96784	35.70766		
Total	50	1942.5098			

Figure 9. One-Way ANOVA analysis of work experience duration and food safety practice scores

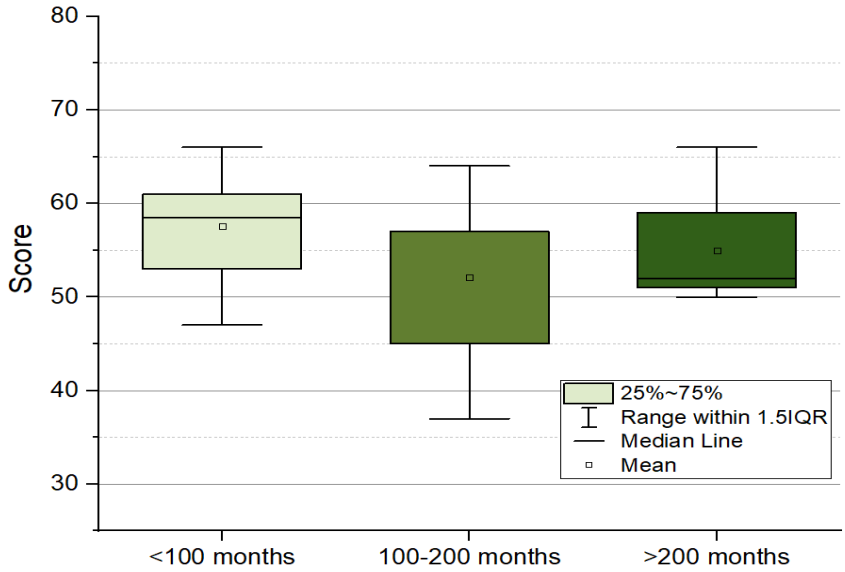

Figure 10. Distribution of overall food safety practice scores by respondents' work experience duration

Figure 11 illustrates the correlation between respondents' status and food safety implementation scores. The survey identified two categories of respondents: business owners and employees responsible for managing food business operations. The total food safety implementation scores of respondents who were also business owners tended to be lower than those provided by employees.

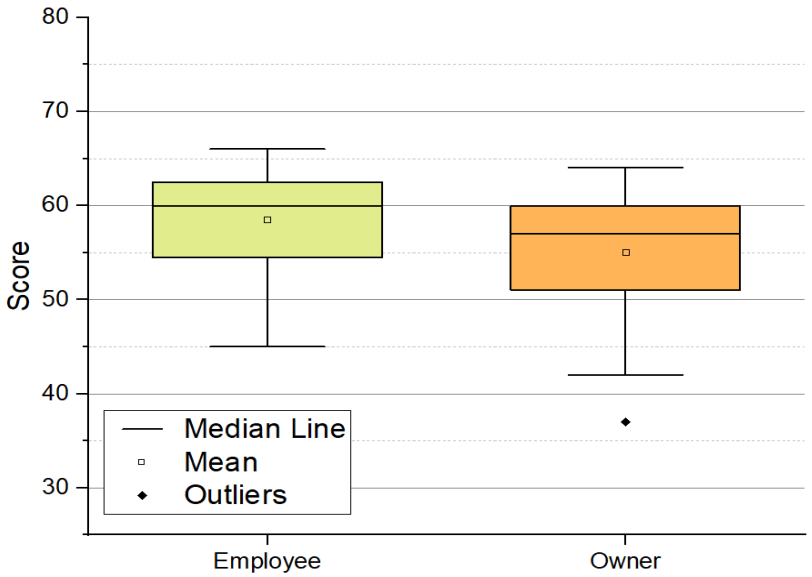

Figure 11. Correlation between respondent status and total food safety implementation scores

Based on the analysis, the level of education did not show a significant correlation with the final food safety implementation scores. Similarly, the status of the business location—whether the premises were privately owned or situated within a food court (puja sera), which typically has established regulations—was also not correlated with the final scores of food safety implementation.

APPENDIX E (Data Analysis of Food Safety Questionnaire for Food Business Regulator)

Introduction

In addition to conducting surveys on micro, small, and medium enterprises in the food sector, it is also aimed at food regulators. Regulators can be domestic institutions or agencies that formulate regulations or guidelines for food safety implementation, as well as inspectors or supervisors at the local government level who directly interact with food business operators and consumers, whether they sell food on the roadside, in community food centers, or in restaurants. This survey aims to obtain information and an overview of the supervision of food business operators so that food safety and consumer safety can be maintained.

The questionnaire in this survey consists of 22 questions that take approximately 10-15 minutes to complete. The main focus topics in this research include regulations governing business permits for food entrepreneurs, control and supervision of food product safety, availability of training or guidance on food safety implementation, and evaluation of food safety implementation. Because the nature of this questionnaire targets regulators, the respondents targeted are regulators who are already in place/operating in an economy. Therefore, the APEC secretariat carries out data collection or questionnaire distribution.

Results and Discussions

The respondents in this study represent food regulators responsible for formulating and implementing food safety policies in APEC member economies, including Australia; China; Indonesia; Japan; Malaysia; New Zealand; and Thailand. Generally, the respondents are employed by government institutions and possess, on average, more than 15 years of experience in the food sector. The questionnaire data analysis indicates that most APEC member economies have established food safety regulations, including those specifically addressing food safety for food business operators. Furthermore, regulatory enforcement systems are in place to ensure compliance with legal requirements, such as obtaining business licenses and implementing food safety measures within business operations.

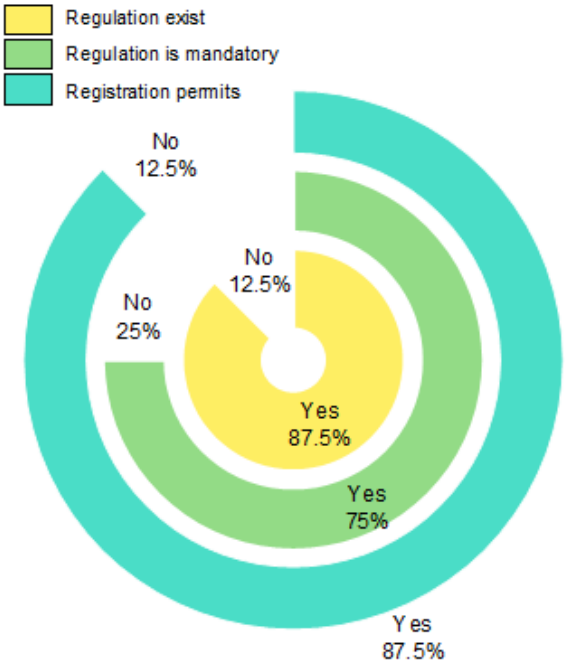

Figure 12. Information on food safety regulations in APEC member economies

As shown in Figure 1, 87.5% of respondents indicated that food safety regulations are established at the economy level. In 75% of the economies, it is mandatory for all food business operators—from micro-level businesses such as street food vendors to medium-scale enterprises—to register their businesses to obtain the appropriate operating licenses. While the regulations are set economy-wide, their implementation may vary across cities or local governments. In some areas, business operators are required to complete formal registration processes, whereas in other jurisdictions, a license or notification is only necessary before commencing food business activities. Furthermore, in most economies (87.5%), the institutions responsible for food safety regulation also provide licensing services with clear and transparent procedures, making it easier for business operators to obtain legal authorization to operate. In some economies, the licensing process for micro and small food enterprises is even offered free of charge.

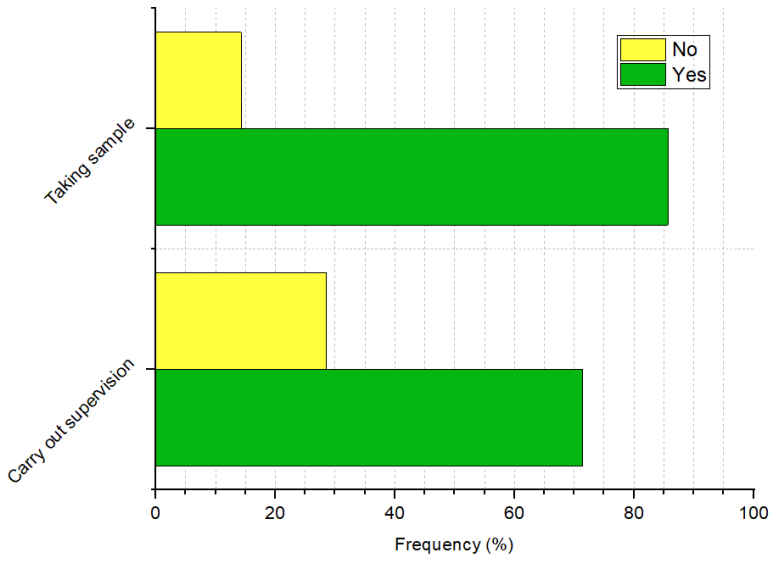

Figure 13. Implementation of monitoring and food product sampling for inspection purposes

Food safety enforcement in several respondent economies has extended to implementing product sampling activities for food business operations. This practice helps mitigate the risks of foodborne illnesses or hazards from using spoiled or expired ingredients. Although 85.7% of the respondent economies reported conducting sampling activities, the remaining 14.3% did not perform product sampling, as shown in Figure 2. Some regulators only conduct general visits, routine inspections, or random analytical surveys without collecting physical samples. As illustrated in Figure 3, 42.9% of regulators conduct monitoring activities only once a year. However, in 28.6% of cases, food safety inspections are conducted more than once annually, while 14.3% of regulators perform unscheduled visits as part of surveillance audits or observational monitoring.

Table 2. Types of non-conformities identified during food safety inspections of food business operators

No.	Non-Conformities	Frequency
	Monitoring	
1	Waste Management	12.5%
2	Competence	12.5%
3	Documentation and Data Recording	25.0%
4	Hygiene	50.0%
	Report	
5	Food Poisoning	57.1%

71.4% of food safety regulators have developed plans and implemented regular or scheduled inspections targeting micro, small, and medium-sized food business operators in their respective economies. Common findings from these inspections typically include poor sanitation or hygiene at business premises, inadequate food waste and garbage management, and the lack of documentation or records related to food business operations, as presented in Table 1. In some economies, the results of such inspections are published and made publicly accessible. Listing the names of food businesses alongside their inspection findings serves as both a form of encouragement and motivation for operators to maintain hygienic and safe business environments. It is also a positive promotional tool for businesses demonstrating good food safety practices. This information provides a useful reference for identifying clean and safe dining options for consumers. This is especially important in preventing foodborne illness cases—57.1% of survey respondents reported receiving such incident reports in their respective areas.

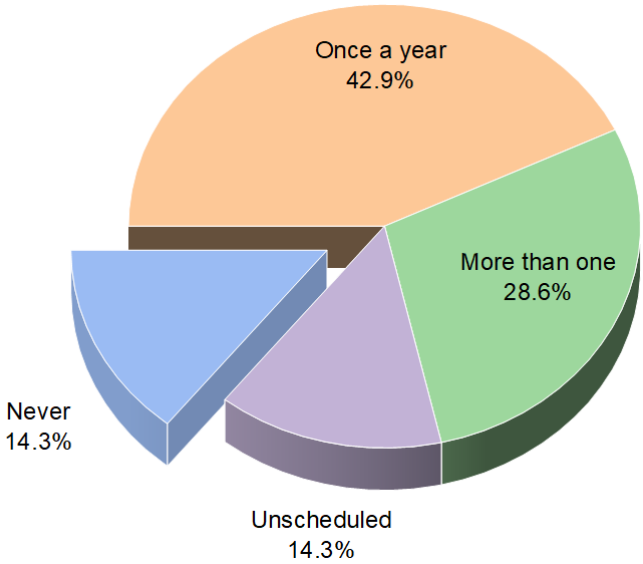

Figure 14. Number of food safety inspection visits per year conducted by regulators in APEC member economies

Food safety regulators are generally receptive to consumer feedback and responsive to reports regarding potential issues from food products sold by business operators. Based on such issues, several regulators have implemented programs to enhance food safety practices among food business operators, as illustrated in Figure 4. A total of 85.7% of regulators reported providing training, with 71.4% of that training directly related to food safety programs. The remaining portion includes other types of training relevant to general business operations. Although 14.3% of regulators do not directly provide food safety training programs, existing regulations in their jurisdictions require that food business operators be certified or have undergone training on food handling and safety practices. Therefore, food business operators need to obtain food safety training from other institutions that provide certification to comply with these regulations before starting their business.

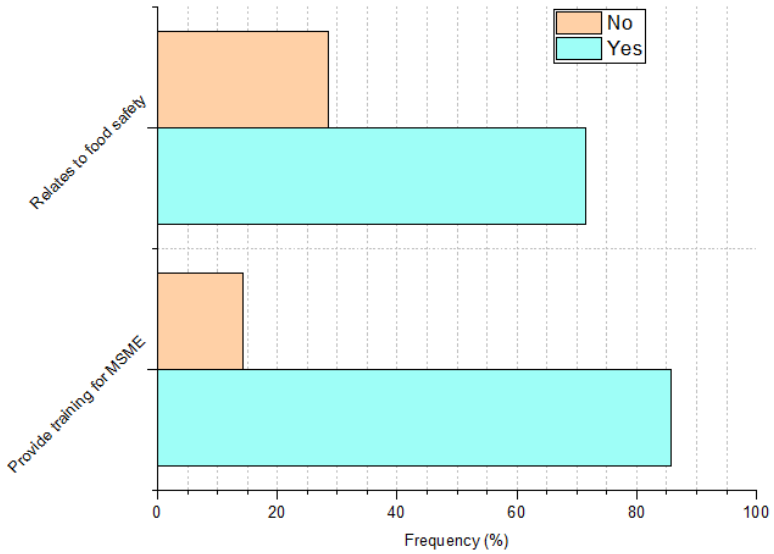

Figure 15. Programs provided by regulators to enhance food safety implementation among food business operators

In general, no significant correlations were found among the variables across the columns of the questionnaire data. Table 2 presents the Chi-square test results

conducted to determine the correlation between an economy's regulatory function and food poisoning incidents. The test results indicate no correlation between the two variables, as evidenced by a low Chi-square value (0.225) and a high P-value (> 0.05). Table 3 shows the Chi-square test results examining the correlation between the implementation of monitoring programs by regulators and the occurrence of food poisoning. The analysis revealed no correlation between food safety monitoring and foodborne illness incidents, as indicated by a low Chi-square value (< 5.99) and a P-value greater than 0.05. Table 4 presents the Chi-square test results to assess the correlation between food safety training programs provided by regulators to MSME food business operators and the incidence of food poisoning. The findings indicate no correlation between the training programs and food poisoning events, supported by a low Chi-square value (0.09) and a high P-value (> 0.05).

Table 3. Chi-Square test results on the correlation between the availability of food safety regulations and the incidence of food poisoning

Chi-Square Test

	ChiSquare	DF	Prob > ChiSq
Pearson Chi-Square	0.225	2	0.8936
Likelihood Ratio	0.22846	2	0.89205

Warning: 9 cell(s) with expected count(s) less than 5.
According to Pearson Chi-Square test:
At the 0.05 level, there is NOT significant evidence of association between two variables.
Linear Association is only available for numeric data.
Continuity Correction is only available for 2x2 tables.

Table 4. Chi-Square test results on the correlation between the implementation of monitoring and the incidence of food poisoning

Chi-Square Test

	ChiSquare	DF	Prob > ChiSq
Pearson Chi-Square	2.115	2	0.34732
Likelihood Ratio	2.8626	2	0.239

Warning: 9 cell(s) with expected count(s) less than 5.
According to Pearson Chi-Square test:
At the 0.05 level, there is NOT significant evidence of association between two variables.
Linear Association is only available for numeric data.
Continuity Correction is only available for 2x2 tables.

Table 5. Chi-Square test results on the correlation between the availability of food safety training programs and the incidence of food poisoning

Chi-Square Test

	ChiSquare	DF	Prob > ChiSq
Pearson Chi-Square	0.09	2	0.956
Likelihood Ratio	0.09001	2	0.95599

Warning: 9 cell(s) with expected count(s) less than 5.
According to Pearson Chi-Square test:
At the 0.05 level, there is NOT significant evidence of association between two variables.
Linear Association is only available for numeric data.
Continuity Correction is only available for 2x2 tables.