



**Food and Agriculture Organization
of the United Nations**

Meeting proceedings

**Regional consultation on
food safety indicators for Asia and the Pacific**

6–8 December 2017, Singapore



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Food and Agriculture Organization of the United Nations
Regional Office for Asia and the Pacific
Bangkok, 2018

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ISBN 978-92-5-130542-3

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Acknowledgements

The Food and Agriculture Organization of the United Nations (FAO) would like to express its appreciation to the many people who provided advice and guidance on the initiative on food safety indicators. These proceedings were prepared under the project of the FAO Regional Office for Asia and the Pacific (FAORAP), which was coordinated by Masami Takeuchi (FAO Food Safety Officer) under the overall direction of Sridhar Dharmapuri (FAORAP Senior Food Safety and Nutrition Officer). FAO would like to thank all the participants to the regional consultation in particular, the officers and experts from the Agri-Food and Veterinary Authority of Singapore for valuable inputs provided throughout the consultation. The initial draft preparation and contributions to finalization of the proceedings by Gokce Akbalik (FAO junior consultant) and technical editing by Kim Des Rochers are also gratefully acknowledged.

Keywords

Food safety, indicators, measure, Asia and the Pacific, food chain, capacity development, One Health

Abbreviations and acronyms

AVA	Agri-Food and Veterinary Authority of Singapore
CAC	Codex Alimentarius Commission
FAO	Food and Agriculture Organization of the United Nations
FASFC	Federal Agency for the Safety of the Food Chain Belgium
FPS–HSFCE	Federal Public Service for Health, Food Chain Safety and Environment Belgium
FSANZ	Food Standards Australia New Zealand
OECD	Organisation for Economic Co-operation and Development
WHO	World Health Organization

Executive summary

Developing a set of regional food safety indicators with the overall goal of strengthening national food control systems has been a key topic at various regional food safety meetings in Asia and the Pacific, and Members of the Food and Agriculture Organization of the United Nations (FAO) in the region often request FAO to initiate dialogues on the topic. In order to address the need, FAO held a regional consultation on food safety indicators from 6 to 8 December 2017 in Singapore, with the primary objective for national food safety competent authorities to review various existing food safety indicators in the context of their national situations, particularly in developing countries.

The consultation welcomed 84 participants, including senior officials working in the area of food safety (from 18 Asian and 6 Pacific Island countries), speakers, observers and meeting secretariat members. Participants were provided with an FAO technical working paper that described the preliminary review process and identified existing indicators prior to the meeting. The paper was used as the basis for all discussions during the consultation.

Through various presentations, panel discussions and working group sessions, all participants confirmed the need for, and importance of, having measurable and actionable food safety indicators, and critically reviewed all existing food safety indicators summarized in the technical working paper. Using a set of criteria, participants developed a draft set of regional food safety indicators that national food safety competent authorities could use to develop their own national food safety indicators. Participants also engaged in active discussions on useful applications of national food safety indicators.

Participants suggested that FAO develop a technical tool that can be used as a guide for competent authorities to define their own national food safety indicators. The tool is planned to be piloted in several countries in the region to verify the usefulness of the 1) guidance tool, and 2) applications that the national food safety indicators are aimed at.

1. Overview

The regional consultation on food safety indicators for Asia and the Pacific took place from 6 to 8 December 2017 in Singapore, with the overall objective for national food safety competent authorities to review various food safety indicators identified in the existing literature in the context of their national situations, particularly in developing countries. Three specific objectives of the consultation were to: 1) discuss and confirm the region's need for measurable and actionable food safety indicators; 2) develop a set of useful regional food safety indicators with possible measuring methods, as well as corresponding required sets of data; and 3) discuss the use of the set of regional food safety indicators and their applications in order to develop national food safety indicators. The consultation was organized by the Food and Agriculture Organization of the United Nations (FAO) and co-hosted by the Agri-Food and Veterinary Authority of Singapore (AVA). The consultation agenda is attached as Annex 1.

The consultation was attended by 84 participants, including senior-level government officials from food safety competent authorities from 18 Asian and 6 Pacific Island countries, a speaker from Belgium, an observer from the World Health Organization Regional Office for the Western Pacific, and FAO/AVA secretariat members. Regional participants were from Australia, Bangladesh, Bhutan, Cambodia, China, Cook Islands, India, Indonesia, Japan, Kingdom of Tonga, the Lao People's Democratic Republic, Malaysia, Maldives, Federated States of Micronesia, Mongolia, Nauru, Nepal, the Philippines, the Republic of Korea, Singapore, Sri Lanka, Thailand, Vanuatu and the Socialist Republic of Viet Nam. The female to male ratio of participants was 59.9%:40.1%. The list of participants is attached as Annex 2.

2. Opening session

The consultation was opened by Dr Sridhar Dharmapuri, FAO Senior Food Safety and Nutrition Officer, who stated that effective national food control systems are needed to protect consumer health and ensure fair trade, and that continuous improvement is necessary to adapt to changes in needs and trends. It is important for countries to know where they stand with regard to their food safety capacity level in order to prioritize the areas that need improvement. FAO has received several requests from its Members during various meetings to provide guidance on developing national food safety indicators. Responding to this request, the regional consultation is being held as a first step towards developing a set of concise and practical indicators that will provide a regional overview of the food safety status in each country, with a "One Health" approach from farm to plate. A technical working paper that lists the identified existing indicators was prepared to facilitate discussions.

In his welcome remarks, Dr Paul Chiew, Group Director, Laboratories Group of AVA, pointed out that with the globalization of trade and the growing complexity of the food supply chain, food safety cannot be achieved by the countries alone. Food safety can have a significant impact on national public health and has international trade implications as well. It is crucial for national food safety competent authorities to have useful tools or performance indicators to: 1) help identify any needs for capacity development; 2) systematically detect food safety problems; and 3) assess the effectiveness of new policies or measures to allocate resources to priority areas for the enhancement of food control systems.

Mr Lim Kok Thai, Chief Executive Officer of AVA, delivered his key note address, elaborating on the need for countries to engage in close regional and international collaboration in order to find solutions for food safety challenges throughout all stages of the food supply chain. Being a large food importer, Singapore is: 1) addressing food safety challenges with science-based and international legislations; 2) adopting a farm-to-plate approach; 3) conducting risk-based inspection and testing measures; and 4)

engaging in continuous partnerships with consumers and industries. Mr Lim Kok Thai stressed that the consultation is a great opportunity to work together to discuss a set of potential food safety indicators that can be used by countries in Asia and the Pacific to gauge the effectiveness of their national food safety systems.

3. Background and objectives

Dr Masami Takeuchi, FAO Food Safety Officer, presented the background of the consultation, emphasizing that FAO's mandate is to support Members in their efforts to ensure food security, which should satisfy the three key elements of sufficiency, safety and nutrition. Accordingly, food safety is one of the core works of FAO, and she reminded participants that if food is not safe, then it is not food.

A Codex Alimentarius guideline, adopted in 2017 and entitled "Principles and guidelines for monitoring the performance of national food control systems" ([CAC/GL 91-2017](#)), recommends that Members establish food safety indicators for each desired outcome for the effective national food control system. The guideline states that those indicators should fulfil the criteria to be: 1) unambiguous, 2) easy to interpret and monitor, 3) transparent, 4) closely linked to the outcomes, 5) meaningful from an organizational perspective, 6) amenable to independent validation and/or verification, and 7) obtainable given the available resources. From the public health perspective, the World Health Organization (WHO) also recommends a set of indicators to monitor the progress on implementing the International Health Regulations (IHR), and published (in 2016) a framework document entitled "IHR (2005) Monitoring and evaluation framework: Joint external evaluation tool (JEE tool)¹", which includes a few specific indicators for food safety.

As the Codex guideline suggests, it is ideal for the national competent authority to develop its own indicators in order to capture country-specific capacities and situations; countries, however, have expressed the various technical and capacity challenges they face when they initiate the process of developing useful national food safety indicators. There have been several requests from Members in the region for FAO to provide a set of actionable regional food safety indicators as a guide for food safety competent authorities to establish their own national food safety indicators. Dr Takeuchi explained that the regional consultation has been planned to respond to this specific request by Members.

4. A Belgian case: food safety barometers

Dr Wendie Claeys from the Belgian Federal Agency for the Safety of the Food Chain (FASFC) presented the "food safety barometer," a tool that is based on food safety indicators, as a concrete example of developing and using national food safety indicators that participants can adapt to their own governmental environment and situation. FASFC has developed the food safety barometer at the request of various national stakeholders of the food chain to measure the impact of their joint efforts to align with national and European food safety legislations and regulations. She presented the case in three sections: 1) triggers for developing the food safety barometer; 2) approach and methodology followed for developing the food safety barometer, including the selection of food safety indicators; and 3) (potential) uses of the food safety barometer and indicators, and lessons learned.

In order for participants to understand the triggers that led to the development of the food safety barometer, Dr Claeys explained the context and the organizational structure of the national food control system in Belgium, emphasizing the importance of clarifying the roles and responsibilities of all who are involved. As a member of the European Union, Belgium follows the principles and

¹ available at http://www.who.int/ihr/publications/WHO_HSE_GCR_2016_2/

requirements concerning food chain safety laid down in the European legislative framework. Compliance of food and feed business operators to the relevant regulations are verified by the official controls carried out by the national competent authorities. In Belgium, the main competent authorities in the areas of food and feed safety, animal health and plant health are the FASFC and the Federal Public Service for Health, Safety of the Food Chain and Environment (FPS–HSFCE). The FPS–HSFCE is responsible for the preparation of policy, relevant legislation and standards, and comes under the Ministry of Health. The FASFC verifies – through inspections, samplings and analyses – whether the legislation and standards in place are respected by all actors within the food chain. The FASFC is responsible for the preparation of process standards, and provides advice on risks and prevention of problems within the food chain. Three consultative bodies work with the FASFC: 1) the Audit Committee, which monitors the functioning of internal (audit) activities; 2) the Advisory Committee in which all stakeholders of the food chain are represented, including representatives of other public administrations and from various sector and consumer organizations; and 3) the Scientific Committee, composed of independent experts with complementary scientific expertise in different fields, advising the FASFC on risk assessment-related issues.

In the late 1990s and early 2000s, major changes regarding the management of the food chain took place at both the European Union and national level. These changes required great efforts from all stakeholders, the food industry, as well as the government. Accordingly, the FASFC Advisory Committee raised the question of measuring the impact of the food safety intervention. The need to measure and monitor the status of, and trends related to, the safety of the food chain was also one of the objectives of the agency’s business plan of 2009–2011. It is in this context that the “barometers for the safety of the food chain” were developed. These barometers include three measures: food safety, plant health (phytosanitary) and animal health. For all three barometers, a similar methodology has been followed.²

The barometers were developed by the FASFC Scientific Committee through an exchange with and feedback from risk managers, partners and stakeholders. The “Pressure–State–Response” model³ was applied as a starting point. In this model, “pressure” refers to economic, political and societal factors and forces that have an impact on and might change the “state” of food chain safety, and “response” refers to preventive and corrective measures that are taken by the stakeholders to address the “pressure”. Through a search of the literature, reports, available results and a number of working group sessions, indicators were selected that form the basis of the three barometers. As such, the food safety barometer is based on a set of 30 food safety indicators that provide information on the overall food safety situation in the farm-to-plate spectrum. Results obtained for a number of food safety indicators were shown to illustrate some of the possibilities and limitations related to food safety indicators.

Dr Claeys explained that the FASFC uses the food safety barometer as a communication tool to present to both consumers and industry a general overview of the current status of the food safety situation within a country, and provides consistent and systematic structures to collect data and information. The food safety barometer is not a tool to assess the functioning or performance of the FASFC. Although food safety indicators can serve different purposes, Dr Claeys recommended defining the specific uses or the intended objectives before developing national food safety indicators. Like the Belgian barometers, food safety indicators can be used to communicate about the achievement of objectives and/or to monitor trends and patterns for the continuous improvement in the effectiveness of an official control system or of efforts made by stakeholders. Additionally, indicators can be used

² <http://www.favy.be/scientificcommittee/barometer/>

³ Environmental Indicators Towards Sustainable Development, OECD, 2001
<http://www.oecd.org/site/worldforum/33703867.pdf>

to clearly identify areas for improvement and to understand what data and information need to be collected.

As to the development process, Dr Claeys shared some of the lessons learned. In summary: 1) do not aim at perfection from the beginning because the developed set of indicators can be revisited, reworded and restructured while they are used; 2) start with a small set of national food safety indicators that are feasible to measure, and ensure flexibility to allow for the expansion of indicators over time as the country progresses with capacity; and 3) set up a concrete set of criteria, such as the SMART⁴ criterial, for the selection of national food safety indicators because it helps with the selection of relevant indicators that are most closely linked to the intended objectives.

Discussions

An intensive and productive discussion session was held after the presentation by Dr Claeys. Below is the list of questions and answers that were exchanged.

Q: Regarding the committees advising the FASFC, how can transparency be assured?

A: Committees are independent from the FASFC and they bridge the FASFC and stakeholders with good communication mechanisms. In order to avoid influences from any group of stakeholders, committee members must declare any conflict of interest to ensure independence and neutrality.

Q: The Ministry of Health and the Ministry of Agriculture are the main authorities for food safety in Belgium. How is the coordination between the two ministries managed?

A: The roles and responsibilities of each relevant agency and ministry are clearly defined. There is regular and structural consultation between the various parties.

Q: Should the drivers to set up national food safety indicators come from external stakeholders, or should the food safety competent authority proactively take the lead in developing them?

A: It is always good to have a strong basis to confirm that the initiative is something everyone wants to pursue. Also, a “top-down” traditional way of imposing the use of indicators may not be fully effective as the idea of having national food safety indicators is based on the principles of “shared responsibilities.” Having said that, the proactivity of the competent authorities will be perceived quite positively, and if the initiative is conducted with full consultation of all the stakeholders, it will be equally effective.

Q: There are three barometers: food safety, animal health and plant health. How do they interact?

A: The purpose was to get a view of the safety of the entire food chain (from farm to plate). Therefore, food safety and animal and plant health, which fall under the competence of the FASFC, were considered. Given that the state of these three subareas may differ significantly and that they are not always interrelated and concern other stakeholders, it was chosen to measure their status separately by means of three different barometers. Each barometer contains an individual set of indicators that does not overlap. The food safety barometer is the core one due to the cross-cutting nature of the topic.

Q: How can food safety indicators be used in the countries where some essential capacities or systems, such as an effective foodborne disease surveillance system to track outbreaks, have yet to be developed?

⁴ SMART = specific, measurable, appropriate (or achievable), realistic (or relevant), and temporal or time-based; see Annex 3.

A: If, for example, the number of outbreaks is difficult to measure for a given country, it might be worthwhile to consider measures to be implemented to avoid outbreaks as alternative indicator(s). As such, the number of food business operators having standard operating procedures in place to ensure good hygiene practices could be a more realistic and measurable indicator. There are many ways and different angles to measure various areas of the food safety situation, depending on the current status and capacity level of a country. Indicators might be useful to plan actions for improvement.

Q: Are the indicators specific to domestic products or do they also apply to imported products?

A: Indicators might apply for both domestic and imported products (e.g. indicators related to the compliance percentage for a given contaminant of products sampled in distribution) On the other hand, for the Belgian food safety barometer it was decided not to combine the indicators related to pesticide residues in fruits and vegetables of Belgian origin, and in fruits and vegetables imported from other countries into one indicator because the distinction between domestic and imported products has an additional informative value and the possible pressures on the two indicators are different.

Q: Do the barometer results affect food safety policies?

A: The implementation of indicators can be useful for some countries to clearly identify gaps in the system or to identify the efficiency of incentives taken, thus guiding and supporting policies.

Q: Can the barometer help determine which pressure factors stakeholders are facing?

A: The barometer itself does not include the pressures perceived by stakeholders, but is a representation of the food safety state, which is influenced by economic, political and societal factors that place pressure on the food chain. In other words, the food chain and the safety of that chain (i.e. the “state”) is dynamic, with changing pressures and responses (cf. action–reaction). In order to identify the perceived pressures (as well as the responses made), a survey was performed in 2010 among food policy-makers and various stakeholders.⁵ This inquiry showed that pressures that act on the food chain are, in particular, of economic (financial crisis or limitation of resources, price of raw materials), political (complexity of legislation) and social (media and perception of food safety) natures. International trade and globalization of the supply chain did not show up as a high-ranked pressure, neither did technological development. The pressure perceived by stakeholders differs according to the type of stakeholder but was in the survey dominated by the economic and financial climate of that period. Ideally, the survey should be repeated on a regular basis to monitor timeliness and effect of prior (socioeconomic) events on pressures perceived by the stakeholders.

Q: To what extent are the self-checking systems validated? How does FASFC check the implementation and effectiveness of the self-checking systems?

A: Guidance documents on self-checking systems are made available to assist food business operators to establish their own systems. Up until now, the FASFC has approved 34 guides covering 99% of all food business operators in the country. Self-checking is one of the cornerstones of the FASFC's policy, and is mandatory. However, not only the FASFC, but also European regulations insist on operators' accountability in the food chain. The FASFC has provided operators with the possibility to have their self-checking systems validated by an accredited independent certification body. The guides are used by some certification bodies as an audit referential. Validation of the self-checking system is voluntary, but operators are encouraged to have their self-checking system validated. Validation entitles operators to an important discount on their annual contribution and a reduced inspection frequency. It has been shown that the development of a well-functioning self-checking system generally translates into a better performance with respect to food safety, and inspection results appear to be

⁵ http://www.favv-afsc.fgov.be/scientificcommittee/publications/articles/_documents/Baert_2012_-_Measuring_pressure_and_response.pdf

better when an operator has his or her self-checking system validated. As such, this illustrates the effectiveness of a “bottom-up” approach compared with the traditional top-down unannounced inspections without any guidance.

5. Panel discussion on the need for and importance of food safety indicators

A panel discussion on the need for, and importance of, food safety indicators was moderated by Dr Takeuchi, with the following panel members: Ms Kate Astridge, Senior Food Safety Coordinator, Food Standards Australia New Zealand (FSANZ), Australia; Dr Hishamuddin Badaruddin, Deputy Director, Integrated Operations, Ministry of Health, Singapore; Dr Sayan Ruadrew, Professional Food and Drug Technical Officer, Ministry of Public Health, Thailand; and Mr Vincent Melvin Scotty, Food Inspector, Ministry of Health, Nauru.

At the beginning of the panel discussions, Dr Takeuchi asked Ms Astridge to present the FSANZ initiative called “food safety culture”, which aims to promote the culture in a business where everyone (owners, managers, employees) thinks and acts in their daily job to ensure that the food they make or serve is safe. Ms Astridge explained that it is about having pride in producing safe food every time, and recognizing that a good quality product must be safe. She explained that it is simply not possible, nor cost-effective, for the competent authorities to check every single food item at every food business to ensure strict compliance with every single relevant food regulation. In a successful food safety culture, the role of the competent authority is not policing food business operators, but rather providing advice and assistance that benefits food business operators to ensure the safety of their food products. FSANZ provides a toolkit for food business operators to set up a food safety culture through three steps: “know”, “do” and “follow through”.⁶

Following Ms Astridge’s presentation, panel members were asked for their perspectives. All agreed that food safety indicators are needed, and that it is important for countries in Asia and the Pacific to achieve food safety with the food safety culture principles. Establishing a set of regional food safety indicators would help countries to work together “as one united region” towards better food safety management. Setting up national food safety indicators and using the set of regional food safety indicators as a guide would be useful for countries, which can then select and tailor the specific indicators and feasible measuring methods to their individual country capacities and contexts.

A panel member stated that the saying, “what gets measured, gets done” is true. Food safety indicators would do exactly that, and they would reveal which datasets are essential for the necessary measurements. If no data collection is done in a country when one important indicator requires such data, having this particular indicator is already a significant help in identifying minimum priorities to set up relevant data collection mechanisms. Data collection mechanisms do not have to be highly sophisticated, and often simple data collection methods will suffice. However, it should be noted that some forms of datasets exist in almost all countries, including developing countries. What is really missing are the systematic data compilation and sharing mechanisms within a country. In order to use national food safety indicators to obtain their maximum potential, data compilation and sharing among partner agencies are key components.

Setting a potentially “wrong” indicator can be avoided by reflecting the actual situation within a country when developing the indicators. Such realities may include, but are not limited to, the non-availability of an effective system to measure against the particular indicator, and the lack of financial or human resources in collecting all the required data to address the particular indicator. For example,

⁶ More information about the food safety culture initiative by FSANZ can be found at <http://www.foodstandards.gov.au/foodsafety/culture/Pages/default.aspx>.

if a particular country does not have a comprehensive health surveillance system that covers all foodborne pathogens, an indicator to assess the number of cases against all foodborne pathogens would not reflect the actual situation within that country. It is also important to consider what can be measured. For example, if a surveillance system for *Salmonella* is functional, an indicator related to the number of human Salmonellosis cases can be considered to measure the health impact of a food safety issue. In the analysis, a note could then be added to point out that the indicator does not reflect the situation on all foodborne pathogens, but that it provides an indication of the elaboration of effective surveillance systems on foodborne pathogens; thus, it can be recognized as an area for improvement.

6. FAO technical working paper and the results of the pre-meeting questionnaire

Dr Takeuchi delivered a presentation on an FAO technical working paper entitled, “Measuring food safety: food safety indicators for Asia and the Pacific”, and explained that the process of defining food safety indicators is not straightforward because the universally common under-reporting issue of food safety incidents makes it almost impossible to reflect the actual situation. Because of this, a simple counting of the available amount of food in a given country, or a simple counting of foodborne disease cases and deaths would never reflect the real health and/or economic impact. Both health and economic impacts of food safety incidents are much greater than what people typically think. Dr Takeuchi remarked on the significant economic impact in Ireland, where in excess of USD 1 billion was lost in the dioxin contaminated pork crisis in 2008. In the United States of America in 2008, more than 3 900 products were recalled and destroyed in a *Salmonella* contaminated case involving peanuts. In the latter case, the health impact was also significant as nine deaths and 22 500 illnesses were reported in the United States alone. All of these were reported because those two countries were able to detect, identify and analyze the cases. This implies that many similar food safety incidents and emergencies must have been occurring in many other places and countries, possibly not detected or reported at all, due to capacity and resource limitations. Dr Takeuchi introduced the publication entitled, “WHO estimates of the global burden of foodborne diseases”,⁷ which is the result of many years of efforts made by various international experts and organizations to estimate the entire “iceberg” picture of food safety impact on health, rather than just the tip of it. The study estimated that every year, foodborne diseases cause 600 million cases (i.e. 1 in 10 people to fall ill), 420 000 deaths, and 33 million healthy life years lost. It reported that both health and economic impacts of food safety are enormous, and currently not well-captured or understood by the majority of the people in a way that reflects the reality.

Dr Takeuchi explained that the purpose of developing the FAO technical working paper was to identify existing food safety indicators based on various literature reviews so that countries will be able to use the paper as a basis to further discuss the potential effectiveness of having regional and national food safety indicators. The paper provides four essential elements for food safety experts from the region to considering when determining: 1) whether or not a set of regional food safety indicators is useful; 2) what types of regional and national food safety indicators can be useful; 3) what criteria can be used in selecting regional and national food safety indicators; and 4) how regional food safety indicators can be used. The paper does not provide any direction nor opinions, and all information in the paper is based on the evidence and statements found in the existing literature. A rapid scoping review has been conducted to compile all of the identified food safety indicators in the literature. No selection or de-selection process has been applied to the list, as it is primarily for the regional consultation participants to review and discuss. The list of indicators were organized into five categories: 1) system-level indicators, 2) capacity-level indicators, 3) sector-specific indicators, 4)

⁷ 2015, available at http://www.who.int/foodsafety/areas_work/foodborne-diseases/ferg/

specific food safety topic-based indicators, and 5) indicators on surrounding factors. The technical working paper is attached as Annex 3.

Ms Gokce Akbalik, FAO junior food safety consultant, reported on the results of the pre-consultation questionnaire, which was provided with the technical working paper to all participants prior to the consultation, and stated that all respondents answered that having regional and national food safety indicators would be relevant and useful in their country contexts. A quick overview of the popularity rankings of the individual indicators in five categories was shared. Ms Akbalik said that the rankings could be taken into consideration as a reference, but not as a definite direction. On the question regarding the criteria to evaluate indicators, almost all respondents agreed to follow the suggested SMART-based approach. As to the possible use of regional food safety indicators, all respondents agreed on using the set of regional food safety indicators, which are developed through a collective approach, as a technical guide to develop their own national food safety indicators. This confirmed the appropriateness of the process that the regional consultation was taking, as a starting point. The questionnaire, and the short summary of the results, is attached as Annex 4 and 5, respectively.

7. Working group sessions

All of the food safety indicators identified in the technical working paper were reviewed in three working group sessions so that inputs and insights from various national and regional perspectives and experiences could be incorporated into the outputs. In smaller group discussion, participants found that there are many variations in capacity levels as well as the different national situations surrounding the topic of food safety. At the same time, while they consider all of the differences, they began seeing a way to formulate the indicators to work for most situations, and in that way, they found a significant level of similarities, particularly among developing countries. Three different sets of indicators were assigned to a total of nine working groups so that three groups worked on the same set of indicators separately.

During the first session, groups focused on eliminating non-essential indicators, using the suggested criteria described in the technical working paper. One group set its original principles to read: “five principles for de-selection of the existing indicators”, and used the following five questions: 1) Is it directly relevant to food safety? 2) Is it an important component in a food control system? 3) Is it a duplication with other indicators? 4) Will it easily cause misunderstanding or different interpretations? 5) Is it a yes or no indicator? Or is it a tangible or quantifiable indicator? The group further set three determination formulas: 1) If the answers to questions 1, 2 and 5 are yes, the indicator should remain for further review; 2) If the answer to question 3 is yes, the duplicated indicators should be combined and rephrased; and 3) If the answer to question 4 is yes, the indicator should be further clarified. In this way it was clear to the group to de-select the ones that do not apply to any of them. Although this group’s method seemed to be the most structured, other groups were also able to successfully reach an agreement and completed the initial process.

The second working group session focused on the practicality of measuring the remaining food safety indicators, which triggered participants to share their practices and experiences at the national level. Some indicators imply the need to set prerequisite activities. For example, if the level of the general public’s trust towards food safety competent authorities would be selected as one of the good indicators, then an essential prerequisite action would be to have regular feedback from the general public. Some countries already have a mechanism, such as an annual survey or an online public commenting or polling system, to obtain perspectives from the general public, thus they share the mechanism as a good practice. A need for collecting and compiling data, as well as sharing and making them available for analysis, was a major topic during the session. For example, many participants initially thought a crisp and quantity-based indicator such as “the number of foodborne disease

outbreaks” would make a good indicator, but many of them reconsidered the “lack of compiled data” situation within their countries and rephrased the indicator to be “the number of foodborne disease outbreaks reported”, so that it can be compared with the WHO estimates to reflect the actual situation. Participants concluded that in this way, if the comparison reveals a significant gap, the indicator can lead the competent authorities to different sets of suggestions such as “improving the reporting or surveillance system”, “improving the data-sharing mechanisms”, or “improving the collaboration with the data-owner of the reporting”. If the gap is small, then the actual number of reported outbreaks itself can be one of the good indicators to show the food safety status in the country, and the effort in reducing the number will be the way forward.

In the final session, working groups developed the final list of indicators, with the required data to measure, and the sources of such data (i.e. where from, who obtained the data). The exercise got the participants to once again confirm that a set of regional indicators would be useful as a guide for competent authorities to tailor them to national food safety indicators. When discussing the possible units and options for measuring each indicator – such as yes or no, quantitative units, percentages and qualitative 1–5 scales – participants realized that this is where country differences could vary, mainly due to the different ways and modes of data collection. This resulted in a rather positive discussion, and participants realized that the same indicator could be used in the context of different desired outcomes and different country situations, as long as they know how they can measure it, using appropriate units or options. They also confirmed once more that setting the desired outcomes before setting up indicators is very important for this particular reason. All groups shared the discussion results in the plenary after each session.

8. Panel discussion on the effective use of the regional and national food safety indicators

The second panel discussion on the effective use of the regional and national food safety indicators was moderated by Dr Takeuchi, with the following panel members: Ms Gyem Bidha, Senior Food Safety Officer, Bhutan Agriculture and Food Regulatory Authority, Bhutan; Dr Sushil Kumar Saxena, Director, Export Inspection Council, Ministry of Commerce and Industry, India; Dr Paul Chiew, Group Director, Laboratories Group, Agri-Food and Veterinary Authority, Singapore; Ms Kate Astridge and Dr Wendie Claeys.

Dr Takeuchi remarked that the first panel discussion confirmed that having a set of regional food safety indicators as a guide for national competent authorities would be useful, and asked panel members about the potential use and effectiveness of setting a set of national food safety indicators, in addition to the already agreed use in identifying priority areas for improvement. Panel members referred to the Belgian case and stated that using the results of the analysis of national food safety indicators – summarized in a concise information sheet – would be a good idea because policy-makers are not necessarily knowledgeable about the actual national food safety situations in their countries. Thus, the results from the analysis can be used to help and/or convince policy-makers to appropriately allocate resources to the necessary actions. Also, translating the results into some attractive infographics could be an effective way to communicate with the general public to raise awareness food safety issues.

A panellist stated that in his country, it would be effective if national food safety indicators were used in four different ways: 1) as a measuring tool to review the current status of food safety in the country; 2) to identify the successful areas and areas needing intervention and/or improvement; 3) to allocate resources so that actions can be taken to improve areas that have been identified as requiring an intervention; and 4) to evaluate the impact of such interventions.

Two panellists suggested that if countries in the region set up national food safety indicators guided by the regional set, the methodology would automatically be harmonized, and this would help build strong collaboration within the region, resulting in a positive impact on the regional and international trade. The analysis, which is based on some of the common national food safety indicators, can be shared among countries to find a joint strategy to achieve the goal together to make food in the region safe. This will contribute to building a positive reputation of the region's food; thus, all countries in the region would benefit from the initiative. However, all panel members agreed that a simple comparison among countries using the indicators should be avoided ("sharing and not comparing"). While there may be many similarities among countries, measurement methods, units, options and specific objective of each indicator would vary significantly among countries, leading to a biased comparison that would not provide any meaningful results, or results that could be misleading. There will be a risk, if such a comparison is conducted, to trigger a politically sensitive trade issue among the compared countries.

All panel members agreed that following the idea of a "food safety culture", as presented in the first panel discussion, would be the best approach to use in managing food safety in globalized and complex food trade situations. Both working group discussions and plenary discussions made the idea to promote a food safety culture more important because the desired results through developing national food safety indicators are not achievable by the competent authorities alone. Proactive thinking in safeguarding the region's food supplies would require input and active participation from all stakeholders, and a food safety culture would be a constant reminder that food safety is a shared responsibility.

9. Summary and the way forward

Dr Takeuchi summarized the key points discussed during the consultation and introduced the proposed set of regional food safety indicators, to be used as a guide, so that countries in the region can tailor them to develop their own food safety indicators. Although significant variations in measuring methods were observed, the technical content of the proposed indicators from all the working groups were almost identical. The proposed set of indicators needs further work, including working on appropriate wording and overall structure, but the fact that all regional food safety experts in different working groups came to the same conclusion is solid proof that the proposed set of indicators is relevant and valid for the region. She reminded participants that the current set is not the final set, and should not be used directly because at the national level it is important to define desired outcomes first. Measuring is a complex activity and may require multiple factors to be considered. She also urged that collaboration with a number of governmental partners and stakeholders will be required to develop and use the indicators. The current version of the proposed list of regional food safety indicators is attached as Annex 6.

Now that the expert opinion elicitation process has been done in the format of the regional consultation, the next four steps are to: 1) consolidate the proposed regional food safety indicators into draft a guide for national competent authorities; 2) conduct a series of pilot projects to develop national food safety indicators, possibly together with FAO's partner agencies; 3) conduct a final review of the proposed regional food safety indicators; and 4) publish the guide with the refined set of proposed regional indicators. Some countries – such as Bhutan, Indonesia, the Republic of Korea, the Philippines and Sri Lanka – expressed their preliminary interest in participating in the pilot project. Dr Takeuchi concluded her talk by stating that a call for interest will be circulated by FAO for this potential project in 2018.

10. Closing session

In the closing session, Dr Chiew expressed AVA's sincere appreciation to all participants, including FAO, speakers and observers, for providing their valuable views and insights during the consultation. He proposed that everyone continue to work together to develop a set of regional food safety indicators so that the region can achieve the food safety goal together.

Dr Dharmapuri joined Dr Chiew in his remarks and added his thanks to AVA for its remarkable collaboration in co-hosting the consultation. Singapore joined FAO in 2013, and since then has been a close partner to FAO in efforts to improve food security, nutrition and food safety within a One Health approach. He referred to Dr Takeuchi's presentation on the results of the working groups and the way forward, and remarked that different working groups achieving a nearly identical set of regional food safety indicators shows that countries have similar food safety issues. He also strongly supported the idea for FAO to closely collaborate with all interested international organizations as well as relevant countries for the pilot project.

The closing session was followed by the distribution of certificates to the participants who attended more than 75% of the meeting. All participants received the consultation materials, including all the presentation files, working group results, pre-meeting questionnaire results compilation, references and photos.

11. Evaluation results

The results of the post-meeting questionnaire (response rate = 83%) showed that 95% of participants found the subject useful and relevant for their needs. Future recommendations included:

- developing a case study from a developing country;
- developing a case study to show the direct impact of the indicators on food safety control systems;
- categorizing the indicators as either process, outcome or output indicators;
- establishing an electronic technical working group to further discuss the topic;
- planning for annual/biannual meetings to monitor progress;
- organizing a subregional meeting for Pacific Island countries; and
- developing a technical tool for food safety indicators with useful criteria and parameters.

Annex 1: Consultation agenda

Wednesday 6 December 2017

#	Time	Item
	08.00 – 09.00	Registration
	09.00 – 10.00	Opening session Opening remarks by Dr Sridhar Dharmapuri, Senior Food Safety and Nutrition Officer, Food and Agriculture Organization of the United Nations (FAO) Welcome remarks by Dr Paul Chiew, Group Director, Agri-Food & Veterinary Authority of Singapore (AVA) Presentation 1: Keynote speech by Mr Lim Kok Thai, Chief Executive Officer, AVA
	10.00 – 10.30	Coffee/tea networking break
	10.30 – 10.45	Presentation 2: Background and objective of the meeting by Dr Masami Takeuchi, Food Safety Officer, FAO
	10.45 – 12.00	Plenary session 1 Presentation 3: Food safety indicators – barometers for the safety of the food chain by Dr Wendie Claeys, Staff direction for risk assessment, Belgian Food Safety Agency (FASFC) General discussion 1
	12.00 – 13.00	Lunch
	13.00 – 14.00	Plenary session 2 Panel discussion 1: Needs and importance of having food safety indicators at national and/or regional level General discussion 2
	14.00 – 15.00	Plenary session 3 Presentation 4: Introduction to the working paper - identified existing food safety indicators and suggested set of criteria in reviewing the indicators by Dr Takeuchi Report on the results from the pre-meeting questionnaire by Ms Gokce Akbalik General discussion 3 Presentation 5: Instructions for working group sessions
	15.00 – 15.30	Coffee/tea networking break
	15.30 – 17.00	Working group session 1 Nomination of the chair and a rapporteur Review of the identified indicators De-selection of non-essential indicators
	19.00	Welcome dinner hosted by AVA

Thursday 7 December 2017

#	Time	Item
	09.00 – 10.00	Plenary session 4 Oral Presentations: Progress report by Group 1, 2 and 3 (10 min each) General discussion 4
	10.00 – 10.30	Coffee/tea networking break
	10.30 – 12.00	Working group session 2 Review of the identified indicators Selection of essential indicators Selection of “feasible” indicators

		Addition of missing but essential and feasible indicators
	12.00 – 13.00	Lunch
	13.00 – 15.00	Working group session 3 Selection of final set of indicators that are essential and feasible Preparation for the group presentation
	15.00 – 15.30	Coffee/tea networking break
	15.30 – 17.00	Plenary session 5 Presentations 6, 7 and 8: Suggested set of food safety indicators for Asia and the Pacific General discussion 5

Friday 8 December 2017

#	Time	Item
	09.00 – 10.00	Plenary session 6 Panel discussion 2: Effective use of food safety indicators
	10.00 – 10.30	Coffee/tea networking break
	10.30 – 11.30	Plenary session 7 Presentation 9: Summary of the Regional consultation and the way forward by Dr Masami Takeuchi, FAO General discussion 6
	11.30 – 12.00	Closing session Closing remarks by Dr Paul Chiew, Group Director, AVA Provision of the Certificates by Dr Sridhar Dharmapuri, FAO Announcement on the field trip (AVA)
	12.00 – 13.00	Lunch
	13.30 – 17.00	Field Trip hosted by AVA Visit to Veterinary Public Health Centre

Annex 2: List of participants

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Introduction to the working paper

The potential effectiveness of developing a set of regional food safety indicators with the overall goal of strengthening national food control systems has been one of the key topics at various regional food safety meetings such as the Codex Regional Coordinating Committee meetings held in the Asia-Pacific region. In order to respond to queries from the Members in Asia and the Pacific, the Food and Agriculture Organization of the United Nations (FAO) Regional Office for Asia and the Pacific has initiated the first step, which is to develop a technical paper that identifies existing food safety indicators and relevant key issues in order for Members to further discuss the potential effectiveness of having regional indicators. The present working paper consists of four major chapters: 1) the need for and importance of food safety indicators; 2) the list of food safety indicators identified in various literatures; 3) criteria that can be useful in selecting food safety indicators for the region; and 4) the use and applications of food safety indicators.

Aim and scope of the working paper

The present working paper provides essential elements for food safety experts from Members in the region, to help them consider and determine: 1) whether or not having a set of regional food safety indicators is useful; 2) what types of food safety indicators can be useful; 3) what criteria can be used in selecting food safety indicators; and 4) how food safety indicators can be used. The paper does not provide any directions nor opinions, and all information in the paper is based on evidence and statements found in the existing literature. For each of the abovementioned four components, a rapid scoping literature review has been conducted to collect information. Among them, the literature review process and results of the main output on identifying the list of indicators has been explained in Chapter 5 in order for readers to understand what methodology has been applied throughout (see the methodology section in Chapter 5). As to the list of existing food safety indicators (Chapter 2), no selection or de-selection process has been applied. The list is a simple compilation of the identified existing food safety indicators found during the literature review. Therefore, the list is to be reviewed during the Regional Consultation against the set of criteria that regional experts would agree with, and to be finalized with possible amendments.

Chapter 1. The need and the importance of developing food safety indicators

Prior to discussing any specific food safety indicators, a key question needs to be answered first: Do we need food safety indicators? Various food safety-related government officials, particularly from developing countries, have expressed that there is a strong need to establish food safety indicators because the first and immediate concern for them is not to be able to know where they stand in order to improve their national food control systems. In addition, they often state that if there are no food safety indicators, there will be no systematic mechanism to monitor the progress on improving national food control systems. Thus, having no food safety indicators means that it is not possible to work on priority areas that have significant gaps, but also to properly allocate both financial and human resources to manage and mitigate food safety risks.

For example, during a round table discussion on Food Safety Risks Management meeting in Viet Nam, experts from the Fruit and Vegetable Research Institute stated, “the need to assess the current status of food safety in the production of fruits and vegetables will contribute to identify the cause and limitations, thereby propose solutions for the development in vegetables and fruits production, for ensuring food safety and public health and the healthy farming environment” (World Bank, 2016). Also, a paper on food safety challenges in Southeast Asia (Othman, 2007:90) stated that:

From a national perspective, it is imperative that governments initiate the conduct of a needs assessment for food safety capacity-building which can be implemented at the systems,

organizational, and individual levels. Generally, the assessment process requires the following steps: (a) review and analyze the current capacity or situation; (b) define the desired future of the food safety systems; (c) identify gaps in abilities or areas for improvement; (d) prioritize those needs; (e) identify options to address the needs, including assistance from external support; and finally, (f) undertake monitoring and evaluation.

A paper from Belgium (Jacxsens *et al.*, 2010) explained the need and usefulness in measuring food safety in the agri-food chain without performing actual microbiological analyses but using effective indicators. The authors stated that “information of the food safety performance in the agri-food chain is desired by food business operators, government/food safety authorities and/or sector organizations in the frame of the evaluation of implemented interventions to improve the (microbiological) food safety output.” The authors concluded that through these food safety performance indicators, food safety problems can be detected systematically (Jacxsens *et al.*, 2010). On the same initiative, another paper reported that the food chain stakeholders advisory committee of the Belgian Federal Agency of the Safety of the Food Chain (FASFC) requested to measure the impact of current food safety policy to determine the effect of efforts made under new laws and regulations from the European Commission. FASFC recognized the need to identify a set of indicators to measure and follow-up on food safety within the food chain with the impetus received from the committee (Baert *et al.*, 2011). Also, the Nordic Council of Ministers published a report that listed a strategy and 10 goals to achieve sustainable development of food safety in 10 Nordic countries where several indicators were selected for the initiatives that target each goal (Fabech *et al.*, 2004). The report highlighted the importance of having indicators, and stated that “(a set of) indicator(s) will be an excellent tool to assess the efficacy of initiatives started to achieve a goal.”

At the global level, the 2017 Global Food Policy Report by International Food Policy Research Institute (IFPRI) emphasized the strong need to define datasets, indicators and indexes to develop and share global public goods, and stated that “decision makers and policy analysts need solid evidence and timely information to develop and implement effective food policies”, and that measuring national capacity for food policy research is important for identifying capacity gaps in food policy research and guiding allocation of resources to fill those gaps (IFPRI, 2017). FAO also conducted a study on food safety indicators for evaluating the impact of the capacity development activities, and concluded that a set of indicators is useful in achieving an effective routine monitoring, and is a cost-effective tool to improve communication and alignment of expectations in project management (FAO, 2007a).

While no literature was found on any negative impacts of having systematic food safety indicators, another key question remains: Do we need a set of food safety indicators for the region? A few initiatives already exist to take a regional approach in providing indicators as guidance. For example, a recommendation of the Regional Committee for the Eastern Mediterranean Region of the World Health Organization (WHO) to their Members is to “identify and evaluate (their) current food safety infrastructures and problems at the national level” (DeWaal and Robert, 2005). Given that a set of regional food safety indicators will not have any legally binding powers, the use of such regional indicators as a part of the technical guidance for national competent authorities would be the pragmatic and effective way and the need expressed by the Members would be properly addressed.

Chapter 2. Existing food safety indicators

In total, 139 existing food safety indicators were identified through an in-depth literature review and analysis (Chapter 5, p.32). Compiling these into one list has been a challenge as some are quite broad and some are extremely specific. However, in looking at the aim of each indicator, it was found that they can be put into five categories: i) system-level indicators (25); ii) capacity-level indicators (59); iii) sector-specific indicators (15); iv) specific food safety topic-based indicators (34); and v) indicators on surrounding factors (6). Thus all identified indicators are presented below in five categories. It should

be noted that each indicator is listed in a raw format without any modifications; thus, some overlap each other and may not be expressed in a consistent manner.

A. System-level indicators

1. Presence of an agency to ensure the safety and health of food
2. Clear government commitment to protect consumers' health and interests, and ensure fair practices in food trade
3. An integrated food chain approach, transparency and the participation of all concerned stakeholders from farm to plate
4. Encompassment of a number of essential elements, including:
 - a. organizations with clearly defined roles and responsibilities for food control management, and mechanisms for communication and coordination between them
 - b. an enabling policy, legal and regulatory framework for food safety
 - c. functioning food inspection and certification systems
 - d. capable diagnostic and analytical laboratories
 - e. working mechanisms for information, education and communication with stakeholders
5. Conformity with relevant policy and legal frameworks and ensures the delivery of an efficient food control programme
6. Mandatory notification with regard to food safety
7. Monitoring of self-checking throughout the food chain
8. Leaders set clear objectives concerning hygiene and food safety
9. Leaders strive for a continuous improvement of hygiene and food safety
10. Working in a hygienic and food safe way is recognized and rewarded
11. Existence of the government representatives
12. Existence of the Inspection agencies
13. Existence of the relevant NGOs international and national
14. Presence of the relevant certificate (types)
15. Existence of a Codex committee
16. Number of people work in the Codex Committee
17. Budget provided to the national Codex subcommittees
18. Existence of a well-functioning body providing advice to government on food safety and quality issues
19. Goals, objectives and activities are clearly described for all governmental bodies operating in the field of food safety and quality
20. An institute exists (either governmental or commercial) that collects data on food safety and quality issues
21. Roles and responsibilities for food safety are appropriately assigned and harmonized across different agencies, clearly defined and implemented in a consistent and coordinated way
22. New food law accepted by Parliament
23. Use of standard operating procedures for food inspection
24. Use of standard operating procedures for diagnostic analysis
25. Financial provisions secured for supporting the FSA (food safety authority)

B. Capacity-level indicators

26. National food safety emergency response capacity
27. Consistency in food recalls
28. Food traceability
29. Food policy research capacity indicators (FPRCI)
30. Risk-based inspection and audits

31. The use of risk analysis to inform and support decision-making and establish food safety control measures
32. Provision of an appropriate level of protection (expressed as a percent of the population) against food safety risks for domestic consumers
33. Ability to meet, and demonstrate compliance with, international food safety and quality requirements and obligations (i.e. Codex standards, the World Trade Organization Sanitary and Phytosanitary Measures agreement and requirements of trading partners)
34. Inspections regarding traceability within the food chain
35. Leaders are clear about the expectations concerning hygiene and food safety towards employees
36. Hygiene and food safety issues are addressed in a constructive and respectful way by the leaders
37. It is possible for the operators to communicate about hygiene and food safety with the leaders
38. Employees can discuss problems concerning hygiene and food safety with colleagues
39. Employees are actively involved by the leaders in hygiene and food safety related matters
40. Employees get sufficient time to work in a hygienic and food safe way
41. Risks related to hygiene and food safety are known
42. Risks related to hygiene and food safety are under control
43. Colleagues are alert and attentive to potential problems and risks related to hygiene and food safety
44. Leaders have a realistic picture of the potential problems and risks related to hygiene and food safety.
45. Operators have a realistic picture of the potential problems and risks related to hygiene and food safety
46. Leaders are able to motivate their employees to work in a hygienic and food safe way.
47. Leaders listen to employees, if they have remarks or comments concerning hygiene and food safety
48. Leaders clearly consider hygiene and food safety to be of great importance
49. Leaders communicate regularly with the operators about hygiene and food safety
50. Leaders communicate in a clear way with the operators about hygiene and food safety
51. My colleagues are convinced of the importance of hygiene and food safety for the organization
52. Leaders set a good example concerning hygiene and food safety
53. Leaders act quickly to correct problems/issues that affect hygiene and food safety
54. Sufficient staff is available to follow up hygiene and food safety
55. Necessary infrastructure (e.g. good work space, good equipment) is available to be able to work in a hygienic and food safe way
56. Sufficient financial resources are provided to support hygiene and food safety (e.g. lab analyses, extern consultants, extra cleaning, purchase equipment)
57. Sufficient education and training related to hygiene and food safety is given
58. Good procedures and instructions concerning hygiene and food safety are in place
59. Number of Codex documents received and made available for access
60. Number of Codex documents actively disseminated to stakeholders
61. Frequency with which government representatives attend international working groups on Codex issues
62. Frequency of interaction between national food safety advisory body and regulatory authority
63. Frequency with which data are collected on different steps of the food supply chain (production, distribution, trading, consuming) and reported back to the Food Safety
64. Guidelines exist on emergency preparedness and response, stating responsibilities parties and necessary actions
65. Provisions on a rapid alert system are made in food legislation
66. Percentage of food safety incidences in which the origin of the problem was traced down

67. Number of guidelines drafted on HACCP, GMP and GLP
68. Number of food inspectors trained on official food control
69. Number of food inspectors trained
70. Number of laboratories established and equipped
71. Number of consumers reached in food safety information activities
72. Number of workshop participants
73. Number of workshops held
74. Number of follow-up trainings
75. Number of food producers and traders working according to HACCP
76. Rejections of food exports by importing country
77. Confidence to explain the importance of food safety
78. Confidence to explain the concept of risk analysis
79. Confidence to explain the different aspects of a food law
80. Confidence to explain the concept of “farm-to-plate” approach
81. Confidence to disseminate acquired knowledge and skills
82. Percentage of inspection reports and letters in which a clear distinction is made between legal requirements and recommendations
83. Extra-European Union (EU) Food Imports (Vulnerability)
84. European Rapid Alert System for Food and Feed (RASFF) Notification (Measures)

C. Sector-specific indicators

85. Percentage of the population with access to potable water
86. Presence of a formal grocery sector
87. Self-checking systems in the supply sector for primary production
88. Self-checking systems in the primary sector
89. Self-checking systems in the transformation sector
90. Self-checking systems in the community kitchen sector
91. Inspections of infrastructure, installations and hygiene in the sectors of distribution, hotels & restaurants and community kitchens
92. Percentage of food business operators who have systems and procedures in place which allows them to identify any person from whom they have been supplied with a food, a feed, a food-producing animal, or any-substance intended to be, or expected to be, incorporated into a food or feed
93. Importance of hygiene and food safety is permanently present by means of, for example, posters, signs and/or icons related to hygiene and food safety
94. Percentage of producers that have implemented a traceability system
95. Percentage of producers that are implementing HACCP / have certification
96. Percentage of producers that have implemented GHP/GAP/GMP have certification
97. Percentage of producers that are complying to (other) project specific regulations (e.g. not using certain pesticides or specific quality schemes)
98. Outbreaks of food borne illness (Outcome)
99. Certifications of good practice (Measures)

D. Specific food safety topic-based indicators

100. Chemical risk in production: use of agricultural chemicals (pesticides)
101. Chemical risk in consumption: reporting of chemical risks through total diet studies (TDS)
102. Microbial risk: incidence of reported illness by foodborne pathogen and relevance to national food consumption or dietary intake reporting
103. Radionuclides standards
104. Allergenic risks (labelling food and indicating allergens)

105. Residues from pesticides and/or herbicides in fruit and vegetables (of Belgian origin)
106. Acrylamide
107. Lead and cadmium in fruit and vegetables
108. Aflatoxin and deoxynivalenol
109. Substances with an anabolic action, unauthorized substances and veterinary drugs for cattle and pigs
110. Sulfite in minced meat
111. Dioxins and dioxin-like PCBs in dairy products and in eggs
112. Mercury in molluscs, crustaceans and fish
113. Residues from pesticides/herbicides in fruit and vegetables originating from other EU countries and third countries
114. Forbidden colorants
115. Chemical and microbiological hazards in imported animal products intended for human consumption
116. Dioxins and dioxin-like PCBs in feed
117. Contact materials
118. *Salmonella* spp. in meat pigs
119. *Salmonella* spp. in layer hens
120. *Salmonella* spp. in poultry and pigs
121. *E. coli* in carcasses and cut meat
122. *E. coli* in foodstuffs
123. *Listeria monocytogenes* in foodstuffs
124. Foodborne outbreaks
125. Salmonellosis in humans
126. Listeriosis in humans
127. Overuse of food additives,
128. Microbial contamination
129. Poor food quality indicators
130. Pesticide residues
131. Contamination of metal elements
132. Detection of non-food substances
133. Mycotoxin contamination

E. Indicators on surrounding factors

134. Change in public trust in food safety over a five-year period
135. Agricultural science and technology indicators (ASTI)
136. Statistics of public expenditure for economic development (SPEED)
137. Global hunger index (GHI)
138. Agricultural total factor productivity (TFP)
139. International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT)

Chapter 3. Criteria for selecting effective food safety indicators

In order to properly define a set of effective regional food safety indicators, above-identified existing food safety indicators should be evaluated in the context of relevant countries and regions, therefore development of concrete criteria is an essential activity prior to selecting indicators. Below is the compilation of example sets of criteria that can be referred and modified for the use in selecting effective food safety indicators for the region.

Example A: a case from the Canada and Organisation for Economic Co-operation and Development study

As a preliminary work to the 2014 World Ranking Food Safety Performance (Le Vallée and Charlebois, 2014), the authors set the below criteria for all indicators used to measure the relevant food safety performance as follows:

1. The indicator provides valuable information concerning the performance or status of the particular food safety domain
2. The indicator can be affected by policy
3. The indicator secondary data are reliable and readily available
4. The data are sufficiently consistent to allow benchmarking over time and permit a valuable international comparative analysis
5. There is general agreement that a change in the indicator in one direction is better than a movement in the other

Example B: a case study from Belgium

FASFC of Belgium documented the list of criteria in selecting their indicators (Baert *et al.*, 2011) as follows:

1. **Measurability:** The actual goal of measurement of the state is to find out whether overall food safety (and in due time, animal health and plant health) has improved, deteriorated or remained the same over time. For this reason, quantitatively measurable indicators were selected in order to be able to follow-up evolutionary trends in time.
2. **Independence:** Indicators should be independent and should not measure the same aspect of food safety.
3. **Reliability:** Indicators must be relatively insensitive to bias.
4. **Availability:** The data used in the indicator must, at all times, be easily available in reports, documents or databases. Only results that were collected in the context of the FASFC control programme are used for product control purposes.
5. **Being a representative for food safety** (or in due time animal health or plant health): The whole set of indicators must include the various categories of food safety hazards.
6. **Being a representative for the food chain:** The whole set of indicators must be representative for the various aspects of the food chain and its stakeholders.
7. **Unambiguity of formulation:** An unambiguous relationship should exist between an increase or decrease of the indicator on the one hand, and an improvement of the overall food safety (or in due time and/or animal and plant health status) on the other hand.
8. **Durability:** The indicators have already been measured over a long period of time, and it is expected that they will be further followed up during many years to come.

Example C: a case from an FAO study

An FAO study used the generic SMART checklist for identification of relevant indicators (FAO, 2007a) as below:

1. **Specific:** The indicator should unambiguously specify what it will measure and the set of indicators should be concise.
2. **Measurable:** The indicator must be measurable by quantitative or qualitative mechanisms. Scales for judgment should be based on agreed on expectations and criteria of performance, and should be accompanied by feasible methodologies and resources for measurement. Definitions of indicators and scales should support unbiased ratings.
3. **Appropriate** (or **Achievable**): The indicator must directly relate to the project goals and objectives. It should be based on an agreed and appropriate identification of what needs to be measured or assessed, based upon a demonstrated and solid relationship with the result to be assessed. Also, the set of indicators should be complete in covering all relevant issues

4. **Realistic (or: Relevant):** The NGO must have the resources necessary, human and financial, to measure the indicator.
5. **Temporal (or: Time-based):** The indicator must be measurable within the project timeframe.

Therefore, the common and relevant questions (criteria) that can be extracted from the three examples above are the following six questions.

Key questions when evaluating the effectiveness of each indicator

1. Does the indicator provide specific (appropriate) valuable information?
2. Is the indicator measurable?
3. Does the indicator require certain appropriate evidences or datasets?
 - 3.1. Are those evidences or datasets reliable?
 - 3.2. Are those evidences or datasets readily available?
 - 3.3. Are those evidences or datasets consistent?
4. Does the indicator provide a certain direction for improvement?
5. Does the indicator provide realistic information?
6. Can the indicator be used repeatedly over time (to monitor the progress)?

Chapter 4. The use and applications of food safety indicators

As various literatures have indicated, setting food safety indicators can be useful in many ways. In fact, there are literally endless possibilities when considering applications of food safety indications and analyses produced using such indicators. For example, national food safety indicators can be specifically defined in order to assess the national capacity in managing food safety. Some regional bodies may have a good justification in systematically standardizing the process in evaluating food safety performance with pre-set indicators, thus benchmarking in the region can be possible. In fact, the Food Safety Performance World Ranking study compared 16 countries on their levels of food safety, based on 10 indicators (Charlebois and McKay, 2010). The Canadian authors explained that the comparison was made to facilitate the identification of Canada’s relative strengths and weaknesses, which can be useful for other Organisation for Economic Co-operation and Development countries. The authors stated that the goal of the study was to assist academics, practitioners and policy-makers in assessing food safety systems and processes within Canada.

IFPRI report stated that indicators derived from agricultural science and technology indicators allow the performance, inputs and outcomes of national agricultural research and development systems to be measured, monitored and benchmarked, with the ultimate goal of informing and improving decision-making. Statistics from the Public Expenditure for Economic Development database provides data that policy-makers, researchers and other stakeholders can use to examine both historical trends and the allocation of government resources across sectors. The Global Hunger Index is designed to raise awareness and understanding of regional and country differences in the struggle against hunger, and to trigger action to reduce hunger around the world. Food Policy Research Capacity Indicators Agricultural Total Factor Productivity contributes to the understanding of agricultural systems needed for policy and investment decisions by allowing for comparisons across time and across countries and regions.

In the Belgium case, the use of the food safety barometer was explained as “(mainly) a tool to communicate in an intelligible, comprehensible manner on aspects of food safety to consumers and other stakeholders in the food chain.” (Baert *et al.*, 2011). The set of 30 indicators have been used to observe trends between past years and the present, thus making it possible to have an overview of the historical evolutions of food safety situations.

An FAO report (FAO, 2007a) stated that having a standard evaluation format of the indicators would be useful to systematically inform stakeholders – including project counterparts, lead project officers, donors, recipients and general public – of project outcomes with a baseline description for follow-up projects. It can also be used as evidence for fund raising for follow-up projects and future capacity building activities. In addition, FAO’s capacity building assessment guide (FAO, 2007b) explained that the use of food safety indicators would follow:

...a systematic approach to identify and prioritize needs, and produce an action plan to strengthen the capacity of the food control system... (to) improve the ability of food safety regulatory authorities to plan, implement and monitor their activities... (and to) help to make the use of available resources more efficient and to raise additional resources for unmet needs.”

While acknowledging that food safety indicators can be useful in countless applications, it is important to focus on the concrete purpose(s) of setting and using the regional set of food safety indicators for the present initiative. This is because if the set of indicators aims at multi-purpose applications, several pitfalls might be foreseen as described below:

1. Indicators become too broad or general and the use of them becomes a time-consuming activity, and thus not sustainable.
2. Required datasets are either too big or unavailable (thus, a need arises to generate them) and becomes non-cost-effective.
3. Comprehensive “judgement” types of indicators may become a performance evaluation mechanism for other countries (i.e. trade partners) and create a politically sensitive issue between countries.
4. Broad-range indicators may require too many agencies to be involved in using the food safety indicators, and ownership becomes blurred.

Therefore, it is recommended to set only a few, focused objectives when using the food safety indicators. Suggested purposes extracted from the abovementioned literatures are as follows:

Recommended uses of analyses produced based on the regional food safety indicators

1. The set of indicators can be used as a guide to develop an overview of current national food safety situations.
2. The analysis result can be used as a communication tool with governmental partners, stakeholders, policy- (decision-) makers, donors and the general public.
3. The analysis results can be used to determine priority areas for improving capacity.
4. The overview of the analysis can be used to determine effective and proper funding allocation (to policy-makers or donors).
5. Periodic (i.e. yearly) analyses can be used as an effective tool to monitor the improvement of food safety situations at the national and/or regional level.

Next steps

The Regional Consultation on food safety indicators for Asia and the Pacific will be held in Singapore from 6 to 8 December 2017. Approximately 90 participants (food safety experts) are expected to attend the consultation to discuss various potential indicators that can effectively address the needs of Members. The Regional Consultation will be the forum to elicit expert opinions where the indicators identified in the present paper will be reviewed by the experts one-by-one. Comments and feedback received will be consolidated for the next steps forward. If the need and importance of setting regional food safety indicators has been confirmed by the Regional Consultation, the paper will be the basis to set the criteria for the selection and formulation of the indicators, and to define the ultimate purposes of setting the regional food safety indicators. The present paper will not be an official FAO publication

although the final paper with the selected set of indicators, together with the process to formulate the indicators, will be officially published by FAO in 2018.

Chapter 5. Literature review process and results on the list of indicators

1. Introduction

As the first step in identifying potential food safety indicators for Asia and the Pacific, synthesizing global evidences on existing food safety indicators, regardless of the geographic regions, as well as the documented development processes of such indicators, would be useful. The present chapter describes the methodology and the results of the literature review process.

2. Methodology

2.1. Focused literature review

In order to provide evidence-based pointers for existing food safety indicators, a focused literature review has been conducted. Focusing on all broad types of evidence concerning both direct and indirect indicators, targets were determined to be public institutions including governmental agencies and organizations, international organizations and research institutions and public universities and research institutions. The scope followed the Codex Alimentarius definition of food safety, which is: "Assurance that food will not cause harm to the consumer when it is prepared and/or is eaten according to its intended use." (CAC/RCP 1, Rev.4-2003).

2.2. Rapid scoping review

A rapid scoping review of literature was conducted to identify any existing food safety indicators developed in the past by public institutions mentioned above. A set of keywords have been developed to address this key research questions as presented in Table 1.

Table 1. Keywords for a scoping review

#	Primary keywords	Secondary keywords	Tertiary keywords
1.	food safety	indicators	
2.			evaluation
3.			measure
4.			score
5.			tool
6.		management	
7.			evaluation
8.			measure
9.			score
10.			tool
11.		performance	
12.			evaluation
13.			measure
14.			score
15.			tool
16.		status	
17.			evaluation
18.			measure
19.			score
20.			tool

21.		capacity	
22.			evaluation
23.			measure
24.			score
25.			tool
26.		evaluation	
27.		measure	
28.		score	

Four scientific sources – ScienceDirect⁸, Elsevier⁹, PubMed¹⁰ and Google Scholar¹¹ – were used to conduct the scoping review. For all databases, an advanced search option was used in order to specify keyword combinations with no language restriction. ScienceDirect and PubMed sources were searched with a “Title, Abstract, Keyword” filter. Keywords were searched as combinations of primary, secondary and tertiary words with Boolean connectors. After the search, a quick title and abstract screening process was applied to assess the relevance of the findings to the studies and only relevant validated set of indicators were extracted from the sources.

2.3. Global Internet search

As the results of the abovementioned scoping review did not find a sufficient number of food safety indicators, an additional internet review was conducted using several secondary information sources, including general Internet search engines (i.e. Google¹², Yahoo!¹³) and a social networking site for scientists and researchers (i.e. ResearchGate¹⁴) to identify any existing food safety indicators that were not published in scientific journals.

3. Results

3.1. Results from the focused literature review

From the initial literature review, while issues of global importance such as health, nutrition, food security among others have well-defined indicators that are tracked regularly by the countries as well as United Nations and its agencies, it was revealed that there are no internationally agreed indicators for food safety. However, some sets of indicators were identified or proposed. These include:

- 1) Three food safety indicators included in the Annual Global Food Security Index of the Economist Intelligence Unit (EIU, 2016):
 1. the presence of an agency to ensure the safety and health of food
 2. the percentage of the population with access to potable water
 3. the presence of a formal grocery sector

- 2) The Organisation of Economic Cooperation and Development ranks food safety performance of its Members using 10 indicators across the three components of risk analysis: risk assessment, risk management and risk communication as follows (Le Vallée and Charlebois, 2014):

Risk assessment

 1. Chemical risk in production: use of agricultural chemicals (pesticides)

⁸ <http://www.sciencedirect.com/science/search>

⁹ <http://www.elsevier.com>

¹⁰ <https://www.ncbi.nlm.nih.gov/pubmed/advanced>

¹¹ <https://scholar.google.com/>

¹² <https://www.google.com/>

¹³ <https://www.yahoo.com/>

¹⁴ <https://www.researchgate.net/>

- 2. Chemical risk in consumption: reporting of chemical risks through total diet studies
Microbial risk: incidence of reported illness by foodborne pathogen and relevance to national food consumption or dietary intake reporting
 - 3. Risk-based inspection and audits
- Risk management
- 4. National food safety emergency response capacity
 - 5. Consistency in food recalls
 - 6. Food traceability
 - 7. Radionuclides standards
- Risk communication
- 8. Allergenic risks (labelling food and indicating allergens)
 - 9. Change in public trust in food safety over a five-year period
- 3) International Food Policy Research Institute published its proposed five food policy indicators as follows (IFPRI, 2017):
- 1. Agricultural science and technology indicators
 - 2. Statistics of public expenditure for economic development
 - 3. Global Hunger Index
 - 4. Food policy research capacity indicators
 - 5. Agricultural total factor productivity
 - 6. International Model for Policy Analysis of Agricultural Commodities and Trade
- 4) FAO published its capacity building guide on “Strengthening national food control systems: a quick guide to assess capacity building needs” in 2007 (FAO, 2007b). The guide provide the following seven performance indicators for an effective national food controls systems:
- 1. Clear government commitment to protect consumers' health and interests, and ensure fair practices in food trade
 - 2. An integrated food chain approach, transparency and the participation of all concerned stakeholders from farm to plate
 - 3. The use of risk analysis to inform and support decision-making and establish food safety control measures
 - 4. Encompassment of a number of essential elements including:
 - a. organizations with clearly defined roles and responsibilities for food control management, and mechanisms for communication and coordination between them
 - b. an enabling policy, legal and regulatory framework for food safety
 - c. functioning food inspection and certification systems
 - d. capable diagnostic and analytical laboratories
 - e. working mechanisms for information, education and communication with stakeholders
 - 5. Conformity with relevant policy and legal frameworks and ensures the delivery of an efficient food control programme.
 - 6. Provision of an appropriate level of protection (expressed as a percent of the population) against food safety risks for domestic consumers
 - 7. ability to meet, and demonstrate compliance with, international food safety and quality requirements and obligations (i.e. Codex standards, the World Trade Organization Sanitary and Phytosanitary agreement and requirements of trading partners).

3.2. Results from the rapid scoping review

Table 2 shows the number of total hits according to the keyword combinations, regardless of the relevance to the context

Table 2. Number of hits on the databases

#	Primary keywords	Secondary keywords	Tertiary keywords	Science Direct	Elsevier	PubMed	Google Scholar
1.	food safety	indicators		118	246	52	83,900
2.			evaluation	13	24	35	56,200
3.			measure	5	31	27	40,600
4.			score	2	11	1	20,000
5.			tool	13	19	9	33,800
6.		management		899	727	1380	513,000
7.			evaluation	71	67	394	172,000
8.			measure	23	110	176	76,200
9.			score	10	19	31	33,100
10.			tool	87	109	155	81,200
11.		performance		584	608	493	325,000
12.			evaluation	68	82	254	175,000
13.			measure	24	50	146	72,900
14.			score	9	16	26	30,900
15.			tool	5	68	153	78,800
16.		status		245	294	526	212,000
17.			evaluation	31	31	224	114,000
18.			measure	13	40	212	68,100
19.			score	3	12	31	30,200
20.			tool	16	17	99	61,300
21.		capacity		181	217	169	160,000
22.			evaluation	18	12	90	96,900
23.			measure	1	22	53	64,600
24.			score	1	2	7	23,200
25.			tool	10	25	52	58,500
26.		evaluation		651	750	668	529,000
27.		measure		73	693	379	130,000
28.		score		162	163	50	48,800

The total hit results for the determined keyword combinations were very low on ScienceDirect, PubMed and Elsevier. Google Scholar results were significantly higher than other sources, as the search options were set as broader than the simple search in title and abstracts. The results clearly showed the following facts:

- Several studies discussed that measuring food safety at different levels of the value chain is important, however the development of specific food safety indicators has not been done or the process has not been well documented.
- A quick title and abstract screening process to assess the relevance dropped the majority of the hits recorded in Table 2 as they are not about the system-based food safety indicators but rather on the topic of indicator organisms used in microbiological risk assessment.

1) One of the most relevant findings of the scoping review was the food safety barometer system that was developed by the Belgian Federal Agency of the Safety of the Food Chain (FASFC) (Baert *et al.*, 2011, 2012). 30 food safety indicators of the barometer provide an overview of the status of food safety in Belgium in the European context, and is a tool to communicate in an intelligible, comprehensible manner on aspects of food safety to consumers and other stakeholders in the

food chain (Baert *et al.*, 2011). 30 indicators that were developed and currently used by FASFC include:

1. Mandatory notification with regard to food safety
 2. Self-checking systems in the supply sector for primary production
 3. Self-checking systems in the primary sector
 4. Self-checking systems in the transformation sector
 5. Self-checking systems in the community kitchen sector
 6. Monitoring of self-checking throughout the food chain
 7. Inspections of infrastructure, installations and hygiene in the sectors of distribution, hotels & restaurants and community kitchens
 8. Inspections regarding traceability within the food chain
 9. Residues from pesticides/herbicides in fruit and vegetables of Belgian origin
 10. Acrylamide
 11. Lead and cadmium in fruit and vegetables
 12. Aflatoxin and deoxynivalenol
 13. Substances with an anabolic action, unauthorized substances and veterinary drugs for cattle and pigs
 14. Sulfite in minced meat
 15. Dioxins and dioxin-like PCBs in dairy products and in eggs
 16. Mercury in molluscs, crustaceans and fish
 17. Residues from pesticides/herbicides in fruit and vegetables originating from other EU countries and third countries
 18. Forbidden colorants
 19. Chemical and microbiological hazards in imported animal products intended for human consumption
 20. Dioxins and dioxin-like PCBs in feed
 21. Contact materials
 22. *Salmonella* spp. in meat pigs
 23. *Salmonella* spp. in layer hens
 24. *Salmonella* spp. in poultry and pigs
 25. *E. coli* in carcasses and cut meat
 26. *E. coli* in foodstuffs
 27. *Listeria monocytogenes* in foodstuffs
 28. Foodborne outbreaks
 29. Salmonellosis in humans
 30. Listeriosis in humans
- 2) In the study “Food safety climate in food processing organizations: Development and validation of a self-assessment tool” (De Boeck *et al.*, 2015), food safety climate in food processing companies is considered as a part of the food safety management systems since the food handler error in the system may also be a cause of unsafe food incidences. With the help of the food safety climate self-assessment tool presented in the study, food companies are able to go beyond traditional food safety management and mirror the human dimension in food safety (De Boeck *et al.*, 2015). In the study, they identify and use indicators for measuring the food safety climate in food companies from the perception of the employees with 28 indicators under five components as presented below:
- a. Leadership
 1. the leaders set clear objectives concerning hygiene and food safety.
 2. the leaders are clear about the expectations concerning hygiene and food safety towards employees.

3. the leaders are able to motivate their employees to work in a hygienic and food safe way.
 4. the leaders listen to employees, if they have remarks or comments concerning hygiene and food safety.
 5. hygiene and food safety issues are addressed in a constructive and respectful way by the leaders.
 6. the leaders strive for a continuous improvement of hygiene and food safety.
- b. Communication
7. the leaders communicate regularly with the operators about hygiene and food safety.
 8. the leaders communicate in a clear way with the operators about hygiene and food safety.
 9. it is possible for the operators to communicate about hygiene and food safety with the leaders.
 10. the importance of hygiene and food safety is permanently present by means of, for example, posters, signs and/or icons related to hygiene and food safety.
 11. Employees can discuss problems concerning hygiene and food safety with colleagues.
- c. Commitment
12. the leaders clearly consider hygiene and food safety to be of great importance.
 13. my colleagues are convinced of the importance of hygiene and food safety for the organization.
 14. working in a hygienic and food safe way is recognized and rewarded.
 15. the leaders set a good example concerning hygiene and food safety.
 16. the leaders act quickly to correct problems and issues that affect hygiene and food safety.
 17. employees are actively involved by the leaders in hygiene and food safety related matters.
- d. Resources
18. employees get sufficient time to work in a hygienic and food safe way.
 19. sufficient staff is available to follow up hygiene and food safety.
 20. the necessary infrastructure (e.g. good work space, good equipment) is available to be able to work in a hygienic and food safe way.
 21. sufficient financial resources are provided to support hygiene and food safety (e.g. lab analyses, extern consultants, extra cleaning, purchase equipment).
 22. sufficient education and training related to hygiene and food safety is given.
 23. good procedures and instructions concerning hygiene and food safety are in place.
- e. Risk awareness
24. the risks related to hygiene and food safety are known.
 25. the risks related to hygiene and food safety are under control.
 26. colleagues are alert and attentive to potential problems and risks related to hygiene and food safety.
 27. the leaders have a realistic picture of the potential problems and risks related to hygiene and food safety.
 28. the operators have a realistic picture of the potential problems and risks related to hygiene and food safety.
- 3) A report from China (Liu *et al.*,2016) states that the rapid growth of China's economy enhances the demands of many consumers, and ensuring that food is safe, of high quality and genuine is particularly important for every society (Liu *et al.*, 2016). The authors continued that, "China's food industry has demonstrated a sustained growth trend since the 1980s; however, the years between 1980 and 2012 witnessed a worrisome food integrity situation", and in their study, seven key factors were identified to affect food integrity as follows:

1. overuse of food additives,
2. microbial contamination
3. poor food quality indicators
4. pesticide residues
5. contamination of metal elements
6. detection of non-food substances
7. mycotoxin contamination

As no other specific food safety indicators were found in other studies, the conclusion to the rapid scoping review confirmed that the development of food safety indicators for the government is a relatively new area to conduct academic research on, or that this is an area that is considered to be outside the purview of research.

Although slightly outside the scope of the study, one interesting article was found through the process entitled “Economics of food safety in chains: a review of general principles” (Valeeva *et al.*, 2004). The authors discuss the costs and benefits of improving food safety in the overall chain, and highlight the need for considering the economic consequences for consumers and companies. Clarification of the marginal private benefits and their distribution are missing in the literature, both at the level of the single chain participant and for the chain as a whole. Estimating such a benefit is important for determining incentives to improve food safety (Valeeva *et al.*, 2004). The paper emphasizes that food safety itself is complex and there is no single indicator to measure it.

3.3. Results from the global Internet search

A simple search in Google and ResearchGate found two possibly relevant studies. Validation of these studies was made on the basis of the credibility of the affiliated organizations.

- 1) A one-off, small FAO study on “Evaluating the Impact of Capacity Building Activities in the Field of Food Quality and Safety: Design of an Evaluation Scorecard and Indicators” was found during the Internet search. The study was conducted by a volunteer in the Food Safety and Quality Unit and the paper provides detailed and well-structured explanations on the development and selection of 44 indicators (FAO, 2007a).
 1. Existence of government representatives
 2. Existence of Inspection agencies
 3. Existence of relevant NGOs, both international and national
 4. Presence of the relevant certificate (types)
 5. Existence of a Codex committee
 6. Number of people work in the codex committee
 7. Number of Codex documents received and made available for access
 8. Number of Codex documents actively disseminated to stakeholders
 9. Frequency with which government representatives attend international working groups on Codex issues
 10. Budget provided to the national Codex subcommittees
 11. Existence of a well-functioning body providing advice to government on food safety and quality issues
 12. Frequency of interaction between national food safety advisory body and regulatory authority
 13. Goals, objectives and activities are clearly described for all governmental bodies operating in the field of food safety and quality
 14. An institute exists (either governmental or commercial) that collects data on food safety and quality issues

15. Frequency with which data is collected on different steps of the food supply chain (production, distribution, trading, consuming) and reported back to the Food Safety
 16. Guidelines exist on emergency preparedness and response, stating responsibilities parties and necessary actions
 17. Provisions on a rapid alert system are made in food legislation
 18. Percentage of food business operators who have systems and procedures in place which allows them to identify any person from whom they have been supplied with a food, a feed, a food-producing animal, or any-substance intended to be, or expected to be, incorporated into a food or feed (EC 178/2002; Article 18)
 19. Percentage of food safety incidences in which the origin of the problem was traced down
 20. Number of guidelines drafted on HACCP, GMP and GLP
 21. Number of food inspectors trained on official food control
 22. Financial provisions secured for supporting the food safety authority
 23. Roles and responsibilities for food safety are appropriately assigned and harmonized across different agencies, clearly defined and implemented in a consistent and coordinated way
 24. Number of food inspectors trained
 25. Number of laboratories established and equipped
 26. Number of consumers reached in food safety information activities
 27. Number of workshop participants
 28. Number of workshops held
 29. Number of food producers and traders working according to HACCP
 30. New food law accepted by Parliament
 31. Number of follow-up trainings
 32. Use of standard operating procedures for food inspection
 33. Use of standard operating procedures for diagnostic analysis
 34. Rejections of food exports by importing country
 35. Confidence to explain the importance of food safety
 36. Confidence to explain the concept of risk analysis
 37. Confidence to explain the different aspects of a food law
 38. Confidence to explain the concept of “farm-to-plate” approach
 39. Confidence to disseminate acquired knowledge and skills
 40. Percentage of producers that have implemented a traceability system
 41. Percentage of producers that are implementing HACCP / have certification
 42. Percentage of producers that have implemented GHP/GAP/GMP have certification
 43. Percentage of producers that are complying to (other) project specific regulations (e.g. not using certain pesticides or specific quality schemes)
 44. Percentage of inspection reports and letters in which a clear distinction is made between legal requirements and recommendations
- 2) 4 indicators are identified to measure the food safety performance of the countries in Europe in the report by the Hague Center for Strategic Studies entitled “Food Safety Performance” (HCSS):
1. Outbreaks of Food Borne Illness (Outcome)
 2. Certifications of good Practice (Measures)
 3. European Rapid Alert System for Food and Feed (RASFF) Notification (Measures)
 4. Extra-EU Food Imports (Vulnerability)

1. Conclusion

In total, 139 indicators have been extracted from the literature review process. Some are very specific and some are very broad, and some come with descriptions of how they can be measured. Overall, the result of the literature review revealed that the concept of food safety indicators has yet to be

studied and/or documented in detail. In particular, the development process of such indicators has not been well documented, apart from the Belgium case.

The Belgium case explained that it is important to use a well-prepared set of criteria to ask experts to apply them to the potential indicators (Delphi method). It would enable a systematic and interactive review of the existing indicators in a short time.

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Annex 4: Pre-meeting questionnaire

Pre-meeting questions

Regional Consultation on Food Safety Indicators for Asia and the Pacific

6–8 December 2017, Singapore

Please read the accompanying FAO Technical Working Paper entitled “Measuring food safety: food safety indicators for Asia and the Pacific” to answer below 5 questions and return the completed form (in **Word**, please do not scan) by **Thursday, 30 November 2017** by email to Ms Gokce Akbalik at Gokce.Akbalik@fao.org. Please note there are 5 questions and the whole process will not take more than 2 hours. You can make as much space as you like to put your full answers (the total page number can exceed the original).

Your name:

Your country:

I. Please read the **Preface (pages i–iv) and Chapter 1 (pages 1–2)** to answer the following 2 questions:

Q01: Considering your national context, do you think having food safety indicators would be useful for your country? Please keep your answer and delete the one that does not apply.

- Yes, if the indicators are set with full consideration of appropriateness, measurability and specific purposes, they will be useful for my country.
- No, no matter how the indicators are set, I do not think it would be useful for my country.

Q02: Please state a few concrete reasons why you chose a or b above. Please type your answer below.

II. Please read **Chapter 2 (pages 2–6) and supplemental Annex A (pages 10–17)** to answer the following question:

Q03: Please note each indicator in Chapter 2 is numbered (1–139). Please select 1–5 indicators from each category that you think essential/priority and add a short explanation each on why you think they are essential/important. Please list them in the order of your importance/priority.

A. System-level indicators

Indicator #	Indicator	Why important

B. Capacity-level indicators

Indicator #	Indicator	Why important

C. Sector-specific indicators

Indicator #	Indicator	Why important

D. Specific food safety topic-based indicators

Indicator #	Indicator	Why important

E. Indications on surrounding factors

Indicator #	Indicator	Why important

III. Please read **Chapter 3 (pages 6–7)** to answer the following question:

Q4: On page 7, there is a box with key questions when evaluation the effectiveness of each indicator. Do you agree with the set of questions (criteria) to evaluate the indicators? If yes, please state the reasons. If no, please suggest any modifications (additions, amendments, or deletions). Please type your answer and suggestions/comments below.

IV. Please **read Chapter 4 (pages 7–9)** to answer the following question:

Q5: On pages 8–9, there is a box with the recommended uses of analyses produced based on the regional food safety indicators. Do you agree with those major purposes of using the food safety indicators? If yes, please state the reasons. If no, please suggest any modifications (additions, amendments, or deletions). Please type your answer and suggestions/comments below.

Thank you very much for your valuable inputs. Please return the completed Form in **Word** by **Thursday, 30 November 2017**.

Annex 5: Summary of the pre-meeting questionnaire results

Summary of the pre-meeting questionnaire results

Responses and demographics

- Perfect response rate = 100%.
- Respondents are public sector food safety officials with more than 5 years of related experience. They are from 18 Asian countries and 6 Pacific Island countries.
- Gender ratio: 59.9% female to 40.1% male.

Q1 and Q2: Considering your national context, do you think having food safety indicators would be useful for your country? Please state a few concrete reasons.

- To the first question whether or not having food safety indicators would be useful, all respondents answered yes, confirming the importance of the topic.
- The reasons being:
 - Indicators would provide a systematic approach to have an overview of the current food safety situation
 - Reporting the progress would be less complicated and efficient
 - Helpful for appropriate budget allocation
 - Could serve as technical guidance in gap identification and capacity development
 - Effective food safety management throughout farm to plate would be possible
 - Helpful in setting targets and goals and to set national policy and guidelines
 - Useful in prioritization of programme and activities
 - Would help policy makers and other stakeholders understand the situation
 - Systematic monitoring of food safety risks would be possible
 - Indicators can be a part of the national strategic plan
 - Can serve as a tool to communicate with industries
 - Tool to monitor and evaluate national food control systems
 - By comparing the results time to time, indicators are good tool to monitor improvement
 - Ensure synergies between public agencies and private sector
 - Contributes to raise consumer awareness on the importance of food safety
- Comments on potential benefits of having regional indicators included:
 - harmonization in Asia and the Pacific for a common goal would be beneficial in identifying equivalence
 - As an importing nation, having regional indicators would contribute in building mutual trust in national food control systems of the trade partners in the region

Q3: Please note each indicator in Chapter 2 is numbered (1–139). Please select 1–5 indicators from each category that you think essential/priority and add a short explanation each on why you think they are essential/important. Please list them in the order of your importance/priority.

- As to the individual indicators, the popularity rankings were conducted, based on the number of “votes” each indicator received from respondents.
- For the system-level indicators, the popular ones are followings:
 - Indicator # 4: Encompassment of a number of essential elements including: organizations with clearly defined roles and responsibilities for food control management, and mechanisms for communication and coordination between them; an enabling policy, legal and regulatory framework for food safety; functioning food inspection and certification systems; capable diagnostic and analytical laboratories; working mechanisms for information, education and communication with

- stakeholders. – many respondents wrote that this is the comprehensive description of food regulatory system.
- Indicator # 1: Presence of an agency to ensure the safety and health of food – respondents wrote that this is a starting point of the effective national food control systems and as food safety is a cross-cutting topic, coordination is essential.
 - Indicator # 21: Food safety roles and responsibilities assigned and harmonized across different agencies, clearly defined and implemented in a consistent and coordinated way – one respondent wrote a good summary of what many other respondents have raised, which is “To run food safety programme efficiently, it needs multiple agencies which may work in different areas but all of them need to be streamlined into the same direction by clarification their roles and responsibilities. Also, clearly define role and responsibility of relevant agencies will help to eliminate gap and overlapping.”
 - Indicator # 3: An integrated food chain approach, transparency and the participation of all concerned stakeholders from farm to plate – many respondents wrote that food safety is a shared responsibility and farm to plate approach is key.
 - For the capacity-level indicators, the popular ones are followings:
 - Indicator # 33: Ability to meet, and demonstrate compliance with, international food safety and quality requirements and obligations – many wrote that international standards compliance is fundamental to food safety control system nationally and globally and the ability to comply with international food safety and quality requirement is evident of a country having a mature food control system, especially for exports. One respondent wrote, however, it is desirable that consumers in a country experience the same quality of food for domestic market.
 - Indicator # 26: National food safety emergency response capacity – respondents wrote that this concept encompasses consistency in food recall and elements of food traceability.
 - Indicator # 31: The use of risk analysis to inform and support decision-making and establish food safety control measures – one respondent wrote that it is not operationally feasible to conduct 100% checks for food safety, thus risk analysis is an essential element in effective national food control system, and this should be a key indicator of having a good system to allow policy makers to make informed decisions on various food safety issues.
 - For the sector-specific indicators, the popular ones are followings:
 - Indicator # 93: Importance of hygiene and food safety is permanently present by means of, for example, posters, signs and/or icons related to hygiene and food safety.
 - Indicator # 98: Outbreaks of Foodborne Illness(Outcome) – noting that effective illness/events/disease surveillance systems and reporting mechanism are essential for this indicator to be effective – may not be a realistic indicator for many developing countries.
 - Indicator # 85: Percentage of the population with access to potable water – everyone said it is fundamental, no safe water, no food safety.
 - For the specific Food safety topic-based indicators, the popular ones are followings:
 - Indicator # 100: Chemical risk in production: use of agricultural chemicals (pesticides)
 - Indicator # 102 and 128: Microbial risk: incidence of reported illness by foodborne pathogen and relevance to national food consumption or dietary intake reporting
 - For indicators on surrounding factors, Indicator #134: Change in public trust in food safety over a five-year period was the most popular one. Respondents were asked to select 1 to 5 indicators per category and this category had only 6 indicators so others also had many votes, but when it comes to the reasons why they think important, the comments are mainly saying that they are indirectly relevant, thus the conclusion is that only Indicator # 134 is relevant for this category.

Q4: Under the chapter 3 of the technical paper, there is a box with key questions when evaluation the effectiveness of each indicator. Do you agree with the set of questions (criteria) to evaluate the indicators? If yes, please state the reasons. If no, please suggest any modifications (additions, amendments, or deletions).

- Almost all respondents supported that these questions are the key criteria.
- Some additions were suggested such as:
 - Can the indicator measure the impact of the programme/activities or measure the outcome?
 - Does the indicator related with the core business of the organization?
 - Does the action for improvement for under control by that organization?
 - Are there further evidence of continued updates of the data?
 - Is there any review process in future as the food safety issue is continuously changing?
 - Is the result using the indicator easy to interpret?
- A suggestion received to change the order to follow SMART acronyms.
- There are multiple suggestions to refer to the Codex criteria:
 - Unambiguous, easy to interpret, monitor and transparent.
 - Closely linked to the outcomes (including timing) and meaningful from an organizational perspective.
 - Amenable to independent validation and or verification.
 - Obtainable given available resources.
- One respondent suggested exploring the possibility of creating social indicators for food safety specifically measuring the impact of food safety in the vulnerable populations (i.e. extreme poverty population).

Q5: Under the chapter 4 of the technical paper, there is a box with the recommended uses of analyses produced based on the regional food safety indicators. Do you agree with those major purposes of using the food safety indicators? If yes, please state the reasons. If no, please suggest any modifications (additions, amendments, or deletions).

- Once again, almost all supported the identified uses.
- A respondent suggested a possible approach in using some of the indicators with challenges in quantifying the results. Noting that numbering/or ranking of different national food safety situations compared/against each other may be problematic due to widely varying data sources/set ups, a category-based approach, such as
 - No capacity (1)
 - Limited capacity (2)
 - Developed capacity (3)
 - Demonstrated capacity (4)
 - Sustainable capacity (5).
- Several respondents suggested having an application of the indicators to be used for building regional confidence on food safety so that trade facilitation will be possible in the region.
- One respondent expressed a reservation to use the set of indicators at the regional level due to the diverse situations and capacities in managing food safety matters.
- One respondent flagged that while this can be a great communication tool, the actual communication needs to be tailored depending on the targets.

Annex 6: A compiled set of regional food safety indicators

A compiled set for the regional food safety indicators

A guide for countries to select effective indicators and tailor them for the national context 8 December 2017

Note: This is a simple consolidation of the indicators selected by nine working groups on the last day of the consultation (as of 8 December 2017). This requires further refinement on appropriate wordings and it is not in the final format. If national competent authorities wish to use the set of indicators, it is strongly recommended to first define the desired outcomes before setting the indicators.

Food safety competent authority (-ies) and partners

1. Presence of a leading food safety agency (entity) to drive the coordination work to ensure food safety
2. Food safety relevant agencies have clearly defined roles and responsibilities for food control management
3. Competent authority is supported by necessary infrastructure and adequate resources (e.g. human and financial resources and lab equipment and materials)

Policy and legal and regulatory framework

4. Presence of enabling national policy and legal and regulatory framework are consistent with international standards, guidelines and best practices (including legally embedded criteria for executing food recall and traceability) and they show government commitment to protect public health and ensure fair practices in food trade

Principles of the national food control systems

5. National food control system covers the entire food chain (farm to plate) in an integrated system
6. National food control system is implemented in a transparent manner with mechanisms for information, education, communication and coordination with relevant stakeholders
7. Use of risk analysis paradigm by the competent authority to inform and support risk-based, science-based and evidence-based decision-making and establish food safety control measures with a mechanism for expert consultation to advise government on food safety risk assessment

Codex and functions with other international bodies and platforms

8. Existence of National Codex Committee with allocated budget
9. Level of engagement in the work of Codex
10. Ability to meet and demonstrate compliance with international food safety and quality requirements and obligations (e.g. Codex standards, WTO SPS Agreement and requirements of trade partners)
11. Credible functioning of national contact points for Codex, World Organisation for Animal Health, International Plant Protection Convention and other relevant international organizations and platforms (e.g. International Food Safety Authorities Network (INFOSAN)) with required resources

Food inspection

12. Criteria for risk categorization and prioritization established for food inspection
13. Presence of functioning risk-based food inspection mechanism with well-defined standard operating procedures
14. Number of food inspectors (per population) trained on official food control

15. Number of inspections being conducted for infrastructure, installations and hygiene throughout farm to plate food chain (primary production, processing, distribution, hotels and restaurants and community kitchens)

Food safety certification

16. Presence of functioning food safety certification systems with well-defined standard operating procedures

Testing and analysis

17. Presence of and access to capable diagnostic and analytical laboratories with well-defined standard operating procedures
18. Presence of and access to accredited food testing laboratories with well-defined standard operating procedures

Notifications

19. Presence of notification mechanism on food safety incidents and outbreaks
20. Presence of notification mechanism on food recalls

Support to self-checking systems

21. Presence of monitoring and verification mechanisms by the government on self-checking system of the producers, processors, food industries and food business operators throughout the food chain
22. A recognition system for the producers, processors, food industries and food business operators implementing good food safety practices
23. Presence of effective guidelines for developing good standard operating procedures and instructions concerning Good Agricultural Practices (GAP), Good Manufacturing Practices (GMP), Good Hygiene Practices (GHP) and Hazard Analysis and Critical Control Point (HACCP)

Food monitoring, health surveillance and epidemiology

24. Mechanisms are established and functioning for detecting to foodborne disease and food contaminations
25. Existence of One-Health disease surveillance systems (animal plant, human and environmental health)
26. Number of outbreaks of foodborne illness reported
 - a. Salmonellosis in humans
 - b. Listeriosis in humans
27. Percentage of reported occurrences in which presence/contamination of hazards are identified (biological, chemical, physical) in all types of food and feed from farm to plate [or, Percentage of commodities (food or animal feed) that comply with regulations (e.g. maximum residue levels), pertaining to pesticides, pesticide residues, veterinary drug residues, food additives, mycotoxins, heavy metals, radiological substances and key chemical, microbiological and physical (non-food) contaminants]
 - c. *Salmonella* spp. in food (specify a commodity for an indicator)
 - d. *E. coli* in food (specify a commodity for an indicator)
 - e. *Listeria monocytogenes* in food (specify a commodity for an indicator)

Data collection, collation and interpretation

28. Institution(s) exists that is responsible for the collection, collation and interpretation of data on food safety issues (including microbiological, chemical, natural and environmental) at the national level

Food safety emergency preparedness

29. National food safety emergency response capacity supported by a national plan/guidelines/rapid alert system, which state responsibilities, relevant parties and necessary systems and actions including traceability and food recalls

Information, education, communication and trainings

30. Risk-based education and trainings to food business operators related to hygiene and food safety are mandated and provided
31. All stakeholders farm to plate, including consumers, are reached in food safety information activities and are aware of the potential problems and risks related to hygiene and food safety

Shared responsibility - industry, producers, processors, food business operators

32. Percentage of producers, traders and food business operators implementing documented self-checking food safety management system, such as good standard operating procedures on GAP, GMP, GHP, HACCP or any others in accordance with the local context
33. Percentage of food establishments from farm to plate displaying information, education and communication materials or signs on hygiene and food safety within their premises
34. Percentage of producers, processors, traders and food business operators that have implemented a functioning traceability system
35. Percentage of food establishments complying to labelling requirements including allergen risk indications

Access to potable water

36. Percentage of the population with access to potable water

Public trust in food safety

37. Presence of mechanism to understand public perception on the national food control system
38. Levels of public trust in food safety

Food and feed trade

39. Percentage of reported rejections of food exports due to food safety by importing countries
40. Mutual recognition of equivalence systems (e.g. mutual recognition agreements, memorandum of understandings for market access) based on international guidelines

ISBN 978-92-5-130542-3



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I9459EN/1/05.18