

Abstract

The following describes developing and designing an online food safety toolbox that aims to elevate the food safety knowledge of Food Business Operators (FBO), competent authorities, and trainers. The material within the Food safety toolbox was based on the Codex Alimentarius (Codex) General Principles of Food Hygiene (GPFH), an internationally recognized primary food safety standard. The GPFH provides a guide to elements that should be considered when establishing good hygienic practices (GHP), which are subsequently managed through hazard analysis and critical control points (HACCP). To support the understanding of how to apply the principles of GHP and HACCP, the online Food Safety Toolbox was developed. This Toolbox was designed to enable users to access the principles quickly as a reminder for better understanding of more complex matters, conceptualizing, and building and maintaining food safety management systems. The learning approaches applied in the design of the Toolbox was mapping, chunking (grouping topics into a logic sequence to enable an incremental approach to learning) and Learn-By-Asking. The self-directed learning approach collectively enables the user to understand, categorize, and contextualize food safety information for practical use. Mapping was performed to identify the different elements within GPFH that formed the basis of the online platform and the categories in which basic information was provided for each. The material progresses into greater depth and includes links to detailed descriptions of the underlying science. This user-centric design was chosen to address different users' needs and reduce the entry barrier for contextually applying the presented GHP and HACCP practices. The GHP and HACCP Toolbox for Food Safety should be regarded as a reference resource rather than a training program to empower the user and ultimately enhance food safety practices.

Keywords: Food safety, Good Hygienic Practice, Codex, Training, HACCP, Learn-by-Asking, Mapping, Chunking

Introduction

Food safety is a foundation for food security and general health of populations across the globe (Ellerbroek, 2017). Lowering the incidence of foodborne illness reduces the health burden on the population leads to greater confidence in the food supply and supports trade (Onyeaka et al., 2024). As trade increased at local, national and international levels there was an identified need to develop food safety standards to reduce risks from food safety hazards (Griffith, 2006; Demortain, 2012). In addition, in the late 1940s, when the World Health Organization (WHO) and Food and Agriculture Organization (FAO) were founded, there was heightened international concern about the direction food regulation along with accounting for the rapid developments in food science and technology. Countries were acting independently in developing food regulation, with little consultation among them with a view to harmonization of standards that hampered trade. Emerging from a series of global conferences, the Codex Alimentarius Commission, the body established by FAO and WHO to develop food standards under the Joint FAO/WHO Food Standards Programme, had its inaugural meeting in 1963 (FAO and WHO, 2018). Key to the credibility/justification of the Codex standards is that science-based assessments are undertaken by experts from across the globe prior to the formulation of standards and that the standards are agreed upon by consensus in accordance with the Codex Alimentarius principles of decision-making (Somogyi et al., 2011; Demortain, 2012).

Introduction of the Codex General Principles of Food Hygiene

In the early 1960s the concept of Good Manufacturing Practices (GMP) started to emerge within the pharmaceutical sector and subsequently in the food industry (Emde, 1992). As the name implies, GMPs are practices, processes, facilities, and products that need to be considered in the processing of food that complies with a desired outcome of safety and quality. Good Hygienic Practices (GHP) form part of GMP and focus on food production and handling to ensure food safety. Generic texts covering GMP and GHP are purposely outcome-based and not descriptive providing flexibility in "how to achieve" the outcome. This was in part due to the diversity of food production and processing but also to allow member states to develop regulations for each of the standards for their context.

Through the collaboration between experts from 168 nations, the Codex General Principles of Food Hygiene (GPFH), based on GMP and GHP, were first published in 1969 and formed the minimum standards in food production, processing, and distribution. A goal of developing the GPFH was to distill the principles of good hygienic practice within a single document based on scientifically supported risk analysis (Demortain, 2012). The GPFH has undergone further revisions, with the next landmark occurring in 2003 when the 35th Session of the Codex Committee on Food Hygiene introduced the 12 principles of Hazard Analysis and Critical Control Point (HACCP). The introduction of HACCP represented a means of managing GMPs by assessing hazards and identifying critical control points for their management. HACCP remains the most applied food safety management system.

Structure of Codex Alimentarius

The Codex Alimentarius is structured into committees based on general, commodity-specific, and regional areas (Figure 1). A common feature of the committees is the participation of experts from almost every nation who established science-based standards and facilitate risk communication (LeJeune, Zhou, Kopko, & Igarashi, 2021). The GPFH has provided a nucleus from which committees branched to provide in-depth assessments and prescriptive guidelines for elements covered within GPFH. An example is the Joint Expert Committee of Microbial Risk Assessment (JEMRA), which was established in 2000 and has scripted over forty publications on risk assessment of commodities (e.g., fresh produce) or pathogens of concern (e.g., foodborne viruses) (LeJeune et al., 2021). Other joint committees focus on pesticide residues, additives, nutrition, and veterinary drugs. As one could deduce, Codex has been active since its inception over 60 years ago. It has formed an extensive library of science-based knowledge and guidance in food safety and quality matters.

Challenges to the application of the Codex Alimentarius General Principles of Food Hygiene

Codex Alimentarius has provided codes of practice, guidelines and reports relating to standards that are internationally recognized (Griffith, 2006; Ramsingh, 2014). It should be noted that Codex does not formulate or enforce laws as Codex texts are adopted into national or regional legislation.

The publication of GPFH was introduced to provide a minimum standard to be applied across the food chain with the intent of reducing foodborne illness. In the case of large enterprises that serve national and international markets there has been a sustained effort to introduce more detailed standards that go beyond those highlighted in GPFH (Percy, 2012). The added complexity is driven to close gaps identified while implementing or operating food safety management systems (Demortain, 2012). With complexity comes the increased costs, resource requirements and training for those implementing certified food safety management systems (Clarke, 2010). In addition, resources are required to train inspectors and auditors to evaluate such complex food safety management systems to verify compliance. A positive aspect of complexity in food safety management systems is that they are applied and documented in a standard manner that establishes trust between trading partners (Radu et al., 2023). Yet, complexity also has negative consequences in that FBOs become lost due to lack of knowledge and/or required to work towards increasing demands of additional customer standard (Gilling, Taylor, Kane, & Taylor, 2001). Consequently, there is a need for FBOs to devote time, resources, and training to adopt food safety management systems (Charalambous, Fryer, Panayides, & Smith, 2015; Evans, Lacey, & Taylor, 2021).

Generic HACCP plans were introduced to minimize the burden on small-medium-sized enterprises (SMEs). These plans were also largely based on GMPs and prescriptive standards (Ropkins & Beck, 2000). Yet, challenges were met in relating Generic HACCP to the FBOs' situation, leading to a high degree of variability concerning hazard identification and management (Ropkins & Beck, 2000).

Over time, there has been an increasing gap between food safety standards implemented by FBOs supplying national markets with high food quality and safety requirements and/or trading internationally compared to those supplying less regulated markets (Hasani, Camacho-Martinez & Warriner, 2024). The focus on large enterprises resides in the fact that when foodborne outbreaks occur, they tend to be widespread and involve a high number of cases. Yet, it is thought that most foodborne illness outbreaks occur within food service or domestic environments (Moritz et al., 2023). It follows that Small and Less Developed Businesses (SLDB) lack effective food safety management systems that would prevent foodborne illness outbreaks. Therefore, a key activity of Codex is to

introduce food safety management systems to those who lack the resources to implement the more complex plans (Lee, Neonaki, Alexopoulos, & Varzakas, 2023). Part of the capacity development undertaken by FAO/WHO and others includes identifying barriers to adopting GPFH and developing different means of risk communication.

There have been several strategies to communicate the Codex materials that have included, amongst others, train-the-trainer and publications of guidance documents. The materials are prescriptive and on occasion, commodity specific with the view of easing the interpretation of standards by the FBOs and inspectorate (Mortlock, Peters, & Griffith, 1999). An alternative approach is to undertake elevated learning that, while complex, enables the user to add context/application to their specific application (Cotter, Yamamoto, & Stevenson, 2023; Insfran-Rivarola et al., 2020). This is especially relevant given the diversity of products, processes, and environments encountered within a commodity group. Indeed, it has been suggested that continuous training and improvement is a more effective learning strategy than prescriptive guides and/or intermediate face-to-face training (Insfran-Rivarola et al., 2020). Moreover, as with any training program, the quality of the trainer is directly related to the outcome, even if the learning material is standardized. If training is poorly delivered, it will raise doubts in the user about its applicability (US FDA, 2022).

Developing the GHP and HACCP Toolbox for Food Safety

The main objective of the GHP and HACCP Toolbox for Food Safety is to aid the user in accessing, navigating, elevating, and promoting self-learning in relation to understanding the basics for implementing food safety management systems according to the Codex GPFH. With a view of limited resources and the need for continuous improvement, the GHP and HACCP Toolbox for Food Safety was developed as an online platform accessible and navigable on portable devices. Additional features of the GHP and HACCP Toolbox for Food Safety include the introduction of mapping that facilitates recognition of the elements of the GPFH thereby making it more accessible to the user. Mapping provides a means for the user to categorize information and a greater understanding of how elements interact (Anderson, Lucas, & Ginns, 2003; Silva et al., 2023). The GHP and HACCP

Toolbox for Food Safety also makes use of the learning process referred to as Chunking, which describes a technique that breaks down complex concepts (elements) into small parts (chunks) (Tosatto, Fagot, Nemeth, & Rey, 2022). When combined with mapping, the Chunking technique enables the user to organize the material and facilitate its transfer to short-term memory, then long-term memory, and ultimately implementation.

The GHP and HACCP Toolbox for Food Safety guides the user with questions and examples to help them understand and apply GHP and HACCP. Each topical section links to the science behind the principles in the form of in-depth accessible reports from Codex Alimentarius, FAO, and WHO, amongst other resources. The GHP and HACCP Toolbox for Food Safety is intended for a wide audience, with the main beneficiaries being those who are implementing or maintaining food safety management systems within small, less developed businesses (SLDBs). Yet, the Toolbox will inform competent authorities and those delivering food safety training. It should be noted that the GHP and HACCP Toolbox for Food Safety is not designed as a curriculum of a food safety course, as a training curriculum either needs to be part of an academic program or then tailored to a specific type of food hazard food sector, food business. Rather, the Toolbox should be regarded as a reference source that can be accessed to source information relevant to the user situation and elevate knowledge in relation to food safety standards.

The objectives of the study resulting in the information that make up the Toolbox were to 1) identify and map the elements of the GPFH, 2) identify key information (Chunks) within each element, 3) to provide concepts for each element through Learn-by-Asking and 4) integrate the material in the form of an online resource using appropriate graphical representation.

Materials and Methods

Navigating the GHP and HACCP Toolbox for Food Safety

Since its inception, the GPFH has encompassed the entire chain (farm-to-fork), with concise statements only included in versions after consultation amongst Codex committees. Therefore, each statement within the GPFH was included for a purpose and contributed to food safety risk reduction.

To the casual reader of the GPFH, it is easy to oversee statements given that there is no emphasis or weighting on importance. Consequently, there was a need to include not only each section of the GPFH but also statements made within.

The GPFH document is subdivided into two chapters, the first being related to Good Hygienic Practice (GHP) and HACCP in the second (Table 1). The GHP chapter is broken down into nine sections, which include 46 sub-sections (Table 1). The introduction to GPFH provides terms of reference and purpose and then defines the roles of competent authorities, food business operators, and consumers. Reference is made to the eight general principles and the need for management commitment in relation to food safety, along with a definition of terms.

The first section of the GPFH provides an overview of hazards and a brief description of control strategies such as sanitation. Section 2 is devoted to primary production and includes sections of hazards encountered in the environment through the storage of farm inputs such as pesticides and fertilizer. In Section 3, the aspects to consider when designing a food processing facility are provided in Section 4, relating to competencies and training for food handlers. Section 5 is related to FBOs within a functioning food processing facility in relation to maintenance, sanitation, and pest control. In Section 6, aspects of personal hygiene are provided in relation to reporting illness, hand washing, and behavior. Section 7 focuses on product formulation to reduce the introduction of hazards at raw material receiving and distribution. The section also introduces concepts of validating, monitoring, and verification of GHPs throughout the food chain. Section 8 is related to labeling and providing consumers with sufficient information on potential hazards such as allergens. The section also advises consumers on the importance of information on labels and how to handle and store food products. In the final Section (Section 9), a general description of GHP aspects related to transportation is provided.

Chapter 2 of the GPFH outlines the 12 Steps of HACCP along with the 7 Principles. All 12 steps are related to elements taken from Chapter 1 GHP given that HACCP is an approach to manage Good Manufacturing and Good Hygienic Practices.

Mapping and Chunking

In developing the GHP and HACCP Toolbox for Food Safety, the Chunking process was performed by separating the material into Chapters and then nodes into Sections (Figure 2). Further nodes of the first-level sub-sections, then second-level sub-sections, and the third level were then mapped out in designing the website platform. Each of the sections was designated with a different color to aid orientation, website identity, and navigation through the site. The different levels of sub-sections were then represented by different nodes connected to the relevant Section. The maps were designed to ensure completeness and enable visualization of the main points to consider.

Document search and review

Supporting documents for each identified element within the map were identified from valid sources that are accessible without a paywall. That Codex , FAO , and / or WHO text that informed the standard-making process have been emphasized and could be useful for users in e.g. academia to understand the evolution of the science-based process into a standard. Search terms included the element name, food safety, training, and guidance. If no documentation was found, the search was extended to government publications. The inclusive criteria for the document were that it was within the scope of the GPFH learning objectives for the relevant section. Documents not fitting within the learning objectives were excluded.

The document library for each element was reviewed to identify 3-4 key points. These were selected by a panel of four persons with at least a degree level of education in Food Science. The selected key points were reviewed and verified by FAO food safety officers.

The key points derived from the document research were used to develop a brochure linked to the relevant section on the GHP and HACCP Toolbox for Food Safety as a PDF file. The points and a justification statement were listed for each of the elements. In addition, the responsibilities of the FBO, points to consider or documentation required were developed to provide guidance on practical application of the information covered. At the end of the brochure document a set of questions were formulated by the review committee. The questions were to provide the user direction on what

information to ask of the competent authority for guidance along with opening a dialogue between the two parties.

Graphic Design for usability

The design principles aimed to provide a professional, trustworthy, and user-friendly experience while navigating complex food hygiene content. The layout also provide a visual identity to the Toolbox.

The graphic design principles used to develop the toolbox focused on simplicity, accessibility, and user engagement. Graphics were used sparingly to facilitate interpretation of the material by the user themselves. In addition, low graphical content had practicalities such as encountering low internet bandwidth and small screens, with minimal use of colors and images to ensure visual identity, ease of access, and readability.

Substantive work went into eliminating design elements that could distract the user from following the learn-by-asking approach and to ensure that each map provided the minimal amount necessary for the user to navigate the complex material.

While the emphasis was on creating an online-only tool, there remain many areas where internet access is restricted, and print versions of the PDFs (brochures) might be preferred. Therefore, these were created with high contrast and minimal detail to ensure they are print-friendly, even with low-quality printers.

Nowadays, the first point of contact with the web is the mobile phone or other hand-held devices, so a colour scheme was devised that uses colours strategically to differentiate sections and guide users visually, enhancing navigation and understanding. To aid accessibility, all the PDFs were optimized for vertical scrolling, and internal hyperlinks were employed to improve interaction and control, mimicking modern online reading habits. Text readability was prioritized through careful font selection, size, and spacing. Each Section's PDF was designed to end with questions to provoke curiosity and links to the next section to maintain engagement, considering various user interactions from scrolling on handheld devices to printing.

Results and Discussion

The GHFP map was constructed and formed the framework for the on-line platform (Figure 2). The website can be viewed at <https://www.fao.org/good-hygiene-practices-haccp-toolbox/en>. In the following, the layout of Section 2 Primary Production is provided as an example with the other sections following a similar format (Figure 3).

From the main menu, one can locate Primary Production from the pulldown tap of GHP tab (Figure 3A). Clicking on the Primary Production option takes the user to an introduction. Here, there is a general overview of the section along with learning objectives (Figure 3B). There is also a section of Further Readings that lists the relevant Codex/FAO/WHO guidance document (Figure 3B). This essentially allows more experienced users to directly source the in-depth material. For less experienced users, there is a link from the introductory page to a guide where a general overview is provided (Figure 3C). Within the brochure, there is a cover page that identifies the section being covered. There is also an illustration of how the section relates to the other sections of GPFH (Figure 3D). The next page then provides the rationale and relevance of the section to help place the material into context (Figure 3E). This is further aided by outlining the learning objectives along with Codex definitions for clarity. The following page provides a map of the section taken from the main map illustrated in Figure 2. Within the section map, there are boxes related to the section and sub-section within the original GPFH text (Fig 3F). From each box, there are one or more questions to consider that are relevant to the sub-section. The questions are based on the Learn-by-Asking Approach (LBA) to training (Misra et al., 2018). Unlike the traditional Learn-by-Facts, with LBA, the user is challenged to seek resources to acquire and contextualize the material to answer the question posed (Misra et al., 2018). Of equal importance, using the LBA approach leads the user to formulate their own questions relating to the material that can open a dialog with competent authorities along with translating to Learning by Doing (Gil-Lacruz, Gracia-Pérez, & Gil-Lacruz, 2019). A quote attributed to several scholars and business leaders is apt – “Asking the right question is more important than having the

right answer". The quote essentially differentiates those who learn by remembering facts vs those who can formulate questions for the Learning-by-Asking approach that requires a deeper, critical-thinking approach. Therefore, by posing questions rather than statements, the user is motivated to go further into the Guidance document. In the context of the current example, the answers to questions displayed in Figure 3F can be found in the further reading material list on the Section landing page (Figure 3G). The material is further broken down (Chunked) into sub-sections, and relevant hazards are placed into context along with key points being identified. In the current example, Primary Production (Section 2) contains a sub-section 2.1 that relates to Environmental Control. By referring to the GPFH section 2 sub-section 1, it can be observed that the text highlights land, location, and water as points to consider. Separate pages were then prepared for each of the elements i.e. (land, location and water) and points to consider. Here the points to consider were taken from the further reading document. For example, the main points relating to land selection (Figure 3G) were taken from an FAO training manual for Good Agricultural Practices in horticulture (FAO, 2010). This approach provides the user with key points to consider but also encourages to read the in-depth document that they would refer to for general Good Hygienic Practices.

At the end of each sub-section, examples are given on the types of records to maintain given the underlying philosophy of HACCP is documentation (Figure 3H). Again, this provides the user with the concept of documentation and the types of information that should be collected. The same format is undertaken for the subsequent sub-sections and so forth. At the end of the sub-section, further questions are posed relating to the material covered (Figure 3I). This, in part, is to stimulate inquiry with the user by the LBA approach, but also provides questions to pose to consultants, inspectors, or regulators to initiate dialog.

Chapter 2 covers the background and implementation of HACCP and is prescriptive to a greater degree compared to the GHP covered in Chapter 1. For each of the HACCP Steps, a description of importance is provided along with learning objectives. It then goes on to describe the Codex terminology referred to within the GPFH and provides advice how to accomplish implementation.

At the end of each step the user is invited to identify which GHP elements are relevant to the HACCP Step or Principle being performed. Although the answers are subjective and dependent on the user's application, the approach provides a means of reinforcement to connect/manage GHP practices within a HACCP framework. This is a similar approach to the modernization of the North American food safety systems (e.g. FSMA), which includes GHP for sanitation and facility operations, amongst others, as preventative control practices. The user is then invited to go forward to the next step and onwards.

How to use the GHP and HACCP Toolbox for Food Safety

The main target audience will be end-users at the farm, processing, distribution, and food service, along with the public interested in food safety. The Toolbox is designed to be a reference source and supplement training offered through academic or other programs. The key is to enable the end-user to undertake non-directive learning to place the information into context and apply it to the relevant situation. The self-directive learning approach is a departure from typical food safety training that follows the Analyze-Design-Develop, Implement Evaluate (ADDIE) approach (Cotter et al., 2023). The GHP and HACCP Toolbox for Food Safety purposefully do not include an acknowledgment of training, such as certification that has a tendency to restrict the transition of knowledge into behavior (da Cunha, Stedefeldt, & de Rosso, 2014). That is, certification becomes an end-point of achievement rather than a continuing process of self-improvement. Obviously, the current food safety management systems place emphasis on food handler training to demonstrate due diligence and provide the worker with recognition that can be listed on their achievements. This would be a further consequence of increasing the complexity of food safety management systems.

The toolbox will also be of interest to competent authorities, who can utilize the platform to ensure the completeness of policy/guidelines and as a training resource for inspectors, auditors, and consultants. Finally, those in the food safety academic or professional sector will benefit from using the Toolbox to develop course material focused on the target audience.

Conclusions

The Codex General Principles of Food Hygienic Practices was first published in 1969 and has been the foundation for establishing global food safety minimum standards that can be applied from the farm to the fork. The GPFH are regarded as the minimum standards but, if implemented correctly, can enhance food safety throughout the food chain. By understanding and implementing the basics then it will become possible to implement more complex food safety management systems as required. In developing the GHP and HACCP Toolbox for Food Safety, a reductive strategy has been undertaken to de-mystify the GPFH and provide the user a learning map that provides easily assimilated information in a non-directive teaching approach. This is facilitated by chunking and Learning-by-asking approach to empower the end-users. As with many food safety initiatives, measuring success is challenging given that there are multiple confounding factors that contribute to food safety practices. Yet, as the GHP and HACCP Toolbox for Food Safety becomes established, the number of engagements/interactions, case studies (e.g. commodity specific Toolbox), and testimonials in the form of feedback will provide means of further evolving the Toolbox approach. Ultimately, the metrics to define the success of the Food safety toolbox will be the degree to which the approach enhances food safety practices across the globe.

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Tables

Table 1: Structure of the Codex General Principles of Good Hygienic Practices.

Chapter	Section	Sub-Section
1. Good Hygienic Practices	1. Introduction and control of food hazards	
	2. Primary production	2.1 Environmental control
		2.2 Hygienic production
		2.3 Handling, storage and transport
		2.4 Cleaning, maintenance and personnel hygiene
	3. Establishment – design of facilities and equipment	3.1 Location of establishment
		3.2 Facilities
		3.3 Equipment
	4. Training and competence	4.1 Awareness and responsibilities
		4.2 Training programs
		4.3 Instruction and supervision
		4.4 Refresher training
	5. Establishment maintenance, cleaning and disinfection, and pest control	5.1 Maintenance and cleaning
		5.2 Pest control systems
		5.3 Waste management
	6. Personal hygiene	6.1 Health status
		6.2 Illness and injuries
		6.3 Personal cleanliness
6.4 Personal behaviour		
6.5 Visitors and other persons from outside the establishment		
7. Control of operation	7.1 Description of produces and processes	
	7.2 Key aspects of GHPs	
	7.3 Water	
	7.4 Documentation and records	
	7.5 Recall procedures – removal from market of unsafe food	
8. Product information and consumer awareness	8.1 Lot identification and traceability	
	8.2 Product information	
	8.3 Product labelling	
	8.4 Consumer education	
9. Transportation	9.1 General	

**Chapter 2:
Hazard Analysis
and Critical
Control Point
(HACCP) system
and guidelines for
its application**

- 1. Principles of the HACCP system
- 2. General guidelines for the application of the HACCP system
 - 2.1 Introduction
 - 2.2 Flexibility for small and/or less developed food businesses
- 3. Application
 - 3.1 Assemble HACCP team and identify scope
 - 3.2 Describe product
 - 3.3 Identify intended user and users
 - 3.4 Construct flow diagram
 - 3.5 On-site confirmation of flow diagram
 - 3.6 List of potential hazards
 - 3.7 Determine critical control points
 - 3.8 Establish validated critical limits for each CCP
 - 3.9 Establish a monitoring system for each CCP
 - 3.10 Establish corrective actions
 - 3.11 Validation of the HACCP plan and verification procedures
 - 3.12 Establish documentation and record keeping
 - 3.13 Training

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Figures

Figure 1: Structural organization of Codex Alimentarius commission. The Codex Commission is sub-divided into committees with the primary role of risk assessment, management and communication. Publications derived from Codex are the opinions of expert reviews derived from globally recognized experts. The final publication is reached by consensus between members of the relevant committee.

Figure 2: Map describing the organization of the Codex General Principles of Good Hygiene. The mapping aided in identifying the Toolbox layout and interpreting GPFH.

Figure 3: Images of the GHP and HACCP Toolbox for Food Safety. (Available at <https://www.fao.org/good-hygiene-practices-haccp-toolbox/en>). Figure 3: Images of the GHP and HACCP Toolbox for Food Safety. (Available at <https://www.fao.org/good-hygiene-practices-haccp-toolbox/en>). From the home screen (A), the user can select the Section of interest, such as Primary Production in the current example (B). The section's home page provides a broad overview and a list of further reading. The user can assess the overview of the food safety hazards relevant to section (C) and how this relates to the other Sections (D) along with a tab to the brochure (PDF). The brochure is structured to give the importance and objectives of the Section are provided (E). The user then scrolls down to the map that illustrates the different elements of the section and considerations in the form of questions to note as they go through the material (F). Within each of the elements, the potential sources of hazards are provided (G), along with relevant documentation required as part of the food safety management system (H). At the end of the section, the user is provided with example questions (I) to ask competent authorities or consultants to meet the GPFH standards.

FIG. 1

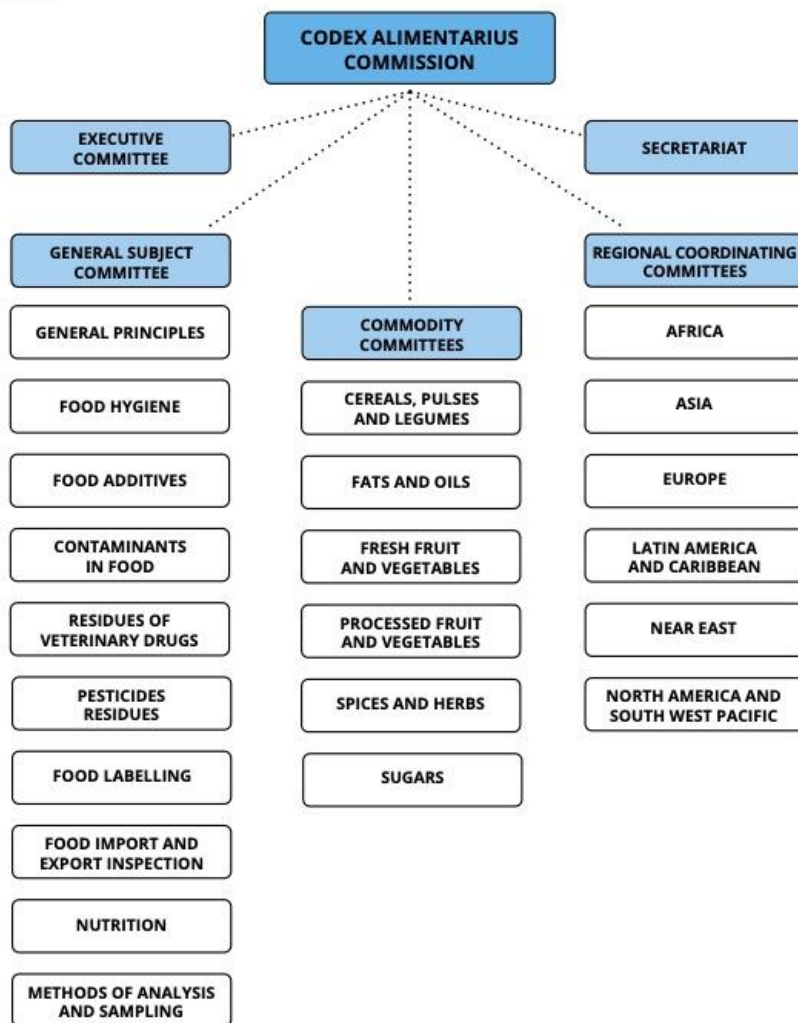


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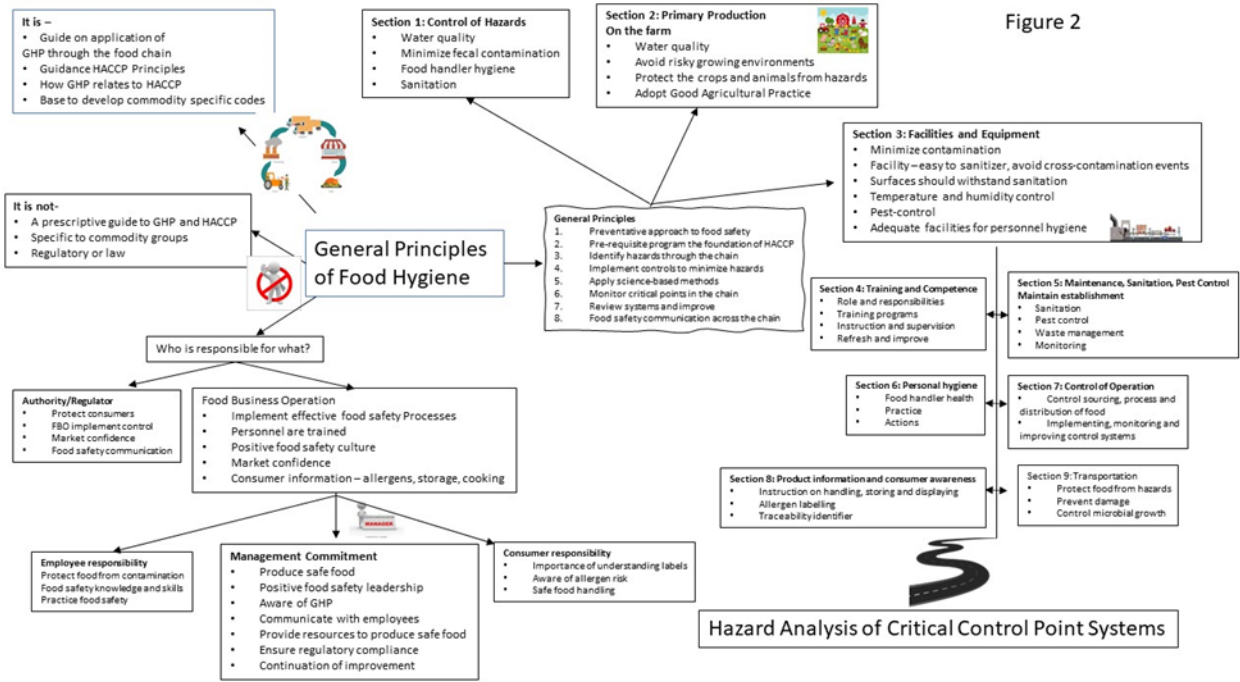


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Good Hygiene Practices (GHP) and HACCP Toolbox for Food Safety

Background How to use GHP - HACCP - Glossary - FAQ

GHP - Set
This guidance construct a

- Introduction to GHP
- Primary production
- Design of facilities, equipment
- Training and competence
- Maintenance, cleaning, pest control
- Personal hygiene
- Control of operation
- Product and consumer information
- Transportation

Food handling premises (premiere) separated from the external of other facilities should be located in a clean, well-ventilated area. The environment should be kept clean and free from pests. The environment should be adequately designed for waste management and cleaning, and support the hygienic production of food.

Consult the **guidance document** on the design of facilities and equipment for guidance on how to:

- identify potential hazards associated with the establishment's location, design, facilities and equipment; and
- prevent food contamination with the right design and construction and by choosing appropriate equipment.

Facilities and equipment should be designed to prevent contamination of food. The premises, equipment and maintenance, cleaning and disinfection, and there should be a plan, particularly those in contact with food, including washrooms, should be adequately designed for waste management and cleaning, and support the hygienic production of food.

Contact: food-quality@fao.org

A

GHP - Section 2: primary production

This guidance document provides detailed instructions on how to identify potential hazards in primary production and information on how to control them.

Figure 3

The types of activities involved in raising animals, growing crops, farming fish, hunting and fishing can introduce multiple hazards that can enter the food chain at the stage of primary production. Food safety along the value chain can only be assured if primary production activities are managed in a way that reduces the likelihood of introducing a contaminant that could affect the safety of the food, or make it unsuitable for consumption.

Consult the **guidance document** on primary production for guidance on how to:

- identify potential hazards in primary production; and
- understand the principles of how hazards can be minimized and controlled by following Good Agricultural Practices (GAP) and Good Hygiene Practices (GHP).

Further Readings

The selected links refer to online sources relevant to the Section on Primary production of the FAO GHP and HACCP Toolbox for Food Safety. The chosen links provide valuable online information to gain more in-depth topical knowledge.

(if any of the following links are broken, please notify food-quality@fao.org)

- FAO & WHO. 1995. Code of practice for packaging and transport of fresh fruit and vegetables (CAC/RCP 44-1995)
- FAO & WHO. 2013. Guidance for Governments on Prioritizing Hazards in Feed (CAC/GL 81-2013)
- FAO & WHO. 2013. Guidelines on the Application of Risk Assessment for Feed (CXG 80-2013)
- FAO & WHO. 2019. Code of practice for fish and fishery products (CAC/CP 52-2003)
- FAO & WHO. 2019. Safety and Quality of Water Used in Food Production and Processing, MRA 33
- FAO & WHO. 2023. Codex Alimentarius - Contaminants
- FAO & WHO. 2023. Codex Alimentarius - Pesticides
- FAO. 1997. Improving agricultural extension. A reference manual
- FAO. 2003. Assessment and Management of Seafood Safety and Quality
- FAO. 2010. Good Agricultural Practices (GAP) on horticultural production for extension staff in Tanzania. Training Manual
- FAO. Fruit Processing Toolkit - Preservatives
- FDA. 2020. Center for veterinary medicine program policy and procedures manual, Responsibilities for Keeping and Maintaining Records (1243.2010)
- New Zealand Ministry of Primary Industries. 2023. Food Safety Hazard Database

B

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Primary production – Section 2

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ALSO AVAILABLE IN: [Turkish](#)

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This guidance document provides instructions on how to identify potential food safety hazards in primary production and information on how to control them.

The types of activities involved in raising animals, growing crops, farming fish, hunting and fishing can introduce multiple hazards that can enter the food chain at the stage of primary production. Food safety along the value chain can only be assured if primary production activities are managed in a way that reduces the likelihood of introducing a contaminant that could affect the safety of the food, or make it unsuitable for consumption.

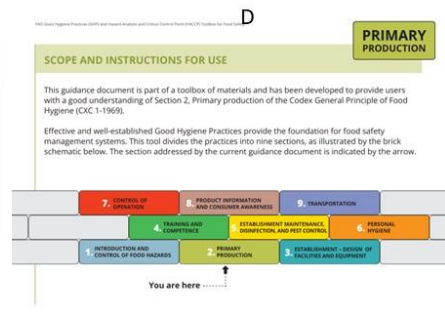
This publication is part of the FAO Good Hygiene Practices (GHP) and Hazard Analysis and Critical Control Point (HACCP) Toolbox for Food Safety series. The Toolbox is a central repository of practical guidance and resource materials to strengthen food safety capacities, both public and private, in order to develop and implement food safety management programmes in accordance with the Codex Alimentarius General Principles of Food Hygiene guidelines (CAC 1-1969).

Care was taken to consider the challenges faced by small food business operators and primary producers in low- and middle-income countries, and those with an institutional role, such as government officials, academia and capacity building organizations.

Further readings - [Section 2](#)

KEYWORDS:
[food safety](#) [Food hygiene](#) [HACCP](#) [good practices](#) [guidelines](#) [primary production](#)

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D

CONTEXT

The types of activities involved in raising animals, growing crops, farming fish, hunting and fishing can introduce multiple hazards that can enter the food chain at the stage of **primary production**. Food safety along the value chain can only be assured if primary production activities are managed in a way that reduces the likelihood of introducing a contaminant that could affect the safety of the food, or make it unsuitable for consumption.

Rationale
To reduce the likelihood of introducing a contaminant which may adversely affect the safety of food, or its suitability for consumption, at all stages of the food chain.

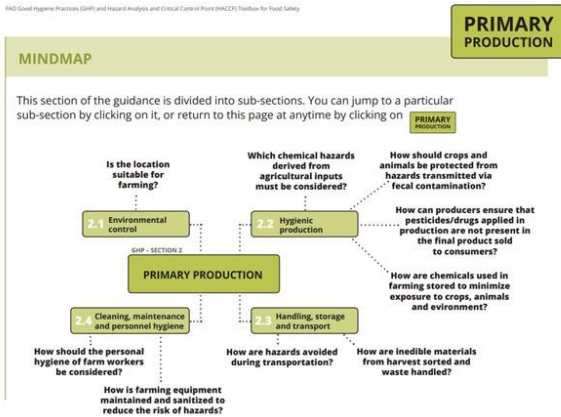
Learning objectives
This document provides guidance on how to:

- identify potential food safety hazards in primary production; and
- understand the principles of how hazards can be minimized and controlled by following Good Agricultural Practices (GAP) and Good Hygiene Practices (GHP).

Codex definitions:
Primary production: Those steps in the food chain up to and including storage and, where appropriate, transport of outputs of farming. This would include growing crops, raising fish and animals, and harvesting plants, animals or animal products from a farm or their natural habitat.

E

F



G

PRIMARY PRODUCTION

2.1 ENVIRONMENTAL CONTROL

Hazards that pose a threat to crops and/ or animals could be present or be introduced into the environment. Hazards can be found within the production environment (e.g. in the field or the barn), nearby or they can be introduced via agricultural inputs.

LAND

! Things to consider

The land on which crops are grown or where animals roam and graze can be a source of hazards. Typically, the hazards relate to the historic use of the land.

- **Pesticides** applied to land can remain in the soil for years. These pesticides can later be found in crops grown in that soil and can be toxic to animals that graze on or roam the land.
- **Manure** can introduce pathogens into the soil that can survive up to 120 days, infecting animals that graze on the land or contaminating crops that are cultivated on it.
- If the site has been used for **landfill**, there is a risk of encountering physical hazards such as glass, chemicals that could be toxic and/or biological hazards such as pathogens.

PRIMARY PRODUCTION

H

PRIMARY PRODUCTION

2.1 ENVIRONMENTAL CONTROL

FBO RESPONSIBILITIES

Topic	Examples of what you should do
Land	Documentation of previous land use, and use of pesticides, fertilizers and manure.
Location	Documentation of flooding. A map showing potential upstream sources of water. Mitigation plans if water sources are at high risk of contamination.
Water	Maintenance log and schedule for wells, pump heads and transfer pipes. Documentation of fertilizer and pesticide use. Microbiological and chemical water testing data.

A

FIND OUT MORE



For additional information on the following topics related to this section, please consult the **Further reading** section accessible from the [SECTION LANDING PAGE](#).

How can you interpret the soil and water analysis results? What corrective actions can be taken?

How can you establish a system to prevent undesirable material from entering the food processing area?

How is a risk assessment performed on waste from plant or animal origins?

How can you establish a maintenance and sanitation programme on your farm?

How can you design and construct safe areas to store agricultural inputs such as fertilizer, pesticides, feedstuffs and veterinary drugs?

What considerations should you make when developing and operating food storage areas?

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