Food and Agriculture Organization of the United Nations

SAFE FOOD FOR EVERYONE

FAO's work on food safety: science, standards and good practices

Required citation:
FAO. 2023. *Safe food for everyone – FAO's work on food safety: science, standards and good practices*. Rome. https://doi.org/10.4060/cc4347en

Food safety concerns kick in the moment the anchovies are caught and the avocado grown – served together at this beachside restaurant in Peru
©FAO/Miguel Arreategui

THE FRAGILE WORLD OF FOOD

As agrifood production evolves, we need food safety systems capable of mitigating multiple risks.

No food business, however small – as is this hatchery in Viet Nam – can ignore biosecurity standards ©FAO

Global and national events such as human and animal diseases; the climate crisis; water scarcity; population growth; conflict; and forced migration powerfully demonstrate the interdependence and fragility of agrifood systems.

As many as 600 million people fall sick yearly because of contaminated food; up to 420 000 of them will die. Disruption in one place can quickly reverberate elsewhere, prompting food shortages, skyrocketing food prices and a resurgence of hunger.

Unsafe food hinders economic growth, with annual productivity losses of up to USD 95 billion in low- and middle-income countries.

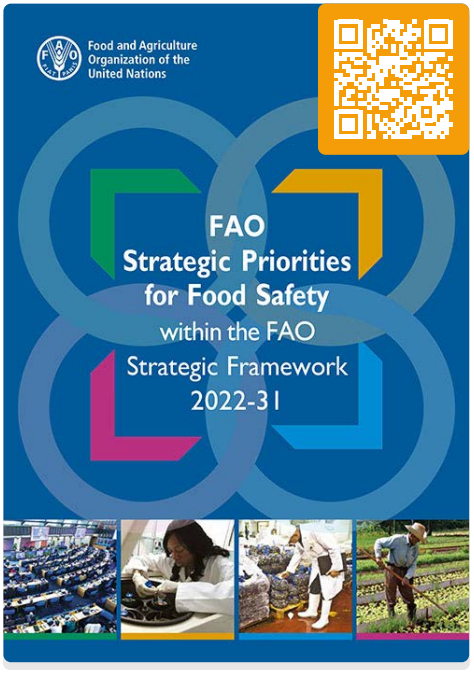
THE WAY FORWARD AND FAO'S MISSION

The solution starts with adopting sustainable agricultural practices that integrate food safety principles. With a better understanding of food safety, consumers themselves will also play their part in preventing foodborne disease.

Next comes ensuring that as we reduce environmental risk to food, we in turn minimize the impact of food production, processing and transport themselves on the environment: in some countries, the food supply chain may already be overtaking farming as the largest contributor to greenhouse gases.

The pursuit of social equity, with equal access and a voice for rich and poor, is a similarly major concern. As things stand, much of the social and economic cost of unsafe food falls on those who are already in vulnerable situations.

Handwashing before meal time at a rural school in Guatemala
©Pep Bonet/NOOR for FAO



With food traded over ever-increasing distances, it is imperative that we make progress on cross-border harmonization of standards.

We at FAO are committed to supporting societal change and technological innovation, backed by scientific evidence, to usher in an era of agrifood systems transformation that puts food safety at its heart.

Safe food is therefore a priority programme area for FAO. It is enshrined in the Strategic Framework 2022–31, and is integral to other priorities. These include transparent markets and trade, and strengthened "One Health" systems that seek to balance and optimize the health of people alongside that of animals, plants and the environment.

FOOD SAFETY AND THE SUSTAINABLE DEVELOPMENT GOALS (SDGs)

The United Nations' Sustainable Development Goals – the 17 interlinked SDGs – form an action plan for the well-being of people and planet, to be achieved by 2030.

Food safety underpins this vision. Unsafe food and inefficient practices would only drive us further off course in the race to fulfil the 2030 Agenda. By contrast, ensuring safe food for all will bring us that much closer to achieving SDG 2 (Zero Hunger) and other related goals and targets.

This simple correlation drives FAO's commitment to transform agrifood systems, providing safe food for everyone.

SDG targets directly related to food safety

SDG 2: "End hunger, achieve food security and improved nutrition and promote sustainable agriculture"

- Ensure universal access to safe and nutritious food (target 2.1)
- Ensure sustainable food production and implement resilient agricultural practices (target 2.4)
- Ensure stable food commodity markets and timely access to information (target 2c)

SDG 3: "Ensure healthy lives and promote well-being for all at all ages"

- End all preventable deaths under five years of age (target 3.2)
- Combat water-borne diseases and other communicable diseases (target 3.3)
- Reduce the number of deaths and illnesses from hazardous chemicals, pollution and contamination (target 3.9)
- Improve early warning systems for global health risks (target 3d)

Food loss and waste and the question of food safety

The SDGs call for halving per capita global food waste at retail and consumer levels, along with reducing food losses across production and supply chains.

Food safety regulations can reduce loss and waste through measures that prevent spoilage or contamination, or by promoting technologies that prolong shelf-life. If they are excessively strict, regulations may fuel loss and waste by preventing safe food from being absorbed into the market. Equally, a fragmented regulatory environment hinders risk assessment while encouraging non-compliance. Delays in testing for quality at borders, or difficulties acquiring certification, may cause spoilage even where storage facilities are exemplary.

FAO supports the development of national food control systems that can strike the fine balance required here: protecting consumers on the one hand, and avoiding inadvertently exacerbating food loss and waste on the other.

Together with its partners, FAO promotes food safety guidance and legislation that is scientifically accurate and actionable, and helps deliver that dual objective.

Food waste is antithetical to food safety
©Chris Steele-Perkins/Magnum Photos for FAO
and ©FAO/Riccardo De Luca

THE SCIENCE BEHIND FOOD SAFETY

Safe food does not occur spontaneously: it is the result of intense research, codification and policymaking.

For almost every safe ingredient that hits our plates, a lab somewhere has done the hard work
©FAO/Miguel Arreategui

For over 60 years, drawing strength from mandate complementarity, FAO has worked with the World Health Organization (WHO) to provide sound, neutral and independent scientific advice. The Codex Alimentarius, addressed in detail here, captures the science as the basis for international food safety standards, guidelines and codes of practice.

Policymakers use this scientific advice in managing food safety risks and making human nutrition recommendations in step with the resources available to them.

FAO/WHO BODIES PROVIDING SCIENTIFIC ADVICE ON FOOD SAFETY, NUTRITION AND HAZARDS

The following scientific expert committees and meetings convene or take place regularly, with participants selected on the basis of specialist knowledge to serve in a personal capacity alongside FAO and WHO experts.

Ad hoc expert consultations and meetings are also organized in response to specific needs or emergency situations.

JECFA
The Joint FAO/WHO Expert Committee on Food Additives

JEMRA
The Joint FAO/WHO Expert Meetings on Microbiological Risk Assessment

JMPR
The Joint FAO/WHO Meeting on Pesticide Residues

JMPS
The Joint FAO/WHO Meeting on Pesticide Specifications

JMPM
The Joint FAO/WHO Meeting on Pesticide Management

JEMNU
The Joint FAO/WHO Expert Meetings on Nutrition

JECFA

The Joint FAO/WHO Expert Committee on Food Additives

The body was founded in 1956 to provide scientific advice on food additives, contaminants and residues of veterinary drugs in food. It establishes and updates the principles for the safety assessment of chemicals in food. This is an evolving field, with ever more nuanced health outcomes requiring analysis. JECFA has paved the way to comprehensively addressing acute and chronic risks posed by contaminants, including exposure to a single pesticide or veterinary drug from multiple dietary sources.

JEMRA

The Joint FAO/WHO Expert Meetings on Microbiological Risk Assessment

This scientific expert group was formed in 2000 to gauge different aspects of microbiological hazards in food, with an emphasis on applicability to low- and middle-income countries.

To date, almost 400 experts have contributed to around 40 monographs. With 900 citations, JEMRA has made a demonstrable contribution to science.

JMPR

The Joint FAO/WHO Meeting on Pesticide Residues

Established in 1963, JMPR conducts risk assessments on pesticide residues and provides independent scientific expert advice on setting maximum residue limits (MRLs). It also develops and updates the principles and methodologies for risk assessment of pesticide residues in food. As of late 2022, JMPR had evaluated more than 300 pesticides and recommended more than 5 000 MRLs.

JMPS

The Joint FAO/WHO Meeting on Pesticide Specifications

JMPS is an expert ad hoc body created in 2002 to produce recommendations on the adoption, extension, modification or withdrawal of pesticide specifications. To date, more than 2 000 pesticide specifications/equivalences have been established/determined. JMPS has also developed the FAO/WHO training manual on development and use of the pesticide specifications.

JMPM

The Joint FAO/WHO Meeting on Pesticide Management

First convening in 2007, JMPM advises on matters pertaining to pesticide regulation, management and use, and issues alerts on new developments, problems or issues that otherwise merit attention.

JMPM combines the FAO Panel of Experts on Pesticide Management and the WHO Panel of Experts on Vector Biology and Control. Both are statutory bodies of their respective organizations.

JEMNU

The Joint FAO/WHO Expert Meetings on Nutrition

JEMNU was established in 2010 to provide scientific information and advice on nutrition. A recent example of its work was the publication of methods to determine the protein content of soy-based and milk-based ingredients in infant and follow-up formula.

THE CODEX ALIMENTARIUS

The Codex Alimentarius is a crucial resource, with a vital role in ensuring the safety and quality of food. This "food code" contains internationally agreed standards, applicable throughout the food supply chain. Its purpose is to protect health and facilitate trade. For consumers, this means food produced according to Codex guidance is safe and of the expected quality.

The texts contained in the Codex are considered the gold standard for international commerce in food – and as such are recognized by the World Trade Organization (WTO). They facilitate cross-border exchange, while preventing and helping resolve trade disputes.

"WHERE THE WORLD COMES TOGETHER TO CREATE FOOD SAFETY AND QUALITY STANDARDS TO PROTECT EVERYONE EVERYWHERE."

Work towards the Codex started in the 1950s, as post-war international food trade took off. But conflicting or absent safety standards remained a serious obstacle.

A founding meeting was held in 1963. Some 60 years later, the Codex represents a comprehensive and continuously updated collection of more than 300 standards, guidelines and codes of practice. It also includes over 10 000 specified limits for additives, contaminants, pesticide and veterinary drug residues.

Of particular note are the "General Principles of Food Hygiene" adopted in 1969, a foundational Codex text that is regularly updated and guides food producers worldwide, from multinationals and chain restaurants to the local street food vendor.

©FAO/Giulio Napolitano

Building consensus

Participation is wide. Discussions are held in 20 technical committees that meet throughout the year. Decisions are taken by 189 Members at the annual session of the Codex Alimentarius Commission. Over 240 Observer organizations are accredited to Codex to give input in their area of expertise. These include non-governmental organizations and umbrella bodies representing the private sector.

Productive collaboration is a driving principle. For example, the FAO GM Foods Platform is a publicly accessible repository, informed by sections of the Codex, through which Members can share information on safety assessments of foods derived from genetically modified plants.

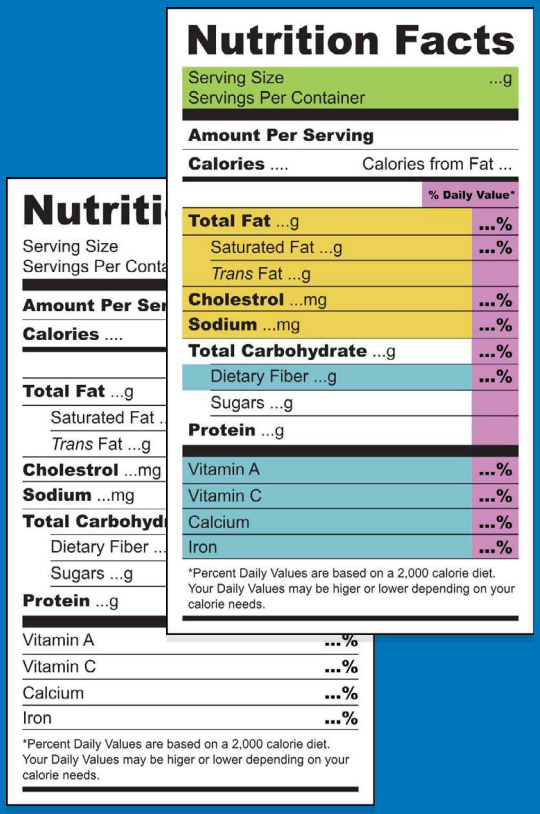
We have developed a four-part, publicly available online training course that covers the background to the Codex; how to use its standards; regional collaboration and FAO/WHO coordination committees; and the role of science and risk assessment in formulating Codex texts.

Labels save lives

Food labelling is vital. Food labels tell us what is in our food and how long it will keep. By reading them, we make healthy choices, prevent wastage and are better protected from counterfeit products which may harm us.

The Codex Alimentarius includes the "General Standard for the Labelling of Prepackaged Foods", used by countries as guidance for harmonization and as the basis for new food labelling policies.

The rise in food intolerances, and increasing awareness of the dangers of allergies, are another reason to focus on labelling that is standardized, accurate and easy to understand. Guidance on allergen management for food business operators is included in the Codex. It is based on the latest scientific information provided by FAO and WHO.



SCIENCE IN ACTION

Grounds for safe food

Mycotoxins – toxic metabolites produced by fungi – can spoil foods like maize and groundnuts, as well as high-value commodities such as coffee and cocoa. They present a threat to both human and animal health. They are implicated in liver and kidney damage, as well as in the risk of developing cancer. And their presence at hazardous levels has an economic impact, with disadvantaged populations typically experiencing the worst effects.

Climate change presents new risks here. Increased temperatures, for example, can adversely affect the prevalence of mycotoxins in susceptible crops at all points in the chain, from seed storage, propagation and growth, to harvest, storage, processing and distribution.

Our scientific work on this and similar subjects has underpinned texts in the Codex Alimentarius that help guide countries which otherwise lack research or regulatory capacity.

FAO has also produced an easy-to-understand, freely available online tool to guide testing of different commodities for mycotoxins. It should be of use to national authorities and food producers.

Keeping antimicrobials working

Resistance to antibiotics, along with other antimicrobials such as fungicide, is one of today's most urgent public health threats. Globally, it is estimated that antimicrobial resistance (AMR) directly caused 1.27 million deaths in 2019, while antimicrobial-resistant infections played a role in 4.95 million deaths.

Some antimicrobial infections may be transmitted through food. In addition to use in human medicine, the use of antimicrobials in livestock, aquaculture and crop production is driving resistance, making diseases difficult or impossible to treat – in humans, animals and plants alike.

FAO is committed to the responsible use of antimicrobials. This means improving food production practices, hygiene and sanitation to limit the contamination of foods during both production and processing. It also involves strict monitoring of the prevalence of antimicrobial-resistant pathogens and unsafe residues.

With scientific advice from FAO and WHO, Codex recently updated and developed texts which provide Members with a One Health approach to minimize and contain foodborne antimicrobial resistant bacteria, and undertake monitoring and surveillance of these organisms in the food chain.

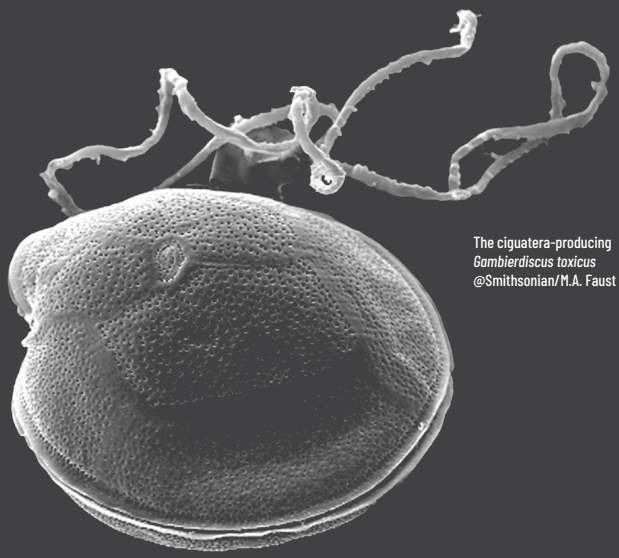
Safe seafood

Some algae, phytoplankton and fishborne bacteria produce powerful toxins which, if ingested, can cause gastrointestinal illness and even long-term neurological disease. In a small percentage of cases, they cause death.

Climate change and coastal water pollution create an enabling environment for harmful algal blooms, which have become more frequent, more intense and more widespread in recent decades.

Ciguatera fish poisoning is typically caused by an algal toxin that accumulates in reef fish. The toxin has no smell or taste and cannot be destroyed by home cooking. The symptoms of poisoning include nausea, vomiting, and neurological symptoms such as tingling fingers or toes. In very light cases, these pass after a few days or weeks, but in some cases the effects can be severe and last for years. Together with WHO, FAO has developed guidelines for managing and mitigating the risk.

FAO supports fishers, fish farmers, fish handlers and processors to stop such toxins entering the supply chain. The 189 Codex Members have agreed to a code of practice which directs and incentivizes preventative measures.



The ciguatera-producing *Gambierdiscus toxicus* @Smithsonian/M.A. Faust

Addressing emerging threats

In 2015, a bacterium called *Streptococcus agalactiae*, also known as Group B Streptococcus (GBS), caused an unprecedented foodborne disease outbreak that affected almost 150 people in Singapore, many of them healthy adults. The consequences were severe, including septicaemia or bacteraemia (blood poisoning). Penicillin can combat the symptoms, but only if they are identified quickly. Mortality may reach 80 percent.

Group B Streptococcus found in raw tilapia poisoned many in Singapore in 2015
©FAO/Timothy Barkham

The authorities traced the outbreak to the consumption of raw tilapia, a freshwater fish. But there is much that is not known about this sequence type of GBS. FAO rapidly produced a risk profile to inform aquaculture practices and guide producers throughout the supply chain to minimize danger, pending further research.

Meanwhile, seaweed has long formed part of the diet in many countries. Since 2000, production across the world has more than tripled. But seaweed consumption is not without risk. Factors at play include the type of seaweed, the season, and the way it is harvested and processed. There may also be hazards associated with heavy metals and marine biotoxins.

With legislation on seaweed production and utilization largely lacking, FAO is at the forefront of work to identify and analyse hazards, and develop guidance for what may become a pillar of future food security.

FOOD CONTROL SYSTEMS

With food traded widely across borders, adequate national regulations, legal frameworks and enforcement are essential.

Enforcing citrus production and packaging standards in southern Morocco
© FAO/Alessandra Benedetti

Effective national food control systems assure the safety and quality of foods being traded both nationally and internationally. They also fight food fraud, ensuring fair practices that foster economic opportunities for all parties along the food chain.

Food control systems include regulatory elements, such as legislation and official controls, and complementary processes, such as the sharing of information and training. The establishment of trusting relationships between all involved – government, academia, business and consumers – is paramount.

There must be appropriate legal and policy instruments; sound institutional frameworks; well-qualified human resources; and adequate financial assets, equipment and infrastructure, including access to laboratories. And these must target the right priorities. FAO's experience and expertise guarantee national authorities support at every level.

We are also active where food is produced: farmers and food processors must be equipped to grow, rear, harvest and process food free of harmful chemical residues and pathogens. This allows food business operators to win trust locally and abroad, thereby increasing food security and locking in income. FAO's farmer field schools (FFS), developed 25 years ago, remain highly prized thanks to their personalized, "bottom up" approach. Concepts and principles of food safety are being integrated into FFS training, including those related to the prevention of antimicrobial resistance.

Raising awareness of antimicrobial resistance at a farmer field school in Kenya ©FAO/Giulio Napolitano

FOOD CONTROL SYSTEM ASSESSMENT

Many of us increasingly eat a mixture of imported and locally produced food, from an ever more diverse supply chain.

This can present difficulties for national authorities in charge of food controls, who lack direct oversight of the production processes of foreign trading partners. Meeting requirements for paperless trade and certification may also be a challenge, especially in developing countries.

This is another area where FAO plays a crucial role. We work with government authorities, international organizations and partners to promote fair trade practices, stimulate dialogue between importing and exporting countries, and offer guidance on assessing food control mechanisms.

FAO's Food Control Assessment Tool helps national authorities develop food control systems which are harmonized, objective and consensual.

Improving food control systems in Africa

The African Continental Free Trade Area (AfCFTA) was established in 2018. It is a regional trading group with a wide membership, covering a population of 1.3 billion. The intention is for AfCFTA to boost intra-African trade by at least 50 percent in the short term, and make the continent more competitive in the global economy.

Much of the liberalized trade will be in food. And this food needs to be safe.

In 2022, FAO initiated an ambitious project with the Comoros, Eswatini, Kenya, Mauritius, Rwanda and Seychelles – all AfCFTA Member States – to assess their national food control systems. Funded by the European Union, the work has already shown itself to be a uniquely valuable learning process for all involved: government authorities, academics, consumer organizations and the private sector.

The project is helping ensure that the countries' food control systems have sufficient capacity, are better able to harmonize, and are capable of communicating feedback. The aim is to dismantle obstacles to freer, more extensive trade, while protecting consumers in Africa and beyond the continent's borders.

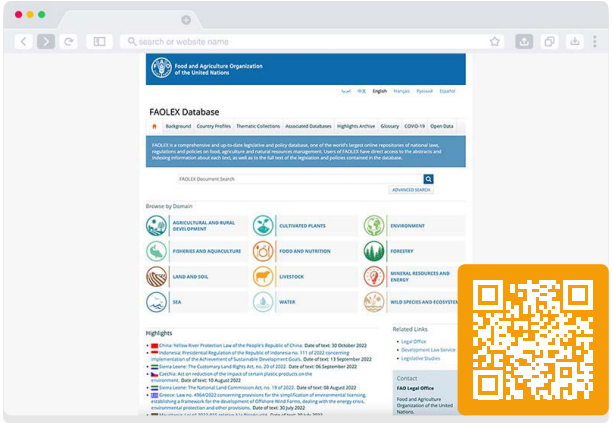
Strict safety standards at a local gourmet foods producer in Eswatini
©FAO/Giulio Napolitano

Strengthening governance and regulatory control

With a unique reservoir of knowledge accumulated over more than 40 years, covering differing legal traditions, FAO plays a major part in supporting countries to build a practicable food control system.

This may involve drafting or amending food safety legislation, and making sure it is internationally compliant, so that operators in the food chain are properly guided and, if necessary, held to account.

Integral to all of this is FAO's FAOLEX resource, the world's largest legislative database on food and agriculture. Active since 1995, it is continuously updated, with an average of 8 000 new entries added each year.

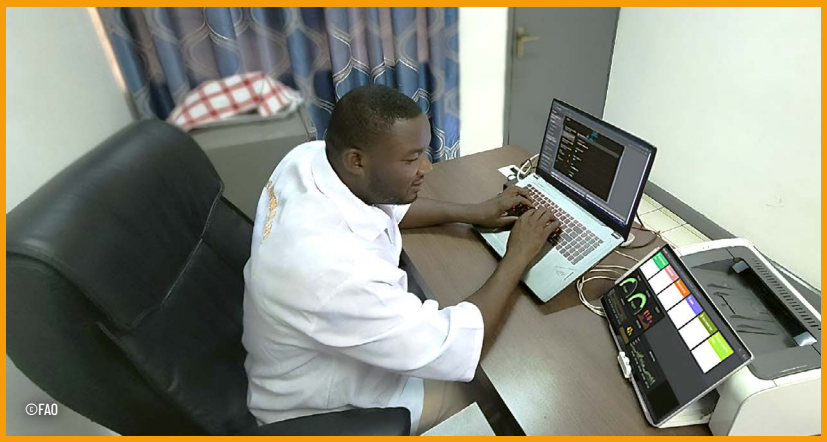


Explore the world's premier database on agrifood policy and legislation

FAOLEX currently contains legal and policy documents in over 40 languages, drawn from more than 200 countries, territories and regional economic integration organizations. Recent additions to the database include Croatia's new law on food hygiene and microbiological criteria for food, and a wide-ranging food safety law in Azerbaijan.

Another area where FAO legal expertise helps combat food safety threats is in helping national governments develop a coherent approach to food fraud. To this effect, an extensive FAO document identifies and analyses possible regulatory approaches, from food vulnerability assessments to traceability exercises to class action lawsuits.

Remote food inspection in Ghana



The COVID-19 pandemic created unprecedented challenges for national food control authorities. How could inspections, monitoring and other routine functions be conducted, when social distancing was mandated and remote work the norm?

In Ghana, FAO joined the Veterinary Service Directorate and the Food and Drug Authority to explore digital solutions that could enable remote inspection of food businesses and dispense online training.

A digital platform has been developed to capture self-control information from businesses. It also monitors parameters such as temperature through remote sensors. The data can be reviewed at a distance by national food control officers.

A pilot project has also been conducted at the large abattoir at Kumasi in Ashanti region, with personnel trained to input key information on premises maintenance and cleanliness, the storage and transportation of meat, and pest control.

Automation, artificial intelligence, big data and blockchain technology are crucial tools in minimizing risk and enhancing food safety management. It is also the case that in an increasingly digital environment, international trading partners must know how to participate in paperless electronic business or use voluntary third-party assurance. FAO works for solutions that are fair, to avoid throwing up barriers to markets and trade for developing countries.

Building capacity in Azerbaijan, the Republic of Moldova and Türkiye

The FAO Regional Office for Europe and Central Asia is supporting these countries to develop their technical capacity to manage and communicate food safety crises.

Our work takes a comprehensive approach that considers the legal basis, technical capacities, documented procedures, and a continuous review of the mechanisms involved.

Each of the three countries is setting up a multi-agency coordination group which, with FAO guidance, will develop a food safety emergency response plan that clearly outlines the steps to be taken in times of crisis, including risk assessment, management and communication.

Aside from advice on the regulatory framework, FAO is providing training to ensure technical staff from the relevant government bodies are properly equipped with the skills and knowledge they need. We will round off the work by conducting detailed simulation exercises to stress-test the plans, and develop a framework for monitoring and evaluation to keep them pertinent in the future.

Veterinarian training for a young Syrian refugee at a chicken farm in Mersin, Türkiye
© FAO/Ridvan Vahapo

CRISIS PREVENTION AND MANAGEMENT

Maintaining food safety day in, day out is a significant undertaking. When standards are breached, a local problem may easily turn into an international incident.

As a multilateral organization, FAO can advise on the likelihood of such incidents, including the precise way hazards could be transmitted through the food chain. The Organization can help build resilience, and in worst-case outcomes, suggest mitigating steps.

Jointly with WHO, FAO leads global information and prevention networks that draw upon national food safety authorities and experts to prevent, prepare for and respond to food safety incidents and emergencies.

The International Food Safety Authorities Network – INFOSAN – is one such instrument, designed to facilitate the rapid exchange of information during food safety-related incidents. Practical measures that INFOSAN can promote include launching consumer warnings or targeted product recalls.

FAO helps predict, reduce and mitigate the transmission of food hazards through the food chain

Meat production in Thailand

Delivering ice to meat and poultry stalls at a market in Thailand
©FAO/Lilliane Suwanrumpha

Prevention is better than cure, and strong food controls ward off food safety incidents in the first place. FAO's work in Thailand's livestock sector offers a good example.

In 2015, when we began implementing a livestock supply chain management project, the sector was vulnerable to food safety risks. These were linked to gaps in oversight and overlapping institutional responsibilities.

The advent of a regional common trading area in the Association of Southeast Asian Nations (ASEAN), and Thailand's ambition to become a hub within a now-expanded export market, meant better food control systems were a priority.

We implemented a 2.5-year project in Chiang Mai and Saraburi provinces to help food control authorities coordinate their work. Experts supported authorities in devising a roadmap to strengthen systems at provincial and national level, by harmonizing guidelines for the monitoring and surveillance of livestock products.

The new management tools also equipped authorities to address food safety emergencies with a national INFOSAN website, along with more efficient ways of communicating with each other.

Dominated by small businesses, Thailand's livestock sector now enjoys greater stability in the provision of quality safe food for domestic and export markets, as well as practices that are aligned to national and international standards.

Food safety in natural disasters

The volcanic eruption in the Tongan archipelago on 15 January 2022 was the largest recorded since Krakatoa in 1883: it triggered tsunami waves up to 15 metres in height. While few direct casualties were identified, up to 85 percent of the population was affected, with ashfall accounting for much of the damage.

Ash from volcanic eruptions often contains toxic chemicals that can enter the food supply though contact with crops, animals grazing in fields where the ash has fallen, and contaminated water. FAO experts were able to provide the Tongan authorities with essential and timely public health guidance.

Living under the shadow of an active volcano in Vanuatu
©FAO/Rudolf Hahn

Food trade in a complex world

Since 1995, the global trade in agrifood products has doubled: by 2018 it had reached USD 1.5 trillion in value. Over a third of exports now cross borders at least twice before reaching consumers.

Along with the benefits in terms of choice and prices come substantial new challenges for the management of food safety. The harmonization of food safety standards across borders, for example, or tracing the origins of food in a timely manner, are now much more demanding processes.

When any breach of food control is identified, the key step is to rapidly inform governments, food producers and, of course, consumers. But notification systems vary greatly from country to country: they may be digitized, though are often manual or entirely ad hoc. The less efficient the system, the greater the potential damage to human health and to trade.

FAO is a founding partner of WTO's Standards and Trade Development Facility. The body aims to help producers in developing countries meet food safety standards by promoting collaboration and greater access to knowledge and innovation. It represents an important means for producers in low-income countries to gain access to markets and benefit from cross-border trade.

A third of all food exports cross international borders twice or more on their way to the consumer

THE FUTURE OF FOOD SAFETY

Food technology and consumption modes stand on the brink of transformation. This will bring new safety challenges.

In this scene from Tajikistan, food safety awareness starts in the orchard
©FAO/Shodibek Sharipov

The world needs safer, more affordable and healthier diets for all, produced in a sustainable manner, along with the equitable improvement of economic outcomes and livelihoods.

Emerging technologies and new food production systems such as cell-based food production, 3D-printed food, aquaponics and vertical urban agriculture, may hold some of the answers we seek. Likewise, the global adoption of foods that were previously unique to some parts of the world, like seaweed, algae, jellyfish or edible insects, may contribute solutions.

However, even potentially positive developments in sustainable supply can have food safety implications which need to be assessed, communicated and managed across borders.

FORESIGHT: WHAT'S ON THE HORIZON?

FAO Foresight is a programme that helps policymakers and private sector operators address issues that will, or could, emerge in the medium-to-long term. It starts with gathering information through horizon scanning and scenario building, then analysing it and using the results for proactive decision-making. While the hazard may be substantial, the risk, if properly managed, can be kept to a minimum.

Hazards are evolving daily. Each day, for example, our microbiome is exposed to new microorganisms and compounds. The potential of food additives, residues of veterinary drugs and other contaminants to induce changes in the gut, along with possible consequences for human health, is increasingly on FAO's food safety agenda. The need to evaluate hazards, for the microbiome as in all areas where food is a factor, is therefore constant and ever-changing.

ONE HEALTH

The way we interact as humans with animals, plants and the environment as a whole, involves tightly interwoven and extremely delicate mechanisms. This idea is especially relevant to the field of food safety, where microorganisms are easily transferred to people through crops grown on contaminated soil, or from foods sourced from diseased animals.

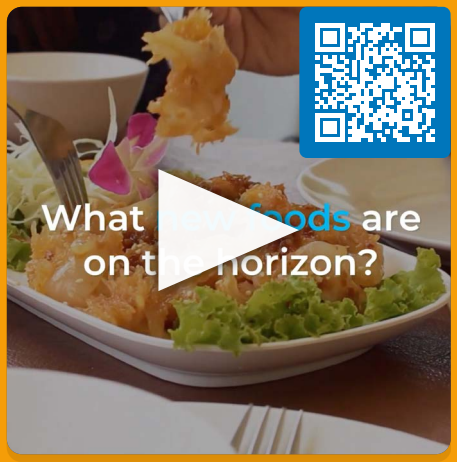
FAO embraces the concept of One Health, which recognizes the holistic nature of life on Earth. The idea has long been part of effective food safety management, and will play an even more important role in ensuring food remains safe in an era of emerging technologies and new food sources.

Food safety is a core tenet of One Health

A broader menu

The seasoning is typical for the region: lime, chilli, garlic and salt. But the key ingredient of Mexican *chapulines* is not meat as many might understand it: it is deep-fried grasshoppers.

Insects have long formed part of diets around the world, and entomological agriculture may be a source of food for many more of us in future. Their carbon footprint and water requirements, lower than those of other animal species, can make insects ideally suited to help achieve food security for a growing world population.



Insects also offer high nutritional value, ease of rearing, and the ability to be farmed in modular environments that could suit urban spaces. But if insects are to find a place on menus globally, there is much work to be done to ensure they are safe to eat.

As with other foods, edible insects can also be associated with food safety hazards, including biological contaminants, which may be greater if they are harvested in the wild or eaten raw. There is also the risk of allergy, and an absence of regulation governing their production and trade.

FAO is at the forefront of food safety in this new field.

IS CLIMATE CHANGE MAKING OUR FOOD LESS SAFE?

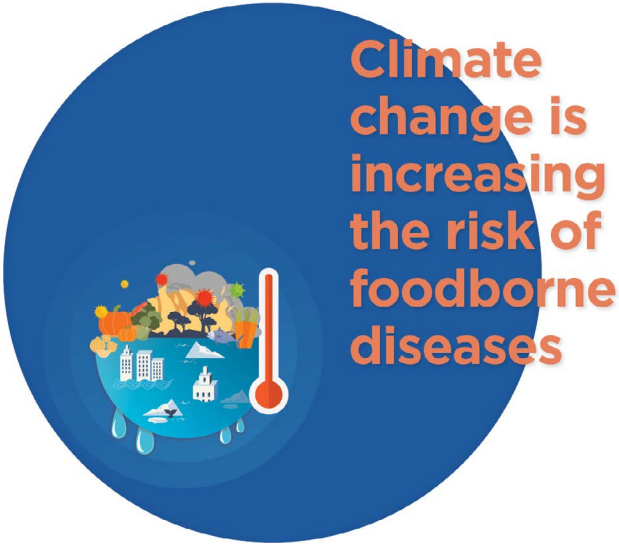
While climate change is a reality most are familiar with, FAO believes its effect on food safety should be much better understood. The Organization produced a publication on the topic in 2020.

Increasing temperatures can promote the survival and proliferation of foodborne pathogens like salmonella and vibrio, while there is evidence that the prevalence of mycotoxins and marine toxins from algal blooms may be increased by climate change. Put simply, these are beginning to occur outside their "traditional" environments.

Climate change can also increase contamination of staple foods such as rice, presenting further danger to populations already at risk from malnutrition.

Globalization has greatly lengthened food supply chains, which adds to the stress on existing food control systems. Climate change means regulations need further improvement still.

Effective international collaboration and monitoring, permitting digitized traceability and analysis, integrated into a structured foresight system, would provide many of the answers we need.



The relationship between unsafe food and climate change is circular: a third of the food we produce is wasted, in part because of contamination, the risks of which grow as temperatures rise.

WORKING TOGETHER FOR FOOD SAFETY

Food safety is as much about global standard-setting and international cooperation as about individual and community awareness.

With the right support and commitment, everyone can enjoy safe healthy food – including residents of the climate-challenged Dry Corridor of Honduras ©FAO/Eduardo Calix

FAO works in close collaboration with other UN agencies, national and international organizations and research centres, as well as food business operators and other stakeholders. And, of course, we work with our Members.

Together, we provide scientific advice, develop international food standards and share knowledge, especially during emergencies. We implement international sanitary and phytosanitary standards, build capacities in developing and adopting nuclear techniques, and tackle food safety issues throughout the food chain.

Food safety is a matter of collaboration, partnership and knowledge sharing

FAO'S PARTNERS

- FAO's longstanding partnership with WHO covers a range of activities which support global food safety and protect consumer health. FAO addresses food safety issues along the food supply chain, while WHO works with the public health sector to lower the burden of foodborne diseases.

- FAO works closely with the World Organisation for Animal Health (WOAH, founded as OIE) to enhance the responsibilities and effectiveness of veterinary services in improving food safety, at both international and national level, as well as in addressing antimicrobial resistance effectively.

- FAO is part of the Standards and Trade Development Facility, a global partnership hosted by WTO that supports developing countries in building capacity to implement international sanitary and phytosanitary standards and requirements, and thereby help gain and maintain market access, agricultural productivity and domestic food safety.

- FAO works with the World Food Programme (WFP) to tackle food safety issues especially at country level, where smallholder farmers are involved in supplying food for humanitarian assistance and school feeding programmes.

- In close cooperation with the International Atomic Energy Agency (IAEA), FAO, through the Joint FAO/IAEA Centre (Nuclear Techniques in Food and Agriculture), assists its Members in developing and adopting nuclear and related techniques that offer science-based solutions to regulating food safety.

Nuclear techniques in food safety

Nuclear science has multiple food safety applications. Launched in 1964, the Joint FAO/IAEA Centre (Nuclear Techniques in Food and Agriculture) (CJN) has made available to Member States more than 200 analytical methods and tools for detecting residues and contaminants in food.

In Bangladesh, thanks to CJN, isotopic and nuclear-based approaches are being used to test eggs, milk, chicken or shrimp samples for antimicrobial residues and mycotoxins. CJN is now building capacity for food microbiological analysis, including for foodborne zoonoses.

The Joint FAO/IAEA Centre's Food Safety and Control Laboratory at Seibersdorf, Austria
©FAO/Andrew Cannavan

The commercial use of irradiation as a phytosanitary pest prevention measure is enabling Viet Nam to trade in agricultural products that would otherwise be restricted by risk-based controls on the shipment of fresh commodities. Irradiation of premium quality fruits, supported by CJN, has guaranteed exports worth USD 20 million to the United States of America alone.

As well as residues of veterinary drugs and pesticides, heavy metals and biotoxins, CJN methods can be used to detect and combat food fraud and adulteration; determine and trace food origins; and attain international accreditation that boosts trade and consumer confidence.

The CJN Food Contaminant and Residue Information System (FCRIS) database is freely available. The body's scientific papers and laboratory manuals can be easily accessed online.

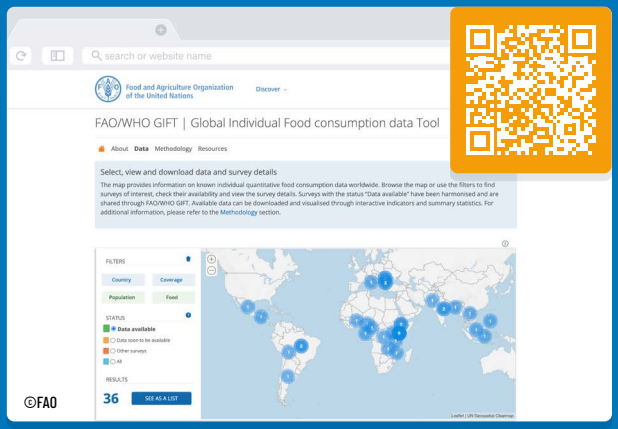
Nuclear techniques are a powerful food safety detection tool

A meal for all demographics at this family gathering in Kyrgyzstan ©FAO/Sergey Kozmin

Collecting data on the food we eat

Dietary data – information about what and how much people eat and drink – can yield important insights about nutrition and food safety.

Many policymakers and programme managers rely on dietary information gathered at the national or household level. But this may conceal crucial data about individuals such as adolescent girls, pregnant and breastfeeding women, small children, adult males, and so on.



View consumption data by country

FAO and WHO have developed the Global Individual Food consumption data Tool – FAO/WHO GIFT – to address such shortcomings. An open-access repository of dietary data, FAO/WHO GIFT makes information about what people eat and drink available to governments and other concerned parties, to help estimate exposure to chemical and biological hazards. Additionally, FAO and WHO are jointly collecting chronic individual food consumption data in the database called CIFOCOss.

Vulnerable population groups, such as women of child-bearing age, infants and young children, can be identified by the data, disaggregated by gender and age to allow focused analysis.

WORLD FOOD SAFETY DAY

The food supply chain is brittle and easily disrupted. The consequences of safety breaches can be rapid, widespread and fatal. Whether we draft policy, grow, process, transport, store, distribute, sell or prepare food, we have the power to promote food safety and protect health.

The seventh of June was declared World Food Safety Day by the United Nations General Assembly in 2018. And despite the COVID-19 pandemic forcing the occasion online in recent years, the event has continued to grow, along with the number of countries choosing to participate.

Safe and scrumptious: marking World Food Safety Day at FAO headquarters ©FAO/Giulio Napolitano

Since the very start, the motto of World Food Safety Day has been "Food safety is everyone's business". As the world's leading food agency, we at FAO believe this slogan speaks to the universal relevance of food safety, and to our duty to collaborate if we wish to achieve it.

The Day is about building greater awareness and inspiring action in food safety.

Food safety is indeed a collective aim. It begins with simple actions like washing one's hands and runs through to the complex scientific evaluation of chemical compounds and the isolation of pathogens. And it demands robust governance, along with the sharing of information.

We all have a role in keeping ourselves, and others, safe.

Further reading:

About FAO's work on food safety

For FAO publications about food safety:
https://www.fao.org/food-safety/resources/publications/en/

About Codex Alimentarius:
https://www.fao.org/fao-who-codexalimentarius/publications/en/

A life necessity, a social event, an act of love, a way of expressing ourselves: food is all of these things, as well as an important source of employment and the heartbeat of every economy.

But the food chain – growing, harvesting, processing, packaging, transporting, distributing, trading, purchasing, preparing, consuming, and eventually disposing of what we consume – is a fragile sequence in which every point is fraught with risk.

These pages address the work of FAO and its partners in ensuring food is safe.

Our intention is to develop, deploy and communicate the latest science; support good governance; facilitate food safety emergency prevention and response; and keep a close watch on both future opportunities and the risks that may accompany them.

Food is the essence of life. And food safety is everyone's business.

ONLINE VERSION

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