FOOD FORWARD NDCs

Regulating food quality and safety

Overview

Every year, **unsafe food** causes 600 million cases of foodborne diseases and 420,000 deaths worldwide, and 30% of foodborne deaths occur among children under 5 years of age.

There are a variety of possible interventions related to the regulation and monitoring of food quality and safety that could provide benefits including controlling foodborne illnesses, extending product shelf-life, enhancing traceability and reducing food loss and waste due to spoilage.

Concrete measures to implement

Promote research and development on food quality and safety by considering the following measures:

- Incentivize through public funding the development and use of **emerging technologies** for food monitoring such as smart packaging, optical sensors, humidity sensors, time-temperature sensors and bio-sensors.
    - **Chromogenic sensors**: versatile and generally cheap method for monitoring food packaging.
    - **Change** of the generic “Best Before” and “Use By” dating to a “dynamic” system using smart technology which offers information about the state of every package in real time.
- Incentivize the development of more broadly applicable food monitoring systems. Many advanced **monitoring systems** have been designed to

specifically prevent the spoilage of high-value foods with tighter perishability windows (e.g., meat, fish) rather than fruits and vegetables.

- According to the **World Index for Sustainability and Health** (WISH score), issues relating to the processing and preservation of fruit and vegetables are relatively neglected in research and development and therefore could be promoted.

Adopt food safety regulations:

- Regulate and catalogue the chemical substances involved in food production to minimize risks for human consumption (e.g. EU's **REACH programme**).
- Regulate the use of agricultural inputs that are harmful to human health, wildlife and ecosystems, such as synthetic pesticides and fertilizers.
- Mandate procedures for the approval, assessment and authorization of food products and other products in the food chain such as food enzymes, feed additives and plant protection products.
- Adopt procedures for **risk analysis**, including risk assessment, management and communication, to examine and manage the potential impact of a hazard that is introduced into the food supply, including identifying methods to effectively address food safety issues and to introduce appropriate food control measures.
- Require that food businesses conduct food safety assessments and improve their public transparency, including related to data on food safety assessments, environmental risk assessments and the authorisation of new foods.
- Develop a **national food control strategy**. National food control strategies enable countries to develop an integrated, coherent, effective and dynamic food control system, and to determine priorities which ensure consumer protection and promote the country's economic development. Such a strategy should provide better coherence in situations where there are several food control agencies involved with no existing national policy or overall coordinating mechanism. In such cases, this strategy helps prevent confusion, duplicative efforts, performance inefficiencies and resource waste. The strategy should be based on multi-sectoral inputs and focus on the need for food security, as well as consumer protection from unsafe adulterated or misbranded food. At the same time, it should consider national economic interests related to trade imports and exports, food industry advancements and farmers' and producers' interests.

Strategies should use a risk-based approach to determine priorities for action. Areas for voluntary compliance and mandatory action should be clearly identified, and timeframes determined. The need for human resource development and strengthening of infrastructure such as laboratories should be also considered.

Adopt regulations for food quality:

- Improve food options by improving the availability and affordability of healthy and sustainable food options to replace unhealthy, ultra-processed foods high in fats, sugars and salt. For example, zoning laws can encourage healthy food outlets and restrict the number of "fast food" outlets and other stores specialising in ultra-processed, low-nutrition foods.
- Not all processed food is automatically unhealthy. Where consumption of fruit and vegetables is below the recommended levels, sustainable, resource-efficient autonomous processing and preservation methods can promote the consumption of nutritious, safe and long-lasting products.
- Develop food quality labels and certification systems (e.g. **EU's schemes** for indicating geographical origin and quality of products).

Strengthen capacity of producers and consumers:

- Promote the development, commercialisation and use of food processing methods/technologies that can limit development of food-borne pathogens such as drying, smoking, salting, fermenting, pickling, canning and irradiation. These methods can preserve the nutritional, aesthetic and taste qualities of food while dramatically extending shelf life and reducing food loss.
- Implement tighter restrictions and/or monitoring of food vendors operating under poor sanitary conditions, such as those often found in "**wet markets**" and other informal markets.
- Launch initiatives to train informal value chain actors (e.g., **street food vendors**) on proper food handling practices.
- Improve street food stall **operating conditions** (e.g., provide clean and protected structures, access to potable water and efficient waste collection/disposal systems).
- Develop and launch public information campaigns to inform households on how to avoid food poisoning and other food safety issues (e.g., through proper handling and cooking practices). Approximately **40%** of food-borne

outbreaks occur in private homes, compared to 22% in public kitchens (e.g., restaurants or cafeterias).

Enabling governance measures

- **Utilize technology** (e.g., cloud computing, Blockchain, GPS, Internet of Things (IoT), Big Data or artificial intelligence) for food safety monitoring and communication.
- **Enhance collaborative efforts** among academia, industrial actors, governments and beyond, to better integrate monitoring technologies into food supply chains.
- **Implement food safety standards and surveillance networks** that operate at and between local, national, regional and global levels, and harmonize any relevant regulatory frameworks across these different political jurisdictions.
- To achieve maximum consumer protection, it is essential that safety and quality be built into food products from production through to consumption. This calls for a comprehensive and integrated **farm-to-table approach** in which the producer, processor, transporter, vendor and consumer all play a vital role in ensuring food safety and quality.
- Strengthen **organisational structures** for national food control systems.
- **Provide sufficient funding** for national food control systems.
- Fund studies to investigate the prevalence of **heavy metals** in agricultural soils; use data to create databases that map soil contamination levels by area to inform land use and agricultural policy to reduce contamination through measures like soil moisture management, amendment application, addition of organic manure, selection of crop varieties with a low uptake of heavy metals and the adoption of agroecological practices.


Made with sustainable palm oil
Two fish fingers provide...
cal 105
fat 4.2g
sat fat 0.6g
total sugars 0.5g
salt 0.44g
Sainsbury's
Breaded
20 Cod fillet fish fingers
Skinless & boneless fish fingers coated in light & crispy Signature breadcrumb and made with 100% cod fillets
MARINE STEWARDSHIP COUNCIL
SGS-NIL-MSC-C-00002
This product comes from a fishery which has been certified to the Marine Stewardship Council's environmental standard for a well managed and sustainable fishery.
www.msc.org

Tools and MRV systems to monitor progress

Data tools

Data tools can help compile data collected by food monitoring technologies and systems. This data could provide insight into various markers of food safety and quality, such as the percentage of food detected that contains harmful pathogens.

Food Control System Assessment Tool

FAO and WHO have developed a Food Control System Assessment Tool. The main objective of the tool is to propose a harmonized, objective and consensual basis to analyse the performance of a national food control system. It is intended to be used by countries as a supporting basis for self-assessment, and to identify priority areas of improvement and plan sequential and coordinated activities to reach expected outcomes. By repeating the assessment on a regular basis, countries can monitor their progress. The Tool is based on principles and Guidelines for National Food Control Systems adopted by the FAO/WHO Codex Alimentarius Commission, as well as other relevant Codex guidance for food control systems referenced throughout the document. The scope of the tool is given by the dual objectives quoted in Codex guidance for these systems: to protect the health of consumers and ensure fair practices in the food trade.

Link: https://www.fao.org/documents/card/en/c/ca5334en/

Climate change mitigation benefits

Improving food safety reduces food waste and losses and associated emissions by reducing unsafe foods that would be discarded for health and safety reasons.

Other environmental benefits

Measures to improve food quality and safety may also reduce air pollution due to reduced food waste in landfills.

Adaptation benefits

- Food security

- Health and well-being
- Increased efficiency of food systems. For example, **improved monitoring capacity** can enhance trust among members of a supply chain, facilitating the creation of contractual relationships, the reduction of transaction costs and reduction of market imperfections.
- Technologies like **smart packaging** can reduce food waste/loss through improved efficiency in supply chains, while also adding to food safety and quality. In the long run, these improvements also reduce costs and increase revenues for producers and vendors. Improved **traceability** from these technologies also reduces the probability of food safety issues and recalls.

Other sustainable development benefits

- SDG 3 (Good health and well-being): ensure healthy lives and promote well-being for all people at all ages.
    - Target 3.4: Reduce mortality from non-communicable diseases and promote mental health.
- SDG 9 (Industry, innovation, and infrastructure): Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
    - Target 9.5: Enhance research and upgrade industrial technologies.

Potential externalities and trade-offs

- **Improved food quality and/or sustainability standards** can lead to higher prices for consumers.
- Food monitoring technologies like smart packaging have struggled to penetrate the market due to low levels of **marketing**, consumer awareness, and consumer trust.
- Smart packaging that provides real-time alerts and product information could nudge consumers towards only purchasing newly displayed items,

thereby leading to food waste at the retail level and **revenue losses** for retailers.

Measures to address potential externalities and trade-offs

- **Enhanced transparency** through traceability may help to persuade consumers to pay higher prices for more sustainable products.
- Incentivise the development and use of food **monitoring systems** using machine-learning and tamper-proof, decentralised blockchain technology.
- Expand the research and development needed to develop more advanced, scalable, versatile and marketable monitoring technologies, such as **interactive packaging** using nanotechnology, to measure product quality more quickly and accurately.

Implementation costs

- Available monitoring technologies generally have high **manufacturing costs**.

Intervention in practice

- In 2009, a **group-based, participatory training** to improve food safety among meat processors and retailers was implemented in Bodija Market, Ibadan, Nigeria. The training included a workshop for representatives of butchers' associations, who were tasked with passing on the information to their respective networks. The workshop led to significant improvements in food safety knowledge, attitudes and practices, including improved understanding of the sources of contamination and methods to prevent food-borne disease. The microbiological quality of meat sold after the workshop improved significantly from the levels prior to the training. The total cost of the workshop was USD 4,414, with costs going to materials, advertising and logistics. With an estimated 500 butchers reached, the cost per butcher was roughly USD 9.
- In East Africa, the **Fruits and Vegetables for All Seasons** (FruVaSe) project improves the nutrition and economic empowerment of women. Over the course of three years in Kenya, Tanzania, and Uganda, the initiative developed capacity for sustainable processing of nutritious surplus fruits and vegetables and their by-products. The project improved shelf life, food safety and food security, as well as the supply of nutritious, affordable products regardless of seasonality. It also investigated novel processing techniques, consumption patterns, and the marketing of preserved foods.

References

1. Chen, S., Brahma, S., Mackay, J., Cao, C., & Aliakbarian, B. (2020). The role of smart packaging system in food supply chain. *Journal of Food Science*, *85*(3), 517–525
2. European Commission. (n.d.). Geographical indications and quality schemes. *Agriculture and rural development*. Retrieved February 19, 2024, from https://agriculture.ec.europa.eu/farming/geographical-indications-and-quality-schemes_en
3. FAO and World Health Organization. (2002). *Statistical Information on Food-Borne Disease in Europe Microbiological and Chemical Hazards*. Retrieved from https://www.fao.org/3/x6865e/x6865e.pdf
4. Food safety regulations in the European Union. (n.d.). *BIOSAFE*. Retrieved February 19, 2024, from https://www.biosafe.fi/insight/food-safety-regulations

5. Grace, D., Dipeolu, M., Olawoye, J., Ojo, E., Odebode, S., Agbaje, M., et al. (2012). Evaluating a group-based intervention to improve the safety of meat in Bodija Market, Ibadan, Nigeria. *Tropical Animal Health and Production*, *44*(1), 61–66
6. Hawkes, C., Walton, S., Haddad, L., & Fanzo, J. (2020). *42 policies and actions to orient food systems towards healthier diets for all*. Retrieved from https://www.foodsystemsdashboard.org/resources/publication-42.pdf
7. Jose, A., & Shanmugam, P. (2019). Supply chain issues in SME food sector: a systematic review. *Journal of Advances in Management Research*, *17*(1), 19–65
8. King, T., Cole, M., Farber, J. M., Eisenbrand, G., Zabaras, D., Fox, E. M., et al. (2017). Food safety for food security: Relationship between global megatrends and developments in food safety. *Trends in Food Science & Technology*, *68*, 160–175
9. Ma, L., Chen, H., Yan, H., Wu, L., & Zhang, W. (2019). Food safety knowledge, attitudes, and behavior of street food vendors and consumers in Handan, a third-tier city in China. *BMC Public Health*, *19*(1), 1–13
10. Mahmoud, B. (2020). Ban, Modernize, and Prevent: Wet Food Markets and Public Health. Retrieved from https://www.researchgate.net/profile/Barakat-Mahmoud/publication/341878786_Ban_Modernize_and_Prevent_Wet_Food_M Modernize-and-Prevent-Wet-Food-Markets-and-Public-Health.pdf
11. Müller, P., & Schmid, M. (2019). Intelligent Packaging in the Food Sector: A Brief Overview. *Foods*, *8*(1), 16
12. Omore, A., & Baker, D. (2011). Integrating informal actors into the formal dairy industry in Kenya through training and certification. Retrieved February 19, 2024, from https://hdl.handle.net/10568/16492
13. Poyatos-Racionero, E., Ros-Lis, J. V., Vivancos, J.-L., & Martínez-Máñez, R. (2018). Recent advances on intelligent packaging as tools to reduce food waste. *Journal of Cleaner Production*, *172*, 3398–3409.
14. REACH Regulation. (2024, February 8). *European Commission*. Retrieved February 19, 2024, from https://environment.ec.europa.eu/topics/chemicals/reach-regulation_en
15. Strenghtening National Food Control Systems. (n.d.). Retrieved February 19, 2024, from https://www.fao.org/3/y8705e/y8705e05.htm.
16. The EX-Ante Carbon-balance Tool (EX-ACT). (n.d.). *Economic and Policy Analysis of Climate Change*. Retrieved February 19, 2024, from https://www.fao.org/in-action/epic/ex-act-tool/suite-of-tools/ex-act/en/
17. von Holy, A., & Makhoane, F. M. (2006). Improving street food vending in South Africa: Achievements and lessons learned. *International Journal of Food Microbiology*, *111*(2), 89–92

18. World Health Organization. (2015). *WHO estimates of the global burden of foodborne diseases: foodborne disease burden epidemiology reference group 2007-2015*. Retrieved from https://iris.who.int/bitstream/handle/10665/199350/9789241565165_eng.pdf

19. WWF UK. (2021). *Driven to waste: The Global Impact of Food Loss and Waste on Farms*. Retrieved from https://files.worldwildlife.org/wwfcmsprod/files/Publication/file/6yoepbekgh_w_ga=2.82962259.492775276.1694102630-1040752906.1694102630

20. Yousefi, H., Su, H.-M., Imani, S. M., Alkhaldi, K., Filipe, C. D. M., & Didar, T. F. (2019). Intelligent Food Packaging: A Review of Smart Sensing Technologies for Monitoring Food Quality. *ACS Sensors*. Retrieved February 19, 2024, from https://pubs.acs.org/doi/abs/10.1021/acssensors.9b00440

21. Yu, B., Zhan, P., Lei, M., Zhou, F., & Wang, P. (2020). Food Quality Monitoring System Based on Smart Contracts and Evaluation Models. *IEEE Access*, *8*, 12479–12490