Food and Agriculture Organization of the United Nations

World Health Organization

World Trade Organization

African Union

SAFE AND **SUSTAINABLE** FOOD SYSTEMS IN AN ERA OF ACCELERATED **CLIMATE CHANGE**

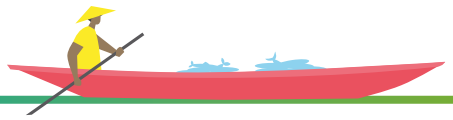
KEY MESSAGES

Agriculture is facing an unprecedented confluence of pressures that is causing profound changes in our food production (crop, livestock, forestry, fishery and aquaculture) systems.

A paradigm shift in practices is required to ensure a sufficient supply of safe food at a global level while at the same time mitigating climate change and minimizing environmental impacts.

As food production systems transform to adapt to changing conditions, there is need to carefully consider impacts on food safety and to evaluate optimal ways to address potential risks.

INTRODUCTION



The world is facing unprecedented global obstacles[1] that affect the sustainability of food and agriculture systems and the livelihoods of smallholders and family farmers worldwide. These problems include resource depletion and the adverse impacts of environmental degradation, such as desertification, drought, land degradation, water scarcity, pollution and loss of biodiversity; climate change; and an ever-increasing world population. Collectively, these challenges pose serious threats to food security. Hunger and chronic undernourishment are on the rise and preventable foodborne diseases continue to affect millions annually. Furthermore, there are projections that, by 2050, the growing world population may require twice as much food as was produced in 2012. This is a problem that is exacerbated by the loss or waste of about one-third of the food produced globally[2], most of which can be attributed to weaknesses in food safety and quality management along value chains. All agriculture sectors - crop, livestock and aquaculture - are therefore at a cross-road. Concurrent with increases in agriculture productivity, negative environmental impacts must not only be minimized, but reversed. This represents a paradigm shift in agriculture towards sustainable intensification that is prepared for shocks and change, such as climate variability and emerging and re-emerging food safety crises. National, international and inter-sectoral responses, policies, capacity development, innovations and incentives are needed that address food safety concerns associated with this fast pace of natural, technological, demographic and social change.

KEY EMERGING FOOD SAFETY CHALLENGES

1. CLIMATE CHANGE AND ITS IMPACTS ON FOOD SAFETY

The infections of plants and animals with microorganisms harmful to humans is influenced by a number environmental conditions. Thus, climate change has the potential to directly impact food safety. For example humidity, water availability, and temperature affect likelihood of fungal contamination and accumulation of mycotoxins. Heavy rainfall events and flooding can contribute to transmission of zoonotic agents and chemical contaminants from livestock to the environment, crops, and to other livestock and to humans. Eutrophication, due to the nutrient enrichment of aquatic environment, is a source of the contamination of seafood through toxin-producing harmful algal blooms. Methylation of mercury is proportional to atmospheric mercury, seawater temperature, pH and eutrophication. The current level of methylmercury is close to 29 percent of all Hg in sub-surface ocean waters and this is expected to double by 2050. The links between climate change and the foodborne disease prevalence need to be defined and effective adaptation and intervention strategies introduced.

2. SUSTAINABLE INTENSIFICATION AND FOOD SAFETY

In the context of long-term food security and to meet increasing food demands, increased production of food must be accomplished by producing more from reduced available land and by using fewer inputs. This type of sustainable agriculture takes into account food safety along with a host of other multi-sectoral topics such as economic planning, trade, education, social affairs, health, energy, transport, natural resources and the environment. The idea that changes in any of these outwardly unrelated sectors may introduce food safety hazards must be maintained at the forefront of decision-making. It is critically important that all government ministries concerned with nutrition and agriculture coordinate and align their policies and their communication efforts across sectors to achieve sustainable intensification.

2.1 Sustainable crop production

by incorporating ecologically based management strategies into farming practices, seeks to increase yields while limiting the need for excessive application of pesticides or synthetic

fertilizers. However, applying organic fertilizers, such as manure or organic (food or industrial) waste, or irrigation with wastewater may inadvertently distribute heavy metals and microbial contaminants across arable land and on crops. Climate change and intensification contribute to increased disease pressure, amplifying the need for better integrated pest management strategies and adequate capacity for comprehensive pesticide risk assessments on the international scale that evaluate, and periodically re-evaluate as necessary, residues and mixtures of residues of pesticides occurring in crops.

Controlled-environment agriculture technologies (e.g. hydroponics, vertical farming) extend growing seasons and conserve water resources but augment the potential for the spread of foodborne pathogens and contaminants if introduced into this concentrated mass production operation.

2.2 Sustainable livestock production

is required to meet the growing demand for meat: projections indicate that meat demand in low and middle-income countries may grow by 80 percent by 2030 and by 200 percent by 2050. Unless addressed at the onset, intensification of livestock production in its current form will impact human health through environmental contamination and increased food safety hazards. For example, mixed crop-livestock production systems represent about half of the world's food production from smallholder farms. Ensuring that these systems are sustainable and while at the same time mitigating the risk of food safety hazards in crop-livestock systems, such as through fertilization or contaminated feeds, is critical.

Appropriate intensification policies and government interventions are needed at all scales of production, as well as specific food safety standards and regulations. The current dangers of antimicrobial resistant organisms emerging and emanating from livestock production will continue to threaten the safety of the food supply.

However, the use of novel feed additives such as prebiotics, probiotics and bioactive substances to improve immunity, reduce emissions and enhance production without antimicrobial growth promoters needs to be thoroughly evaluated to avoid unintended consequences on food safety.

2.3 Sustainable aquaculture production

produces more than half of all fish consumed by humans. Disease is an important sustainability issue and the situation in aquaculture has become increasingly complicated due to the number of different species being cultured, the culture environment, the systems and types of management and scale of operation. Fish is also the most traded food commodity, while creating new market opportunities for farmed aquatic animals, in the absence of appropriate biosecurity, the spread of pathogens and diseases is increased. These trends have all led to increased reliance on veterinary medicines to ensure successful production. A number of veterinary medicines used in aquaculture have been shown to have potential harmful effects on human, leading to bans on their use in aquaculture. The emergence of vaccines has dramatically reduced dependence on antimicrobials in some sectors of aquaculture. More judicious use of veterinary medicines by aquaculturists, better enforcement of current regulations by government and improved health extension support to farmers would result in

1. FAO 2017. The future of food and agriculture – trends and challenges. http://www.fao.org/3/a-i6583e.pdf
2. FAO 2011. Global food losses and food waste. http://www.fao.org/docrep/014/mb060e/mb060e00.pdf

more prudent and responsible use of veterinary medicines in the sector. At the same time, integrated systems in many regions may introduce other food safety risks: animal waste used to feed fish frequently contains high levels of heavy metals, such as zinc and mercury, and occasionally zoonotic pathogens. Using manure slurry as feed for fish can contaminate fish and the use of waste as fertilizer can contaminate crops. Food safety implications should be considered when modifying aquaculture practices to address intensification challenges.

3. ALTERNATIVE FOOD AND FEED PRODUCTS

Alternative food and feed products are emerging as solutions to combat threats to food security and new technologies are being explored as ways to salvage and reuse products that would otherwise enter the waste stream. This is consistent with the concept of circular bio-economy, defined as an: "economic system that replaces the 'end-of-life' concept with reducing, reusing, recycling and recovering materials in production/ distribution and consumption processes". There are demonstrated positive environmental effects of this practice. Japan is a leader in the recycling of food waste as feed and has developed a market premium of "ecofeed" for pork products to incentivize safe recycling in the pig sector. Nevertheless, feeding food waste to animals is still being debated in many countries due to concerns about disease control, food safety and consumer acceptance. The intensive production of insects for human food and animal feed is also being explored, driven largely by their low environmental footprint. The use of insects as food and feed is traditional in some countries, and novel in others, and this difference of perspective possibly underlies the divergent food safety regulatory approaches being applied in different jurisdictions. It is important to pursue a convergence of regulation and this needs to be driven by scientific evidence.

Overall, with respect to alternative food and feed sources, data gaps need to be addressed and consensus and agreement will have to be reached to establish food safety standards and facilitate the trade of these products.

THE FUTURE OF **FOOD SAFETY**

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