FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

FOOD SYSTEMS IN TRANSITION: FOOD LOSS AND WASTE, FOOD QUALITY LOSS AND FOOD SAFETY

FEED THE FUTURE INNOVATION LAB FOR FOOD SAFETY

This conversation was lightly edited by Olivia Hall, a freelance writer with the Feed the Future Innovation Lab for Food Safety. The lab is one of 20 such labs with U.S. universities under Feed the Future, the U.S. government's global hunger and food security initiative led by USAID.

Dr. Jocelyn Boiteau is a postdoctoral associate with the Tata-Cornell Institute for Agriculture and Nutrition (TCI). A registered dietitian, she conducted doctoral work measuring food loss and waste along tomato value chains in South India. With TCI Founding Director, Dr. Prabhu Pingali, she is writing a book on food loss and waste that considers qualitative aspects of food loss and waste — including food quality losses that impact nutrition — in low- and middle-income countries along the continuum of traditional, mixed and modern food systems. We asked her to share her insights on food loss and waste as it pertains to food quality loss and food safety.

What is your working definition of food loss and waste?

There's no harmonized definition for food loss and waste. But we recently came out with a paper in Global Food Security where we reviewed different definitions and frameworks used in the [Food and Agriculture Organization of the United Nations] FAO's food loss and waste database. This tracks progress for the Sustainable Development Goal target 12.3 [aiming to halve per capita global food waste by 2030]. We concluded that the definition put forth by a group led by the FAO in 2014 was both globally applicable and also comprehensive. As we summarize it, food loss and waste is a reduction in both the quantity (physical food loss and waste) and/or quality (nutritional value and food safety) of the edible portion of food, from the time the food is ready for harvest or slaughter to human consumption.

Why is it important to consider food quality loss as well as physical food loss and waste?

In our book, we look at how food loss and waste pathways are linked to food security. More than just the number of calories people eat, the definition of food security — just like that of food loss and waste — incorporates nutritious and safe foods that are available and accessible to people. To date, a lot of the focus of food loss and waste has been on how much mass or volume is removed from the system. We consider how food quality loss happens in a system and may or may not be linked to quantitative food loss. For example, as a food moves through a food value chain, it may lose quality and food safety, but it's still in the system and may become available to consumers. If you remove that from the value chain, you have physical food loss and waste, but you've also diverted unsafe food away from consumers, which can be looked at as positive. As we consider different strategies to reduce food loss and waste, it might not be enough to focus only on physical food loss and waste.

Food loss and waste have been well-studied in high-income countries. However, food systems in low- and middle-income countries are transforming and may have sectors with traditional production systems and value chains that are modernizing. How does this affect food loss and waste, including food quality loss?

We look at different types of food systems as they transform from traditional to modern systems. Traditional food systems have very short supply chains, both geographically and in terms of the number of actors involved. They tend to be staple-heavy, and there is less processing involved. As systems evolve, we see an elongation of value chains, for example with increased demand for food, especially perishable items like fruits and vegetables but also animal products, from growing populations in urban areas. In modern food systems, there are long distances and consolidation of value chain actors. Different infrastructure enables cold chain processes for storage and transportation, and processing is more modern due to technology. The diversity of foods changes with consumer demand, based on what they can afford. And so, as consumers are demanding more perishable produce, for example, the implications for food loss and waste may be different than in value chains for staple grains. So we need to look at how both quantitative and qualitative aspects are changing.

For example, looking at fresh fruits or vegetables being transported over increasing distances — when they are handled roughly or packaged in containers either too tightly or without enough support, they may get bruised, cut or exposed to other damaged produce that leaks moisture. This type of physical damage predisposes produce to decay and leads to accelerated deterioration. Sometimes this damage isn't visible to consumers at the time of purchase. Other times, the only affordable option to consumers is the lower quality produce with these visible defects.

As food systems evolve, how do food safety risks change?

Biological, chemical or physical safety hazards can come up on the production side and affect people once the food enters the value chain to be consumed, or they can occur postharvest or postproduction. In traditional food systems, there's a significant foodborne disease burden for things like zoonotic diseases and parasites of animal source foods. As we move toward mid- to late-transitional systems with longer value chains, we get other types of food hazards like food additives or adulterants, maybe heavy metals or different microbial pathogens. There may also not be food safety standards or, even when standards exist, infrastructure for monitoring time and temperature abuses. When we move to modern systems, both private and public food safety standards are higher, so we see the burden for a lot of these biological, chemical and physical hazards drop off compared to earlier stages.

What are critical loss points for food safety and quality in transitional food systems?

The critical loss points depend on the specific value chain and food commodity. For example, a lot of fresh produce may still be consumed fresh in transitional food systems. The wholesale markets with poor sanitation — such as the ones I observed during my Ph.D. fieldwork in South India — represent a critical loss point. Tomatoes were traded between farmers and wholesalers at markets that were crowded with people, livestock, trucks and other vehicles, and tomatoes spoiled, particularly during peak season. Crates of tomatoes were stacked on the dirt. Sometimes tomatoes would spill out onto the ground and be placed back into the crates. So I imagine the exposure to different food hazards was high.

With growing value chains, some of the fruits and vegetables are entering processing facilities, where there could be issues with certain food safety hazards, such as additives and adulterants. A really good example of how efforts to reduce physical loss and waste can actually generate a food safety issue is when grains are stored in some value chains in transitional food systems. To reduce physical food losses due to insect infestation, sometimes pesticides are used — adding a potential chemical food safety hazard. If we're just measuring the physical food loss and waste, this might seem like a great intervention, but if we consider the qualitative aspects as well, we also ask about the trade-offs.

What do you consider some of the most promising interventions that can help reduce both food quality loss and food safety loss?

Interventions are multifactorial and can start at different levels. Take targeting time and temperature abuses for perishable items, for example. That might require some sort of infrastructure to develop on the public side if there's not sufficient electricity for storage or if road conditions make transportation take a long time. We are trying to identify what these critical points are across different types of value chains and what is needed from actors at different levels. We also know that as these systems are transitioning, private food safety standards usually emerge before or alongside public standards. An example of this would be a private company, such as a regional or global supermarket chain, implementing food safety and quality standards to build their reputation and develop consumer brand loyalty. This can create positive competition between brands and potentially improve local food safety environments when public standards are limited. However, there is the challenge to adapt food safety management systems that are designed and used in high-income countries to fit low- and middle-income country contexts.

In connecting food quality loss to physical food loss and waste in practice, a huge part is first identifying the food safety loss. Private or public standards or rules are needed to identify the threshold that says, OK, now this is a food safety concern. Then there are monitoring and action steps and how they are actually implemented to physically remove food from the system. What's really challenging is when the food quality loss hasn't been identified or the food hasn't been removed from the system.

You are currently writing a book on this topic with Dr. Prabhu Pingali. What can we expect from it?

We're hoping to have a first draft finished by early 2024. Our motivation is that there's been a lot of interest in food loss and waste — broadly speaking, from environmental, socioeconomic and food security perspectives. We focus on food security, because there is an assumption that when you reduce physical food loss and waste, you improve food security, without really defining how that works throughout different food systems and value chains. We have to understand the problem of loss and waste reduction in certain contexts. How do we account for the structural transformation of

economies? How do we account for these different types of food systems and the direction of these transformations in what is important for food loss and waste, both the quantitative and qualitative aspects? Our target audience is people doing both research and programming on food loss and waste and involved in policymaking. I hope we'll get the conversation going on how to measure qualitative aspects of food loss and waste and how they indicate what types of policies or interventions would be best suited in different contexts.