



How can water management improve food security?

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Objectives and methods

Water is a factor input for many food system activities such as agriculture, food processing and consumption. However, food system activities also affect water resources. Moreover, the shift in focus of food security in Low- and Middle-Income Countries (LMICs) from producing enough staple foods toward healthy diets stimulates local production of fresh food such as fruit, vegetables and fish even in water scarce regions. However, scientific evidence is still scattered and fragmented. The aim of this study is to systematically investigate the empirical tested impacts of water quality on the food system activities and vice versa. Using a comprehensive framework, see Figure 1, we sketch the inter-relationships between water quality and food systems based on a literature study. Food system activities included food production (crop production, livestock and aquaculture), food processing, and food consumption. Multiple contaminants were incorporated such as nitrogen, phosphorus, pesticides, pathogens, cyanotoxins, and heavy metals. Moreover, we considered different water sources such as groundwater, surface water, wastewater and coastal water.

Results, solutions and contribution to transitions

We found that food system activities contaminate water in several ways:

- The impact of water quality on the food system is heterogeneous: it depends on the food produced, the type of contaminant and techniques of food preparation.
- Food is contaminated in multiple ways along the food system, not only through irrigation with polluted water, but also in food processing (cleaning of equipment or food products), and in food preparation (at home or by street vendors).
- Hygiene in food consumption is crucial to prevent fecal-oral transmission. However, water, sanitation and hygiene (WASH) received little attention in relation to food consumption.
- Most examples from LMICs with either natural pollution, industrial zones near agricultural areas or wastewater usage.

Products

- Article: Linderhof, Vincent, Thijs de Lange and Stijn Reinhard (2021). The Dilemmas of Water Quality and Food Security Interactions in Low- and Middle-Income Countries. *Frontiers in Water* 3, 736760. <https://doi.org/10.3389/frwa.2021.736760>
- Blog (7-6-2021): <https://weblog.wur.eu/fnh-ri/nutrient-rich-diets-increase-food-security-only-if-proper-water-quality-is-guaranteed/> 2020-2021 work because
- Conference presentation: Thijs de Lange (2021). Nutrient-rich diets increase food security, only if proper water quality is guaranteed. Presentation at the online Conference One Water, One Health: Water, Food and Public Health in a Changing World of the International Water Resources Association, June 7-9, 2021.



Picture: A Bolivian farmer washing his harvested onions in a river (photo: Thijs de Lange).

What's next?

In 2022, the emphasis will be on knowledge creation. There are two extensions of the work foreseen:

- Impact of WASH on food security, as the results of the 2020-2021 work showed little attention for WASH and food consumption
- Impact of saline water use on food security, as it was left out of the 2020-2021 work because

Two MSc theses supervised by Vincent Linderhof, Karsten Beekmann, and Angel de Miguel Garcia.

- WUR meeting to present results
- Event for policy makers and NGOs

Questions for audience

- What do you need to use this knowledge in your research?
- What is a link to your work? What can you offer that is useful for us?

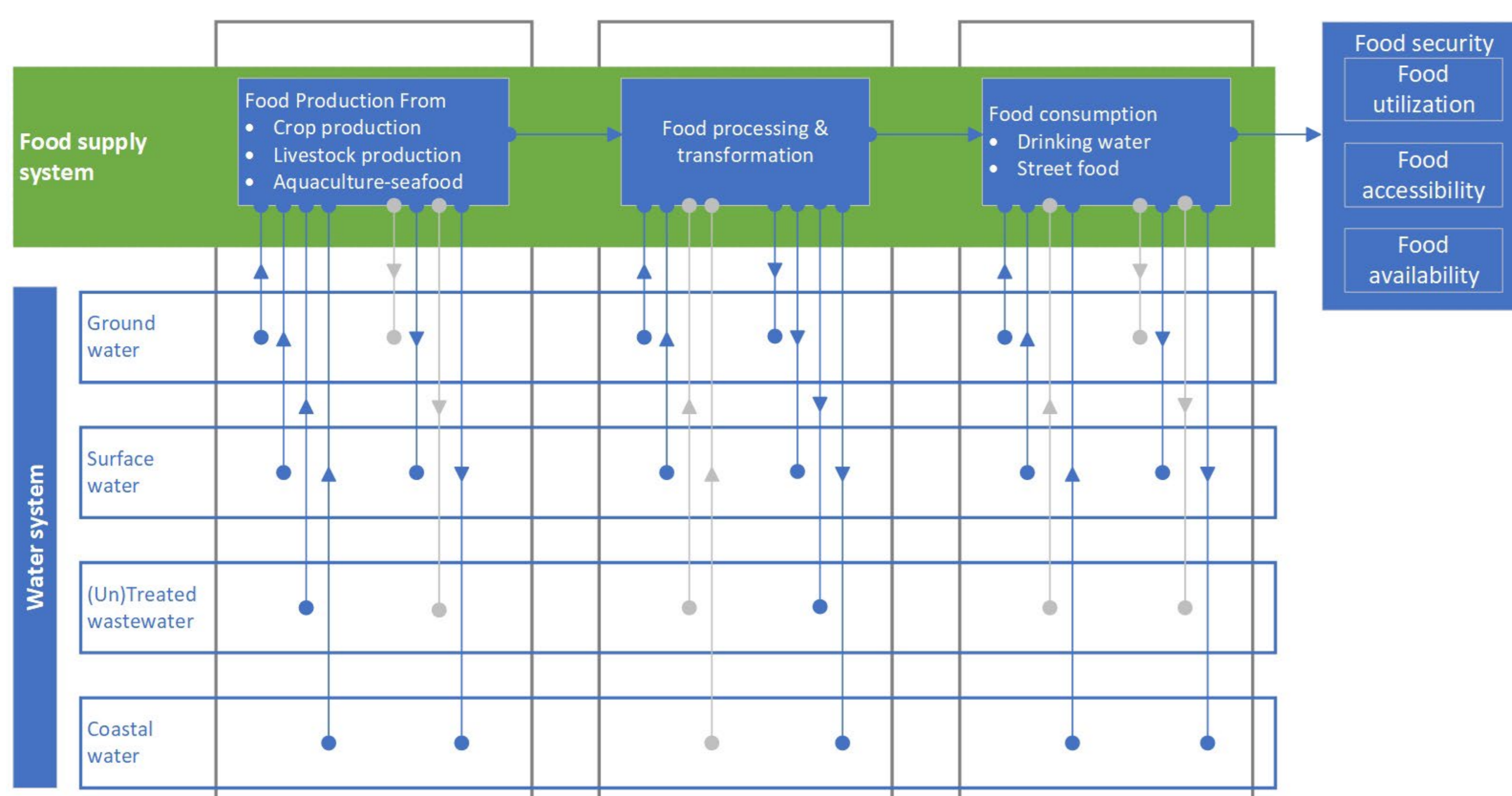


Figure 1. Framework of water systems and food systems relating to water quality (storage and distribution, and food distribution not included). Derived from de Lange et al. (2021).



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Key publications

- Article: Linderhof, Vincent, Thijs de Lange and Stijn Reinhard (2021). The Dilemmas of Water Quality and Food Security Interactions in Low- and Middle-Income Countries. *Frontiers in Water* 3, 736760. <https://doi.org/10.3389/frwa.2021.736760>
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