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One Water, One Health: Water, Food and Public Health in a Changing World

THEME I

How can we better manage water for food and public health in a changing world?

KEY POLICY MESSAGES

- Climate change and the impacts of COVID-19 highlight the increased importance of examining the inter-linkages between water, food, and public health.
- Strategies to address challenges within the water-food-public health nexus include Managed Aquifer Recharge (MAR), Circular Economy approaches, and the strategic application of data and information.
- The long-term sustainability of policies and programs requires location-specific strategies, with community participation, considering the critical role of women and girls.

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Water is intrinsically linked with food and public health. Without sufficient water resources and effective management, food insecurity and lack of hygiene and sanitation threaten human health and wellbeing. Managing water as the binding element for food and public health is crucial to achieving the Sustainable Development Goals (SDGs), adapting to global changes, and preparing for future pandemics.

Irrigation machine on garlic field, Poland, 2021.
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COVID-19: A WAKEUP CALL FOR HANDWASHING, HYGIENE, AND PUBLIC HEALTH

A lack of suitable water sources and awareness regarding hygiene is a rising concern for public health. Living in a pandemic that requires constant hand washing to avoid transmission of germs displays how vital access to clean water is for public health. Currently, only 19% of the world's population practice effective hand washing with soap (Global Handwashing Partnership (2020)).
A lack of access to safe water sources and sanitation plagues much of the globe. For example, more than 200 million people worldwide drink groundwater with excessive fluoride concentrations that can cause the crippling disease, fluorosis. Only 53% of the population in Somaliland has access to a developed water supply, forcing families to fetch water from far and unsafe open wells. Even developed counties face water quality and quantity challenges that threaten public health. Often, vulnerable communities lacking water, sanitation, and hygiene (WASH) facilities also face food insecurity.

Improved water facilities and hygiene education will aid public health and help prepare for future disease outbreaks. Females often drive hand washing and hygiene regimes; efforts to improve WASH cannot overlook them. Implementing multi-use system (MUS) technologies that integrate irrigation and WASH facilities can aid food security, further promoting public health.

FOOD SECURITY REQUIRES WATER SECURITY

Food insecurity and hunger represent a public health crisis for millions across the globe. Water security directly impacts the availability, quality, and safety of food supply. The agricultural sector consumes 70% of all fresh water diverted for human uses. Food production generates a significant portion of greenhouse gas (GHG) emission, as well. In Myanmar, the agricultural sector (rice production) dominates the use of water, followed by livestock, and these two sectors also comprise the most significant GHG emissions sources.

Future changes will add pressure on water resources. Population growth will increase demand for food and water. Warmer temperatures due to climate change will place greater pressure on irrigation demands and food supply systems, while an increase

Even developed counties face water quality and quantity challenges that threaten public health.

in the number and duration of droughts will decrease water supplies during the growing season in many regions.

Currently, 75-80% of food is imported. As such, food security is dependent on the water security in countries from which food is imported. There, abundant production does not translate into food and nutrition security. For example, Myanmar is an agricultural country capable of exporting crops; however, a high level of the population is malnourished. Climate change has the potential to impact major exporting nations and world market prices, resulting in an increase in risk of hunger in low income nations.

Without innovative water management and food production strategies, increased water and food insecurity is inevitable in many parts of the world. Opportunities exist in many regions to reduce agricultural water demand and improve the efficiency of food production, such as by upgrading irrigation systems; reducing unproductive irrigation; promoting fewer, intensive, and healthier crops; and implementing other best management practices for agriculture. In addition to these tried and true practices, managing water for food and public health in a changing world requires novel water management strategies such as: managed aquifer recharge (MAR), a circular economy approach, and digital water management.

SUSTAINABLY TAP GROUNDWATER TO INCREASE RESILIENCE

In many countries, groundwater is the primary source of water usage. However, climate change and population growth imperil this vital resource through decreased recharge and overexploitation, respectively, while groundwater contamination threatens public health and food production systems.

Managed Aquifer Recharge (MAR) seeks to intentionally replenish aquifers when water is abundant, either through passive recharge basins, such as ponds that seep water into the ground, or by actively pumping water into aquifers through recharge wells. Often MAR facilities are situated in arable areas where they can provide sustainable water for irrigation and, consequently, food production.

TAKE A CIRCULAR ECONOMY APPROACH TO REDUCE PRESSURE ON WATER SYSTEMS

Managing the water-food-public health nexus through a circular economy approach can increase sustainability and water security by creating synergies between actors to manage water for food security and public health more effectively and efficiently.

Figure 1. Circular Economy approach

Wastewater reuse promises to guarantee water availability and reduce dependency on surface water and groundwater resources. Reused water from urban and peri-urban areas can increase water availability for agricultural uses, with potential food security benefits, or even domestic use, with additional public health benefits. Further, reducing the amount of wastewater and contamination entering waterways can prevent disease and increase available safe water sources.

Reuse of wastewater can also create economic benefits. The treatment process can generate products such as biogas and fertilizers that generate revenues. In some areas, reused water is cheaper than water treated to higher standards than required; however, cost recovery more often remains a barrier to water reuse.

Other challenges to wastewater reuse include a lack of social acceptance, technical and human capital constraints to treatment and distribution, and policies that impede reuse.

BUILD THE NEXUS KNOWLEDGE BASE

Improving food security and public health through water management requires better data collection, quantification of key metrics and relationships, and long-term monitoring.

Managing water for food and health in a changing world requires novel management strategies.

The specific data and analysis necessary for improved management in the water-food-public health nexus discussed during the conference included:

- **Quantification of water embedded in agricultural food production:** Reducing food risk requires data regarding the volume, timing, and sources of water for agricultural production. This includes distinguishing between green water (site-specific precipitation that ecosystems eventually use and release through evapotranspiration) and blue water (surface and groundwater stored in rivers, lakes, aquifers, and dams available to meet human water demands). The ratio of green to blue water is an index of food risk and agricultural water security.

- **Water quality monitoring:** Water quality monitoring can help ensure the effectiveness of water treatment as well as quantify the benefits of wastewater reuse on improving water and food security and public health. Policy makers should consider information gathered through monitoring to set water quality requirements for waterways and wastewater discharges and reuse.

- **Digital water management:** Digital water management offers an opportunity to improve the resilience of agriculture, food, and health systems by enabling prompt decision-making based on real-time data. Digital water management for agriculture utilizes various information about a farm, including plant-based sensors and other monitoring components, to implement smart irrigation scheduling. Digital water management can mitigate water problems in urban water management through the interoperability of real-time monitoring systems, water infrastructures, and sewer conditions. Real-time control of wastewater treatment facilities can assess if the water quality is suitable for reuse. Digital solutions also allow dynamic network and data sharing. For example, data sharing among farmers could provide large scale benefits by tracing water flows, water consumptions, and soil moisture. Challenges to implementing digital water management include a low level of readiness for advanced technology, digital inequality, and probable cybersecurity failure.

- **Suitability mapping for Managed Aquifer Recharge (MAR):** MAR requires specific hydro-physical conditions, limiting its applicability in many regions. Suitability mapping is necessary to identify potential locations for MAR.

- **Quantify food consumption patterns in developed and developing countries:** Better understanding and quantifying the interactions indicated under the triple-O concept (one water, one earth, one health) requires studies on food consumption patterns in developed and developing countries. This information would help design strategies to effectively address the Sustainable Development Goals (SDG), particularly, SDG2 (Zero hunger) and SDG 3 (Ensure healthy lives and promote well-being for all at all ages).

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It is increasingly important to manage water for food and public health to adapt to climate change, recover from COVID-19, and increase resilience to future uncertainties. Policy makers and water managers have a wide variety of established strategies at their hands to address challenges within the water-food-public health nexus, along with innovative new approaches for managing water in a changing world. Selecting a portfolio of appropriate actions for managing water for food and public health requires consideration of local conditions, community support, and technical and human capacity.

ONE WATER, ONE HEALTH: WATER, FOOD AND PUBLIC HEALTH IN A CHANGING WORLD
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