



Nutrition and the Perfect Storm of Water

A WORLD OFF TRACK

Water-related risks and widespread malnutrition are alarming, and they are expected to affect half of the global population by 2050. Global warming and demographic factors, among others, hamper opportunities for progress. In this policy brief, we explore how food security and nutrition can be improved through a novel approach for synergy: a timely coordination of expertise to intensify sustainable food production, focusing on farmers' livelihoods and nutrition as well as water, sanitation, and hygiene.

In a decade, the global population will top 8.5 billion, and the world should be a better place. But the world is not on track to reach the Sustainable Development Goals (SDGs). It is very likely that a few hundred million more people will not have access to adequate food for a healthy life at the end of the SDG period. Global warming and increased climate irregularity are undermining sustainability.

Over the next thirty years, water scarcity and malnutrition are expected to affect half of the world's population (Ringler et al., 2016). The World Economic Forum has listed water crises among the top five long-term risks for eight years in a row.

The number of people affected by hunger is on the rise again after decades of gradual decline. As of 2019, around 9 percent of the global population, between 690 and 750 million people, were affected. The number may well exceed 840 million by 2030 (FAO et al. 2020). In addition, between 83 to 132 million people can be added to this number in 2020 due to the ongoing Covid-19 pandemic (ibid.).

Other kinds of malnutrition are even more alarming. According to WHO (2019), 1.9 billion adults are overweight or obese and a similar number are affected by micro-nutrient deficiencies, in stark contrast to the 462 million who are underweight. More than every fourth child under 5 suffers from stunting—they are too short for their age, impairing physical health and cognitive development—while over 38 million suffer from overweight and obesity.

Since malnutrition has life-long implications, an increase in prebirth and infancy prevalence is a dire alert for the future. Such malnutrition cuts across social groups in all countries and between family members. The annual global societal cost of malnutrition is estimated to reach US\$3.5 trillion while the price tag for excessive weight and obesity is a hefty US\$500 billion (Global Panel 2016).

Hunger is associated primarily with lack of access to food and appropriate diets due to too low yields or too little purchasing power to buy food. Overweight, obesity and micro-nutrient related malnutrition are linked to food habits with an excessive intake of energy-dense food and an insufficient intake of nutritious food.

Nutrition, and malnutrition, is not only about food. Deficiencies in household water provision, sanitation, and hygiene contribute to repeated incidences of diarrhoea and other infections. High morbidity rates reduce the ability of the body to absorb the nutrients in the food eaten. Improvements in WASH services reduce the drudgery and challenges of females and children when it comes to fetching water. With the prominent role of women in agriculture, food preparation and water management, gender, food security and nutrition are all interlinked.

Similarly, nutrition is not only about agriculture. Capture fisheries and aquaculture are of basic importance in staple



diets, particularly in Asia. Fish is also important in Africa, in coastal areas and in the interior of the continent.

ALARMING TRENDS

Until recently, a long-term decline in the prevalence of hunger was made possible through a tremendous increase in food production and supply, triggered by the Green Revolution in the 1950s and 60s. The increase in global food supply occurred 30 percent faster than population growth. Considering that the world population grew from about 3 to 7 billion from 1961 to 2011, this achievement is unprecedented (Lundqvist & Unver 2018). Equally remarkable, this development occurred with a considerable drop in the unit cost of production. This was greatly welcomed by consumers, especially in low-income communities that typically spend 30–60 percent or more of their income on food.

The massive increase in food supply has created a situation where the energy content is far above dietary energy needs. The FAO also reports substantial increases in the availability of protein for low- and medium-income countries. However, "... an estimated 2 billion people in the world did not have regular access to safe, nutritious and sufficient food in 2019" (FAO et al. 2020). Similarly, the availability and intake of micro-nutrients remain huge challenges (ibid., Willet et al. 2019).

Sweden is a high-income country with a good general level of education and plentiful availability of food including for example fruit and vegetables year-round at affordable prices. Information about the importance of fruits and vegetables for health is widespread. It would, therefore, seem plausible that a majority of people in Sweden eat the recommended 500 grams of fruits and vegetables per person and day. And yet only 17 percent of the population had an intake of the recommended level. The surprisingly low level of intake can be explained by the differences between the amount of food bought and otherwise procured, in schools for example, and the amount eaten. For nutrition, it is the food that we eat, and the ability of the body to absorb the nutrients, that matter and not the amount of food consumed, which is another matter .

☯️ *In Ethiopia, for instance, about 60 percent of the farmers cultivate 0.9 hectares or less* ☯️

THE MASSIVE ONE-HECTARE FARMER CHALLENGE

Food insecurity, malnutrition and livelihood risks are major barriers to progress among smallholder farmers and their dependants. The size of a smallholding in Africa is, generally, about one hectare of land for cultivation while in Asia, a smallholding is about one acre. Pastoralists do, of course, need larger areas. Globally, the number of smallholders is estimated to be about 500 million. The number of people dependent on small farm holdings may be in the order of two and a half to three billion.

In Ethiopia, for instance, about 60 percent of the farmers cultivate 0.9 hectares or less (Lundqvist et al. 2021). As in most parts of

Africa, rainfed agriculture with erratic rainfall and associated risks is a significant feature. With low yields and a concentration on a couple of starchy staples, food security and nutritional outcomes are poor. Similarly, a lack of surplus agricultural commodities from domestic producers hampers the availability of food for people in rapidly expanding cities, or for an expansion of industry that depends on agriculture. Low productivity and production, and concentration on a few starchy staples, mean that income opportunities and the possibility to invest in agriculture, pay school fees, cover health costs or support other livelihood improvements are lacking (ibid.).

In addition to unpredictable trends, temporary disasters, like the effects of Covid-19, increase food insecurity and push millions of people deeper into poverty.

TEMPORARY SHOCKS

Millions of impoverished people and herds of livestock have repeatedly been hit, for instance, in the Sahel region. On a wider scale, the world food crisis, or more correctly, the world food price crisis, made headlines in 2007–2008.

While the Sahelian famines were associated with drought and climate variability, other circumstances triggered rapid increases in the price of food (and fuel, among other items) in the 2007–2008 crisis. Restrictions of food exports by several countries and the use of grains for biofuels contributed to price hikes, reducing availability of food on the global market, which contributed to severe food insecurity in low-income communities.

Societies with limited domestic production and with limited national funds to purchase food from abroad are vulnerable. Even if food can be imported, as has normally been possible, imports drain the countries of foreign exchange and are a major cause of vulnerability, notably in Africa.

WHAT IF THE CURRENT TRENDS AND TEMPORARY SHOCKS BECOME THE NEW NORMAL?

None of the drivers mentioned above are going away. The frequency of extreme events, demographic trends, socio-political instability, and conflicts evolve in tandem. Increased deviations from a general pattern of climate variations are being experienced across the world: Australia, the Middle East, Europe, California, and the Amazonas, to mention a few. Water predicaments are, no doubt, drivers in what Sir John Beddington refers to as the Perfect Storm.

In a much-cited article in *The New York Times*, Thomas Friedman invites the reader to look back and to imagine the future: "If you fell asleep 30 years ago, and woke up last week... you could be excused for saying 'I did not miss a thing'". The political and ideological struggles in countries in the Middle East are still the same. But you had better be awake during the next thirty years. With reference to Iran's former agriculture minister, Issa Kalantari, an adviser to Iran's president, Hassan Rouhani, Friedman reminds the readers of a very different future: "Our main problem that threatens us, that is more dangerous than Israel, America or po-



litical fighting, is the issue of living in Iran... the Iranian plateau is becoming uninhabitable... Groundwater has decreased... I am deeply worried about the future..." Mr. Kalantari concluded: "Deserts in Iran are spreading, ... and people will have to migrate. But where? If we start this very day to address this, it will take 12 to 15 years to balance" (Friedman, 2013).

MAKE USE OF UNTAPPED OPPORTUNITIES

The 2007–2008 crisis illustrates that a high dependence on food imports, does not drive the necessary transformation of agriculture. Nor does it provide incentives for a demographic transition or income opportunities. A mixture of strategies that aim to enhance productivity, diversification, and economic viability for the large group of one-hectare farmers is a better option.

Enhanced productivity

With erratic rainfall, farmers are uncertain about when and how much water will be available. This uncertainty is particularly devastating for the cultivation of horticultural crops that are important for nutrition and that can generate profits, since these crops are sensitive to moisture stress. Efforts to increase and stabilize yields at realistic levels include improved management and combinations of different sources of water: rainfall supplemented with water from other sources including soil and water conservation, water re-use, rainwater harvesting, shallow wells, and distribution through buckets, hoses, and mechanical or motorized devices.

Throughout Africa, a range of systems, referred to as farmer-led irrigation and multiple-use water services, built and managed by members of households, allow improved water control to meet productive and reproductive water needs throughout the year.

These kinds of facilities can be critically important in situations where the risk of dry spells is high. More importantly, they provide possibilities for the effective use of available resources, for example land and not only water. High marginal productivity gains are conceivable, especially at low and varying yields, typical in rainfed agriculture. Contrary to conventional irrigation schemes, these small-scale systems can utilize local rainfall. Generally, they have a limited detrimental effect on stream flow to downstream communities. Small amounts of supplementary water reduce the risk of crop failure and improve prospects for the sustainable

☀️ *These kinds of facilities can be critically important in situations where the risk of dry spells is high* 🗨️

intensification of agriculture and an increase of the cultivation of high value crops. The cultivation of fruits and vegetables, supported by facilities that provide a controlled and supplementary amount of water is, for instance, practiced in home gardens, improving the nutrition and dietary diversities of households.

The combined management of water and other inputs is critical to improve water productivity in agriculture. Based on a large set of data from six countries in Africa, Sheahan and Barret (2018) show that a substantial number of farmers use more irrigation, water, more fertilizers, and better-quality seeds compared to "conventional wisdom". But the coordination and combination of these inputs tend to be quite poor. This means the synergy effect on improved crop productivity is not reached. Improved coordination and timing are likely to boost yields, water productivity, and income and stimulate the cultivation of high value crops, including nutrient-dense crops. Similarly, the use of inorganic fertilizers appears to be higher compared to that of smallholder farmers in Ethiopia using supplementary water, although with a variation between crops (Lundqvist et al. 2021).

Diversification does not mean a switch from starchy staples

Smallholders cannot be expected to switch easily to nutritious and high value crops at the expense of staples for basic requirements. Nutritious and economically promising crops, for example horticultural crops, are risky and sensitive to droughts, more difficult to transport and store as well as having a short shelf-life. Yields can be high, but they vary much more than for staple crops.

However, through strategic and integrated support, crops with a high economic and nutritional value can increasingly be included in cropping patterns alongside starchy staples in a range of farming systems.

Strategic support should include improved physical and other access to remunerative markets and food procurement programs. Such interventions can be critical drivers in a necessary transformation of agriculture and food systems.



SUMMARY: A CALL FOR COORDINATION TO MAKE USE OF UNTAPPED OPPORTUNITIES

1 Coordinate and combine efforts in rainfed agriculture with the addition of supplementary water, high quality seeds and fertilizers. This would ensure a high marginal productivity, stimulate an increase in the cultivation of high value and nutritious crops, reduce the risk of further encroachment of agriculture into other ecosystems, and reduce dependence on imports.

2 Coordinate efforts to enhance productivity in the cultivation of staples for basic food security, with strategic support to diversify production, e.g., facilitate the use of some of the land and water for high value crops.

3 Coordinate water for WASH and water for crops with a high density of nutrients (improved WASH services are likely to reduce the prevalence of diarrhoea and other infections and increase the absorption of nutrients in the food eaten).

REFERENCES

FAO, IFAD, UNICEF, WFP and WHO. 2020. The State of Food Security and Nutrition in the World 2020. Transforming food systems for affordable healthy diets. Rome, FAO. <http://www.fao.org/documents/card/en/c/ca9692en>. Accessed September 20, 2020.

Friedman, T. 2013. Mother Nature and the Middle Class. *The New York Times*, Sept 21. <https://www.nytimes.com/2013/09/22/opinion/sunday/mother-nature-and-the-middle-class.html>.

Global Panel. 2016. The Cost of Malnutrition: Why Policy Action is Urgent. Available at: <https://glopan.org/sites/default/files/pictures/CostOfMalnutrition.pdf>

Lundqvist, J. & Unver, O. 2018. Alternative pathways to food security and nutrition – water predicaments and human behavior. *Water Policy*, 20(5): 871–884. doi: 10.2166/wp.2018.171.

Lundqvist, J., Malmquist, L., Dias, P., Barron, J. and Wakeyo, M. 2021. Water productivity, the yield gap, and nutrition. The case of Ethiopia. *Land and Water Discussion Paper 17*. FAO, Rome.

Ringler, C., Zhu, T., Gruber, S., Treguer, R., Auguste, L., Addams, L., Cenacchi, N. et al. 2016. Role of water security for agricultural and economic development – concepts and global scenarios. In: C. Pahl-Wostl, J. Gupta and A. Bhaduri, eds. *Handbook on water security*. Aldershot, Edward Elgar Publishing Ltd. 384 pp.

WHO, 2020. Malnutrition: Fact Sheets. April 1. <https://www.who.int/news-room/fact-sheets/detail/malnutrition>, (Accessed September 20, 2020)

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T. et al. 2019. Food in the anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170): 447–492

Acknowledgements

Several colleagues have made contributions to this Policy Brief. Special thanks to Jennie Barron and Louise Malmquist, the Swedish University of Agricultural Sciences, Uppsala, Claudia Ringler, International Food Policy Research Institute, Washington, Sasha Koo-Oshima, Paulo Dias and Marlos de Souza, Food and Agricultural Organization of the UN, Rome, Mekonnen B. Wakeyo, Policy Studies Institute, Addis Ababa, Olli Varis, Aalto University, Aalto, and Olcay Unver, Arizona State University. Support from colleagues at Stockholm International Water Institute and in the working group, Water & Nutrition, WASAG, is gratefully acknowledged.

Author

This Policy Brief has been authored by Jan Lundqvist (Jan.Lundqvist@siwi.org), senior scientific advisor at SIWI. It draws on: Lundqvist, J., Malmquist, L., Dias, P., Barron, J. and Wakeyo, M. 2021. Water productivity, the yield gap, and nutrition – The case of Ethiopia. *Land and Water Discussion Paper 17*. FAO, Rome

About SIWI

SIWI is a leading water institute, focused on water governance and capacity building in order to reach a just, prosperous and sustainable water wise world. It is well-known for its research, knowledge generation, and applied science, which helps to develop policy recommendations and supports the implementation of programmes. In addition, SIWI uses its trusted convening power to facilitate multi-stakeholder dialogues, most evident in its annual event, World Water Week.