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Yemen, Factor 2: Water Scarcity

Effects of Water Scarcity on Food Resources in Yemen

Yemen is faced with multiple humanitarian crises, where water scarcity serves as an accelerant of widespread food insecurity. With a population of 38.4 million people advancing at a yearly growth rate of 3.1%, the country is geared to increase its strain on currently restricted water and food resources (WHO, 2023). Situated at the bottom of the Arabian Peninsula bordered by Saudi Arabia, Oman, the Red Sea, and the Arabian sea, Yemen's predominantly hot desert climate limits cultivable land to just 7% of its total area, making water the most critical factor contributing to agricultural productivity and, by extension, food security (World Organisation for Animal Health [WOAH], 2026). This paper will outline barriers to food access in Yemen, detail its relationship with water scarcity, and discuss realistic solutions considering implementation challenges due to current conflicts.

Typical Yemeni families live in multigenerational households with limited access to basic resources, navigating significant hardship across multiple sectors. There is an average of 4-6 family members per household, with three family members typically sharing bedrooms. Educational attainment remains low, with 30% of the population receiving no education beyond the pre-primary level and only 16% accessing higher education. Access to healthcare proves even more alarming: 99% of women and children lack health insurance, the infant mortality rate stands at 35 per 1,000 live births, and significant portions of sick children receive no medical treatment (DHS, 2022-2023). Food insecurity pervades daily life, with 62% of households experiencing moderate food insecurity and 12% facing severe food insecurity primarily as a result of water scarcity. These conditions reveal why improving reliable water access at the community level is important for addressing both household needs and food security.

Environmental factors, resource scarcity and misaligned farming priorities are some of the many factors that result in severe food and water scarcity in Yemen. Conflict has destroyed much public infrastructure, forcing the burden of food production on individual families in many cases. Farming operations in Yemen are predominantly small-scale, as 62% of farms have less than two hectares of land. While 19% of households maintain agricultural land and 37% keep livestock including sheep, goats, cattle, camels, donkeys, and horses, these resources do not yield enough food to support a malnourished nation (WOAH, 2026). Small farming operations often cannot afford essential agricultural inputs like water, fertilizers and seeds, an issue exacerbated by ongoing conflict. The most prominent crops in Yemen are cereal, fruits, and vegetables, but domestic farming provides little food resources compared to the country's staggering needs. This current situation is partially due to the cultivation of qat, a culturally significant narcotic cash crop that utilizes most cultivable land while providing no nutritional value. The government, while not directly supporting qat cultivation, provides no viable alternatives for farmers and benefits from qat's tax revenue. Qat cultivation not only reduces land available for food, but it also overconsumes agricultural water resources (FAO, 2014). However, it employs one in seven people and is very profitable, which are economic benefits. As a result of high qat cultivation, low arable land, and a lack of investment in large-scale farm technology, the country imports 90% of its food crops (Oxfam, 2022). Because many Yemeni farmers operate on a small scale, a community-based water system is more feasible than expecting individual farmers to finance irrigation infrastructure themselves.

Aside from agricultural barriers to food security, Yemen faces cultural and economic challenges that reduce food purchasing power. Civil war alone has forced the United Nations Food Agency out of Yemen as a rebel group continues to contend for national dominance. In 2014, the Houthis (backed by Iran) seized Yemen's capital, Sanaa, and now control much of the country's north while Yemen's internationally recognized government rules the south with support from Saudi Arabia. The civil war has

only grown in scale in the past 10 years, affecting factors from foreign aid to the destruction of infrastructure. Large centralized projects are difficult to implement when infrastructure can be damaged and humanitarian organizations lose access to certain regions, further establishing that localized solutions are the optimal choice for Yemen's water scarcity problems. The formal economy in Yemen has largely collapsed due to this conflict, forcing most of the population into informal work as well as self-employment (DHS, 2022-2023). Many Yemeni people rely on remittances as a safety net for income (a sector that makes up 38% of the country's GDP), and many have migrated internally to find work due to ongoing conflict over the past decade (Gadain, 2023). Food is often (but not always) physically available in markets, but it can be economically inaccessible due to inflation and lost wages (Oxfam, 2022). As a result, many pay in debt to food stores, caretakers often skip meals so their children can eat, and some borrow food from neighbors.

Water scarcity, Yemen's primary food insecurity factor, is severe and worsening with no signs of improvement in the near future. Due to the nation's arid climate, political instability, lack of usable infrastructure, and lack of governmental management, Yemen has become one of the most water-scarce countries on earth. Water availability per capita has fallen well below the international scarcity threshold of 500 cubic meters to only 83 cubic meters, and in some regions groundwater levels are falling between one and eight meters per year (Bociaga, 2026). Yemen's water resources come primarily from groundwater, but water is extracted from wells–which are often illegally drilled–twice as fast as aquifers can replenish. Water supply infrastructure has largely been destroyed due to conflict, and related systems like sewage and waste collapses can also lead to water pollution and disease outbreaks (Gadain, 2023). Nearly half of Yemen's water infrastructure, including pumps, piper, reservoirs, and treatment plants has been damaged or destroyed, and conflict has crippled what little remains (Bociaga, 2026). Available water resources are often allocated to Qat, which does no service in feeding the population. Food production is directly impacted by water scarcity, with shortages causing lower yields, total crop failure, livestock threats, and food safety issues from lower-quality water (Gadain, 2023). Water overuse and mismanagement exacerbates food shortages, causing prices to increase and malnutrition to remain high in a climate region that already has an undersupply of water. Agriculture accounts for 90% of Yemen's water use, rendering food cultivation both a victim and an accelerant of the water crisis. These conditions make improving water access an important step toward strengthening food security. However, because conflict has damaged centralized infrastructure and groundwater is already being depleted, simply increasing water extraction would not be sustainable. A solution must therefore improve access while also reducing dependence on unreliable electricity and strengthening local water management.

Because agriculture consumes approximately 90% of Yemen's available water, improving household access to water alone would not resolve food insecurity. However, providing reliable water access to rural farming communities can support agricultural production while reducing the amount of time families spend searching for water. This makes decentralized water systems a practical starting point for addressing both immediate household needs and longer-term food security. In conflict-affected regions, community-level systems are inherently more resilient because they are not prone to large-scale infrastructure collapse. Primary community interventions include purification education, water tanks, and rainwater harvesting, as well as solar water pumps. Solar-powered water pumps require significant focus within this strategy as they address both immediate irrigation needs and continual sustainability. By reducing reliance on Yemen's conventional energy infrastructure, they render systems more resilient to conflict-related power disruptions. Installing public water tanks in rural farming communities reduces the foraging burden on women and children who currently spend hours daily searching for water, freeing time for education or economic involvement. These tanks, when not powered by the sun, can be gravity-fed from nearby elevated sources or supplied through trucking networks, minimizing the need for centralization. Additionally, community-based rainwater harvesting, while limited by Yemen's arid climate, could provide supplemental water during seasonal rains. Harvested rainwater can extend community supply during dry periods without any dependence on centralized water supply systems.

Solutions would be implemented in phases, beginning in relatively stable areas where water scarcity is significant, existing infrastructure is damaged or insufficient, local leaders are willing to participate, and the security situation allows humanitarian organizations to operate. Planning would involve different stakeholders with different backgrounds to ensure cultural sensitivity and local support. Community planning would also help build momentum, as community members would be able to see tangible improvements to their water scarcity issues early on, establishing trust in aid programs and creating support for future phases. Once communities are selected and planning is completed, solar powered water pumps and public water tanks would be installed to provide more reliable access to water. Local residents would then be trained to construct and maintain the systems. Consulting with local influences to obtain access and selecting community members for construction and servicing would develop local ownership and technical abilities. Technical assistance must accompany physical infrastructure to develop local maintenance capacity, preventing systems from deteriorating when international support eventually phases out and ensuring Yemeni communities can sustain improvements long-term. Finally, water use would be monitored to ensure that increased access does not contribute to further groundwater depletion. Beyond physical infrastructure, establishing community-level rules for water access could reduce unsustainable well drilling, aiding groundwater recharge and ensuring future water access. Broader groundwater regulations should eventually be developed as governance capacity improves.

In addition to decentralized infrastructure interventions, low-input safety measures like chlorination tablets, ceramic filters, and solar disinfection can effectively ensure the safety of available water resources despite sewage infrastructure failure. Ensuring safe drinking water sources should be a primary goal of these interventions, as waterborne disease outbreaks like cholera compound already rampant malnutrition. These small, localized approaches benefit from rapid implementation potential and strong local ownership, as well as continued function even when broader centralized systems face threats due to conflict.

A phased approach requires coordination of many stakeholders, each of whom would be affected differently by the implementation of community-based water systems. Farmers would benefit from reliable water access, making agricultural production more predictable and reducing unnecessary water waste. However, solar pumps alone would not solve groundwater depletion, making responsible water management essential. Rural families could benefit from reliable water for household and crop production needs, while women and children could spend less time collecting water and potentially free time for education or economic activity. Community leaders would play an important role in deciding where systems are installed, managing access to water, and helping resolve conflicts over its use. International organizations would primarily be involved in funding long-term, but in initial stages their role would be to train, coordinate, and assist with technical labor. As the program develops, local technicians would be trained to maintain and operate new infrastructure, taking on greater responsibilities as international organizations reduce control over operations. Government institutions, where functional, could eventually support broader groundwater regulations and water management policies as governance capacity improves. Finally, qat farmers must be considered throughout implementation because qat provides stable income and has deep cultural importance in Yemen. The recommendation should not restrict qat cultivation as an immediate condition of receiving water infrastructure. Because qat provides income and has cultural significance, imposing rapid restrictions could harm farming households and reduce local support. Instead, improved water management should be introduced alongside voluntary incentives for farmers interested in increasing food production. Eventually, however, diverting land and water resources from qat to food production is a key step in this process. This intervention would lower food prices by increasing the volume of food grown domestically, though qat's deep cultural importance and economic value to farmers requires carefully designed incentive programs rather than large-scale restrictions.

Successful implementation of this phased approach requires coordination among international organizations including the UN Development Programme, Food and Agriculture Organization, UNICEF, Oxfam, and the International Red Cross, with funding from sources such as the World Bank and bilateral aid programs. Management intends to avoid the duplication of efforts from multiple organizations while ensuring comprehensive coverage for the critical responses. Funding would cover initial costs and installation of all of the described solutions, including solar power, water tanks, and safety measures. Funding could also cover salaries for locally trained operators and continual maintenance for all projects. However, the overall success of any intervention depends on addressing the conflict-related challenges that persistently risk demolishing restored infrastructure and disrupt carefully planned programs. Already, recent complications due to Yemen's civil war have forced the UN Food Agency out of the country's northern region, cutting off an important humanitarian aid program. Conflict also disrupts interventions' data collection systems, forcing implementers to work with incomplete information. Cultural and economic factors compound these challenges: qat cultivation's deep importance to farming incomes and Yemeni identity calls for incentive-based approaches, and Yemen's collapsed governmental oversight means interventions cannot rely on the state for implementation. Rather, community-led governance and international organization involvement must substitute for lacking government functions before long-term sustainability can be achieved.

In the short term, community-based solar water pumps and public water tanks would provide rural communities with more reliable access to water while reducing the amount of time women and children spend collecting it. Improved water access could also support agricultural production and reduce some of the immediate effects of water scarcity on food availability. Because the systems would be implemented in relatively stable communities and maintained by trained local residents, they could provide visible improvements early in the process and build trust in future phases of the program. In the long term, the recommendation could strengthen local capacity to manage and maintain water infrastructure while reducing dependence on unreliable energy systems through the use of solar power. However, increased access to water must be paired with monitoring and responsible allocation because Yemen's groundwater is already being depleted faster than it can replenish. Therefore, the long-term goal should not simply be to increase the amount of water being pumped, but to create sustainable community water systems that use limited resources efficiently and support more reliable agricultural production. While this recommendation cannot resolve Yemen's entire water or food-security crisis, it can address an important local barrier to food production while creating systems that communities can continue operating after international assistance decreases.

Yemen's food insecurity issues are not only agricultural challenges to conquer but humanitarian crises to unravel. Food insecurity in the country is a wicked problem, or an issue that is inherently unique, involves multiple stakeholders with conflicting agendas, and has no final end or complete solution. While there is no silver bullet to resolving food insecurity, there is much opportunity to innovate carefully planned community-level solutions that address water scarcity and its relationship to agriculture. Barriers to food security include aquifer depletion, infrastructure collapse, economic disruption, and high prices; however, viable solutions remain available and achievable through sustained, coordinated efforts. A solution's potential impact hinges on multi-stakeholder support, conflict sensitive implementation, and strategic prioritization of interventions that seek to support water access, food security, health, and financial stability. Food security serves as the unifying outcome of these efforts, as reliable access to water, stable agricultural production, and functioning markets together determine whether households can consistently obtain sufficient and nutritious food. Without immediate action to reverse unsustainable water depletion and reduce reliance on poor infrastructure, Yemen's food security situation will continue deteriorating, with devastating consequences for a population living in extreme scarcity.

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