

Strategic Analysis Paper

28 July 2015

Food and Water Security in the Kingdom of Saudi Arabia

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Key Points

- Despite its harsh climatic environment Saudi Arabia is currently food and water secure.
- Saudi Arabia relies on its oil-based economy for food imports and desalinated water production.
- Groundwater depletion, a high reliance on food imports and a growing population with steady rates of urbanisation represent challenges to food and water security.
- Both urban and agriculture water consumption rates are wasteful; behaviour change is needed in the Kingdom to encourage conservative water practices.

Summary

The Kingdom of Saudi Arabia has developed policies that integrate its food security with the global market and seeks alternative water sources to manage its food and water security. Saudi Arabia's economic strength has enabled it to import its food needs and create trade-based food security. The arid country primarily meets water demand through desalination to ensure long-term water security; however, it must also develop sustainable water management practices to address wasteful consumption patterns. Managing the demand and supply of food and water with an ever-growing population is one of the crucial challenges facing Saudi Arabia to 2025 and beyond.

Analysis

Population and Employment

By 2050 Saudi Arabia's national population of 29 million people is [predicted](#) to grow by 77 per cent. This population boom will outpace the current rate of food and water production. The median age of the population is 26 years; with Saudis [expected to live](#) to 75 years, high population growth and prolonged life expectancy rates will put pressure on future food and water resources. Scarce arable land and natural water resources limit Riyadh's ability to meet demand through domestic production; increasing food imports and expanding the development of alternative water resources will therefore prove critical in ensuring the country's long-term food and water security.

Saudi Arabia experiences limited rates of poverty due to generous government handouts. An increasingly young and unskilled population and limited job opportunities, however, will place growing pressure on the social welfare system. Currently experiencing a 41.8 per cent youth dependency ratio, rising unemployment amongst young people is expected to continue. Many are inadequately prepared to enter a diversifying economy and despite constituting 60 per cent of [university graduates](#), young women have few employment opportunities. Youth joblessness rates today may create greater unemployment and inequality in the future, impacting further upon the country's capacity to supply food and water to its people.

Urbanisation

Approximately 83 per cent of Saudi Arabia's population resided in urban areas in 2014, with the rate of urbanisation increasing at two per cent annually. Rapid population growth in urban areas and improved living standards, have influenced food demand preferences and the demand for water in both the domestic urban setting and the agricultural and industrial sectors. Urban demand has created pressure on Saudi Arabia's rural and manufacturing sectors to supply goods needed for city living. This in turn has placed increasing strain on Saudi Arabia's natural water supply. If urban growth outpaces the rate at which growth may be sustainably supported, Saudi Arabia will experience a heightened threat to food and water security.

Nutrition

Wealth and globalisation have changed dietary patterns in the Kingdom. A 'nutrition transition' has emerged associated with changes in diet and lifestyle; Saudis have transitioned to the consumption of more energy-dense diets. Fava beans, wheat, rice, yoghurt and chicken are staple items for Saudis, yet many are opting for a more diversified diet with greater Western influence. Changes in lifestyle and Western-style diets are causing growing obesity issues, with 33.7 per cent of the adult population considered obese in 2014.

Saudi Arabia's wealth has underpinned its food security and rising rates of obesity, yet small pockets of the population do not receive adequate nutrition. Despite the country's food security, the [prevalence of undernourishment](#) was recorded in five per cent of the population in May 2015. Riyadh must continue to both reduce inequality and secure adequate nutrition for the entire population if it is to maintain its food-secure status to 2025.

Saudi Arabia's Water Security

The [Global Food Security Index 2015](#) notes that despite Saudi Arabia's harsh desert environment, 97 per cent of the population has access to potable water. Saudi Arabia's average annual rainfall is less than 100mm and high evaporation rates limit the availability of surface water sources. The over-extraction of groundwater resources and a lack of perennial rivers have led to the development of extensive desalination facilities.

Six non-renewable aquifers and numerous desalination plants satisfy a majority of Saudi Arabia's water consumption needs. Data from NASA's [GRACE satellite mission](#) indicates that the Arabian Aquifer (underlying Saudi Arabia and other Gulf States) has one of the highest rates of depletion, particularly from agricultural usage. The extensive withdrawal of water from fossil aquifers is threatening the security of Saudi Arabia's non-renewable water resources.

After locating several large aquifers during the 1970's, the government drilled thousands of deep tube wells for both agricultural and urban use. Years of unregulated water extraction has led to increasing groundwater scarcity. To prevent further environmental damage, the reliance on deep-tube wells to source precious fossil water must be reversed and alternative water sources secured.

Urban Water Usage

Saudi Arabia has one of the highest per capita water consumption rates in the world. The average per capita water consumption rate is [estimated](#) at 100-350 litres per day for urban areas and 15-20 litres for rural areas. Urban dwellers are consuming water at an unsustainable rate. A greater investment in demand-side management strategies to increase conservation practices and decrease consumption rates is urgently required.

Agricultural Water Usage

Dams are used to trap surface water runoff during rainstorms that occur in the coastal areas and southwest highlands. In 2012 Saudi Arabia had an estimated 232 dams in use. Water from these dams is used for agriculture production and is replenished by the flash floods that occur from November to April. Low precipitation rates, however, limit surface water supply.

In 2000, modern irrigation techniques [accounted for](#) 66 per cent of irrigation activity while traditional surface irrigation accounted for 34 per cent. Despite the greater adoption rates of

modern irrigation technology, inefficient water usage is still common on many farms. The Saudi Arabian government must consider social policy aimed at targeting irresponsible water management behaviour to ensure that groundwater supplies are not wasted entirely.

Current Solutions and Gaps

Since 2005, desalinated water has accounted for approximately [70 per cent](#) of the nation's water use. While desalinated water has ensured Saudi Arabia has enough water to meet demand, it does create its own challenges. The process requires high energy input; more than half of domestic oil consumption is required to run the plants. The high costs and energy consumption associated with the desalination process have created a scenario where Saudi Arabia's desalination capacity, and therefore water security, is closely linked to the stability of its oil supply. Leakages and transit problems with pipe networks also cause more than a third of the desalinated water to be lost each year, particularly in the 400 kilometres between the Gulf coast and Riyadh.

Saudi Arabians only pay one per cent of what it costs the government to produce desalinated water. Introducing a water pricing system will not only recoup some of the costs of production, but increase the value of water so that consumers begin to practice better water management. Greater appreciation of the value of water may lead to a change in Saudi behaviour; one that sees sustainable water consumption adopted by all.

Recycled water is currently used for irrigation in agriculture and urban parks. Saudi Arabia reuses approximately 2,367 million cubic meters of treated wastewater per day according to a General Electric industry white paper on water scarcity in Saudi Arabia. This represents 30-40 per cent of the country's wastewater; plans have been [announced](#) at a conference this year to expand that capacity to over 65 per cent by 2020. The National Water Company is currently developing a plan to privatise wastewater, and plans to use almost half of recycled water in urban areas for domestic purposes. This development represents a significant improvement in current wastewater usage and strengthens Saudi Arabia's current water security outlook.

Saudi Arabia's Food Security

Food and Agriculture

Only two per cent of land is arable in Saudi Arabia, and overgrazing and unsustainable agriculture practices are causing increasing rates of desertification. Despite limited natural resources and an arid climate, Saudi Arabia produces and exports dates, dairy products, eggs, fish, poultry, and a variety of fruits and vegetables such as watermelon, citrus, tomatoes and onions.

Both the government and private sector are also expanding investment in aquaculture. Fish farms using both sea pens and onshore tanks are becoming increasingly prevalent as a source of food for Saudi citizens, and as an export product. Shrimp are one of the most

successful fish to be farmed. Continued support and further development in the aquaculture industry will increase Saudi Arabian food security.

Saudi Arabia's Failed Attempt at Self-Sufficiency

Saudi Arabia's decision to pursue self-sufficiency in agricultural production during the 1980's stemmed from [several factors](#), particularly volatilities associated with food imports. Heavy government incentives allowed the wheat sector to flourish; farmers received subsidies on grain, fertiliser, and water for irrigation, and a 45 per cent discount on agricultural machinery. The government sold wheat with artificially lowered prices, despite the inefficiency associated with producing and exporting a grain it could not sustainably support. The wheat subsidy programme resulted in poor water management decisions, a drawback that was compounded by a lack of sewerage development and excessive use of fertilisers, all of which ultimately led to depleted groundwater and contaminated water supplies.

By 1993, Riyadh had fully recognised the harmful impact its wheat subsidy programme was having on its already limited water supply, and subsequently abandoned the initiative in 2007. The government plans to cease wheat subsidies altogether by 2016, and is instead offering subsidies to dairy farmers and those with sheep to use manufactured feed rather than barley and alfalfa that require large quantities of water to produce. The government is also encouraging vegetable production in greenhouses rather than open fields where water evaporates faster, along with drip irrigation systems and sustainable methods of farming. These methods of agriculture that can be sustained in the Saudi climatic conditions, along with significant food imports, will continue to ensure food security for the water-scarce country.

Reliance on Food Imports

Saudi Arabia is increasingly dependent on imported food to meet the needs of its population. The country's key bilateral trading partners include the Ukraine, Russia, India, and Pakistan. Barley, wheat, rice, chicken and sheep constitute Saudi's top food imports, with 80 per cent of food requirements [imported](#) in 2013. A market-based food supply, however, creates risks for domestic food security. In the event of, for example, climate-induced supply shocks with subsequent reductions in global food exports and a rise in food prices, import-dependent countries will be most vulnerable to food insecurity if contingency management plans have not been established.

The [Strait of Hormuz](#) receives 40 per cent of internationally traded oil, with a large portion of this petroleum exported from Saudi Arabia. If Iran were to blockade the Strait for an extended period, Saudi Arabia would experience a threat to its oil revenue; a challenge that would affect the Kingdom's food imports. Food imports could also be restricted, adversely affecting Saudi Arabia's food security. It is vital that the Kingdom continues to secure a wide range of trading partners around the world, with a variety of established shipping routes, to insure against volatility in an insecure region.

The civil uprising of the Arab Spring did not appear to have affected the country's demand for food and water but terrorism in the region could threaten shipping routes and oil infrastructure. Similarly, the conflict in Yemen has not yet had an adverse impact on food and water security, yet if terrorist groups such as al-Qaeda in the Arabian Peninsula or Da'esh gain further strength in the country, Saudi Arabia's petroleum exports could be [threatened](#). If Saudi Arabia's petroleum infrastructure is targeted, the country's oil revenue, vital for its food security, will be critically affected.

Riyadh has pursued a policy of outsourcing its agricultural production by purchasing land in other countries that are more suited for agricultural production, including Sudan and Ethiopia, and exporting the produce back to Saudi Arabia. Political unrest, natural disasters and commodity-price inflation, however, threaten that initiative. Furthermore, the policy is a highly controversial subject internationally, with some referring to the practice as being similar to the 'land-grab' tendencies of colonialism.

The Saudi Arabian Oil Economy

Saudi Arabia is dependent on its oil-based economy; [petroleum exports](#) account for 80 per cent of economic revenue. This has allowed the government to maintain large financial reserves to support social security. An extended drop in oil prices over the long term, however, would hinder efforts to subsidize food and water for a growing population with increasing rates of unemployment.

Oil revenue enables the country to import almost all of its nutritional requirements. In May 2015, Saudi Arabia was ranked as the 30th most food secure nation in the world by the [Global Food Security Index](#). Global carbon pricing, unsustainable energy consumption and the increasing production of shale oil and gas could, however, threaten Saudi Arabian oil profits. Even though the Kingdom has large [financial reserves](#) that enable it to sustain low oil prices for an extended period, those, like its oil reserves, are not limitless and the market for oil is volatile. Any threat to Saudi oil revenue, therefore, is a threat to Saudi food and water security.

The government is currently encouraging economic diversification to enhance food and water security and encourage domestic employment. By diversifying the economy through telecommunications, new forms of power generation and natural gas exploration, Saudi Arabia is able to support economic growth and ensure access to long-term sources of revenue. This will further enhance food and water security in a country that relies on food imports and desalinated water for survival.

Looking Forward: Saudi Arabia's Food and Water Security Outlook to 2025

The following actions have been identified to secure Saudi Arabian food and water security to 2025:

- Pursue economic diversification to create alternate and stable sources of revenue to ensure food and water security. A complete reliance on oil exports places Saudi Arabia's food and water security in a weakened position, particularly as the market for oil is subject to geopolitical disruptions and oil supplies are not infinite.
- Improve education so Saudi youth are equipped with the skills to enter a diversifying economy, reducing future social inequalities and decreasing pressure on the government by enabling its citizens to pay more for their food and water requirements.
- Adopt a water pricing system to ensure consumers are aware of the value of water. Saudi Arabia is improving its awareness campaign regarding the dangers of water scarcity but it must continue to stress the importance of sustainable water consumption.
- Work to integrate both desalinated water and wastewater with [aquifer storage recovery technology](#) to create protected reserves of potable water. The United Arab Emirates has pursued a similar policy, and now has secure water reserves to last for 90 days. Should supply shocks to water or the oil market occur, Saudi Arabia would greatly benefit from these water storage facilities.
- Diversify water production by investing in better infrastructure to transport water, or increase wastewater use. Given that wastewater is a more readily available water source than desalinated water, Saudi Arabia would benefit from greater use of recycled water for agricultural production and industry use.
- Partner with stable, well-governed countries for land purchases and food imports. Saudi Arabia would benefit from investing in countries where political disruptions are infrequent, and the rule of law is more equitable.

Saudi Arabia must address both its demand- and supply-side management of resources if it is to ensure its long-term food and water security. Diversifying the economy to reduce its dependence on oil revenue, and engaging with a broad number of trade partners for food imports must continue to ensure against volatility and food insecurity. Beyond supply-side management, Saudi Arabia will greatly benefit from adopting a more holistic approach to resource management and investing further in demand-side factors that affect food and water security. Promoting the value of water and natural resources and creating strategies to target wasteful consumption are critical to support enhanced food and water security beyond 2025.

Any opinions or views expressed in this paper are those of the individual author, unless stated to be those of Future Directions International.

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