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How Yemen Chewed Itself Dry

Farming Qat, Wasting Water

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A Yemeni man chews qat in the main qat market in Sana'a May 9, 2007. (Ahmed Jadallah / Courtesy Reuters)

In a little over a decade, Sana'a, Yemen, may become the world's first capital to run out of water. Failed governance and environmental mismanagement share some of the blame for drying up the city. But there is also a more surprising culprit: a national addiction to qat, a narcotic that is incredibly water-intensive to cultivate.

If current trends continue, by 2025 the city's projected 4.2 million inhabitants will become water refugees, forced to flee their barren home for wetter lands. In preparation, some officials have already considered relocating the capital to the coast. Others have proposed focusing on desalination and conservation to buy time.

As policymakers butt heads over the best course for Yemen, the dwindling water supply is already leading to instability: according to *Al-Thawra*, one of the country's leading newspapers, 70 to 80 percent of conflicts in Yemen's rural regions are water-related. And across the country, Yemen's Interior Ministry estimates, water- and land-related disputes result in about 4,000 deaths each year -- 35 times the number of casualties in the deadliest al Qaeda attack in the country's history.

THE QAT CAME BACK

The cultivation of qat, a mild narcotic plant that releases a stimulant when chewed, accounts for up to 40 percent of the water drawn from the Sana'a Basin each year, and that figure is rising. That is both because qat takes a lot of water to farm (much more than coffee, another plant that does well in Yemen's fertile soil) and because cultivation of it increases by around 12 percent each year, according to Yemen's Ministry of Agriculture and Water Resources. Not only is the crop drying the Sana'a Basin, it has displaced over tens of thousands of hectares of vital crops -- fruits, vegetables, and coffee -- which has sent food prices soaring. According to the World Bank, rising food prices, in turn, pushed an additional six percent of the country into poverty in 2008 alone.

Why the increasing reliance on qat production? Farmers are willing to put up with the plant's high demand for water because it has a more regular yield than other crops and because the market for it is virtually guaranteed. Every cubic meter of water used for qat cultivation returns a profit five times as great as that for the next most lucrative crop, grapes. No wonder: according to the World Health Organization, up to 90 percent of adult men in Yemen chew qat for three to four hours daily, and women literally sing its praises. (A popular song goes: "Long live qat, which ... makes us stay peacefully at home with our friends.") At weddings and special events, a family's social standing is gauged by the value of qat served to guests. One might think that such a popular drug would have deep roots in a culture, but its widespread use is actually relatively new: in the 1970s, when Yemen had few paved roads, qat, which has a shelf life of only 24 to 48 hours, often could not reach its markets in time, so fewer people had access to it.

Yemen cannot continue using water this way. In 2011, the rate of water consumption from the Sana'a Basin exceeded the rate of natural recharge by a factor of five. And, even understanding this, Yemenis have placed little value on conservation: much of the country's 68 billion cubic meters of annual rainwater is wasted due to mismanagement and inadequate dams.

Part of the problem is that farmers, for whom the physical labor exerted in agriculture is a source of pride, are attached to wasteful practices, such as flood irrigation (the uncontrolled distribution of water over soil). Drip irrigation -- a practice that is about 35 percent more efficient and widely available at low cost -- could easily increase returns on water. But when asked about drip irrigation, one farmer told me that "flood irrigation is more honorable ... all [drip irrigation] requires is pumping water up into the tank."

Making things worse, the country's decaying dams seep water that could otherwise be used productively. May 2010 saw flooding -- the worst to hit Sana'a in decades -- but very little of the water was captured for later use. Moreover, the country's well system is a disaster. By law, only the government is allowed to dig and maintain wells. But according to some interpretations of sharia, which Yemen's constitution specifies as the sole legal framework, a well drilled on privately owned land is the property of the landlord, not of the state. So drilling continues. Today, Yemen's National Water and Sanitation Authority, which is tasked with urban water administration, supplies water to only 36 percent of Sana'a's households. The other two-thirds get their supplies from groundwater wells.

The wells are a public health nightmare -- the country's groundwater is increasingly contaminated by sewage effluent. Beyond that, the wells prevent the National Water and Resource Authority, which is responsible for managing the country's water resources in a sustainable way, from enforcing conservation measures, such as improving irrigation efficiency.

DON'T GO CHASING WATERFALLS

Of course, those officials know that Sana'a is facing an arid future. Moving the capital city, as some have proposed, would cost over \$40 billion, according to some estimates. Securing the funds would be nearly impossible: approximately 75 percent of the government's revenue is derived from rapidly depleting oil reserves, and the World Bank predicts that oil will stop generating income for the Yemeni government by 2017. Foreign aid is similarly scant.

Even if it were possible to raise the funds, moving an entire city of over two million people would surely lead to internal strife. The tribal concept of *juwarah* (rights of neighbors) often inhibits the sale of land to members of other tribes. The transfer of land to Sana'a's two million displaced residents could thus lead to chaos.

Another idea, which the Ministry of Agriculture and Water Resources (MAWR) has discussed, is to transfer water to Sana'a from other sources. Unfortunately for Yemen, all the rest of the country's

fresh water is currently in use. Therefore, transferring water to Sana'a would essentially involve siphoning it away from others, also inviting conflict.

Policymakers have also toyed with the idea of alleviating the strain on the Sana'a Basin by decreasing agriculture in the region. But that would only kick the can down the road, because, even without agriculture, and given all of Yemen's other poor water practices, the growing population would eventually dry out the basin anyway. In addition, decreasing agriculture would push up food prices even further.

LIQUID ASSET

Instead, the government should do three things to secure its water future: push farmers and the public away from qat, shore up Yemen's existing water infrastructure, and manufacture new potable water through desalinization.

First, the government should encourage farmers to switch to less water-intensive crops, such as cactus fruits. For now, the government subsidizes diesel -- the main fuel used to extract groundwater -- which accounts for 80 percent of the cost of qat cultivation. The low cost of extraction gives farmers little reason to switch to other crops or use sustainable farming practices. Attempts to lift a portion of the subsidy several times between 1995 and the present raised the price of diesel and dragged water up closer to its true economic price. Those changes were not enough to discourage qat production altogether, but at least obliged farmers to start thinking about more efficient irrigation techniques. Should the government opt to decrease the subsidy again, the farmers could be pushed even further.

On the supply side of the equation, the government should also launch a public campaign against qat use. Although qat is not deadly, the health risks associated with it are many -- they include hyperactivity, increased blood pressure, liver complications, ulcers, and impotence -- and the societal costs are nothing to sneeze at. Across the country, around 30 percent of household income, on average, is used for buying qat, despite the fact that 45 percent of Yemenis live below the poverty line. Qat has also been linked to diminished productivity at work.

In its campaign against qat use, the Yemeni government has a good model to follow: its own water conservation campaign from 2007, for which it developed a character named Rowyan (meaning "to have quenched one's thirst"). Rowyan's face appeared on wheel covers and in storefronts throughout Sana'a, and the campaign managed to at least convince some Yemenis that water scarcity was a problem. A similar campaign against qat could help gradually wean some chewers away from the habit.

Second, the government needs to encourage improved irrigation techniques in all agricultural areas -- ones that grow the narcotic as well as other crops. It should obligate more farmers to opt for rain irrigation instead of groundwater use, which wouldn't run counter to their desire to do things by hand. More than one million acres of arable land that used to be irrigated by rainfall (as of the 1970s) are

now doused with water drawn from nonrenewable sources. There is no reason that those acres can't be reclaimed.

The National Water and Resource Authority also needs to cooperate with Yemen's local leadership, which, because it makes money off private wells and other water sources, has a vested interest in inefficient use. The NWRA can do so by taking advantage of the political transition in Yemen that accompanied the Arab Spring. For one, the ongoing national dialogue conference, which brings together 565 Yemenis from all segments of society to collaborate on forming a new government, might ease distrust of state institutions. A relationship of cooperation, rather than antagonism, will help the NWRA gain legitimacy in the eyes of local leadership, which will aid with the implementation of conservation measures in places that are outside of the government's reach.

The government should also take care of Yemen's leaky water pipes, which waste up to 60 percent of the water they contain. Money for that, too, will be hard to find. But it could court more investment from countries such as Saudi Arabia, whose security interests are inseparable from its southern neighbor's. Finally, the government must limit the drilling of wells for domestic purposes.

Conserving the water that Yemen has now will only go so far. The depletion of nonrenewable groundwater might leave Yemen with no real option other than to manufacture new water through desalinization. Pumping desalinated water from plants near the sea to Sana'a would be costly, but the fixed startup costs would be distributed across time and would be far less than moving the capital. In the beginning, the government will have to temporarily subsidize desalinated water so that it would be within reach for most consumers. The government would likely need foreign aid to implement this subsidy and to develop the desalination infrastructure.

In ancient times, Yemen was a world leader in agricultural production and water efficiency practices. Between 750 and 700 BC, in what is today northern Yemen, the Kingdom of Saba'a (Sheba) built the Marib Dam, which captured irrigation from rainfall for roughly a millennium. If it improves management of existing water resources and builds up infrastructure for conservation and desalination, Yemen, once a model of water conservation, may yet have hope for reviving its capital.