Edge of Survival

The interaction of food, energy, and water in North Africa is complex and building into a cascade of trouble. It is time to listen to the rural communities facing it on the frontline

By Peter J. Jacques

In a small village in the High Atlas Mountains around Marrakech, a group of women have organized into a formal collective following a series of workshops given by the High Atlas Foundation (HAF), a sustainable development NGO, on women's empowerment. The collective now processes corn, barley, couscous, and dried flowers and shares the proceeds. This provides income and independence in an area that is on the edge of survival—an edge that is getting sharper as climate change accelerates and the pre-conditions for subsistence shift under residents' feet.

North Africa faces fundamental challenges: by 2050, the region is expected to lose 10-20 percent or more of its precipitation, and warm up by 2-3 degrees Celsius, even as world leaders are working, some more than others, to keep the global average warming under 2 degrees Celsius, and preferably 1.5 degrees Celsius. The World Resources Institute places all of North Africa on the high end of water stress, with Libya being the most extreme case. In this case, "stress" means that almost half of the available water is used by irrigated agriculture, industries, and municipalities in any one year, and the amount of available water decreases year after year. Indeed, Morocco has experienced a 40 percent decline in precipitation since the 1960s as a result of global warming. Already, locally consumed foods like barley and wheat fluctuate wildly based on the amount and timing of precipitation. As the climate changes, experts expect that wet areas will generally become wetter, and dry areas like North Africa will become drier, but the timing of seasons and the affiliated rainfall are also changing. If the rains come too late, crops will desiccate in the fields just as if the rains never arrived.

Sustaining North Africa will require prudent measures that slow ecological decline, conserve what can be conserved, reduce malignant social dynamics, and institute measures to protect the most vulnerable, but none of these answers are likely to emerge without significant political changes in the region.

Wicked Problems

Drought and water scarcity are nothing new to North Africa. Since the ninth century, Morocco has had forty-nine drought-related famines, and because

△ The High Atlas Foundation hires locals to cultivate nut trees in the High Atlas Mountains using a method called terracing, Morocco, November 2018. *Photograph by Peter Jacques*

rainfall is irregular, feeding people has been a constant challenge. The Famine Warning System which tracks and predicts food insecurity, ranging from "minimal" to "stressed," "crisis," "emergency," and "famine," noted in July 2019 that much of Sudan was experiencing crisis-level food insecurity caused by fuel shortages and late rains, both of which interrupted planting. Ironically, there were also areas that had too much rain that flooded out crops. Meanwhile, South Sudan is in the grip of a total food emergency on the cusp of famine due to armed conflict that has interrupted markets, aid, and of course agricultural productivity. All of this indicates that the region is a complex and interconnected set of social and ecological systems, and when one part of this integrated set of systems is disrupted, people are exposed to existential threats.

Drought is a particularly important issue because it creates a cascade of problems. As elsewhere, drought in North Africa leads to higher food prices. Herds die for lack of forage, malnutrition multiplies, and refugees and displaced people move to ill-equipped cities where sometimes there are riots and unrest. Desertification and erosion close the circle by reducing land that can produce crops or fodder.

Of course, food is traded internationally so local conditions are not the only factor at play in the food-energy-water systems needed to sustain the region.

However, exporters are themselves facing systemic problems. A recent UN climate report indicated that climate change will drive severe food shortages, and that there is a possibility of "multi-bread basket failures" around the world. We saw what this was like when a heat wave in Russia, torrential rains in Canada, and droughts in Argentina and China that reduced the wheat harvest—at the same time that China made large purchases of wheat to ensure domestic supply—all combined to double the global price of wheat from June 2010 to February 2011. North African countries are among the largest importers of wheat in the world, and the region was gravely affected by these "distant" crises, which figured into political instability. Remember the uprisings in Egypt in 2011 where protesters chanted "bread, freedom, social justice," and in Tunisia where protesters waived baguettes.

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So-called "wicked problems" are expansive, interact with many other issues, and often occur where people have competing interests and there is little incentive to cooperate. The production and consumption of food, energy, and water in North Africa, as in many parts of the world, create such a problem because each component requires other resources to work. The use of energy around the world causes climate change, which then creates local variations in water supply that affect the planting of crops, as well as the quality of soils after erosion. Agriculture uses surface and groundwater which can cause erosion and the pollution of water sources as well as contribute to global warming.

Politics also affect the way water is managed in-country and across borders, where countries have an incentive to use as much as possible before their rival states who share the same resource. In the Nile Basin, Egypt and Sudan insist that their allocation of the river should not change based on treaties established under colonial rule and which they treat as settled. The River Nile is the lion's share of Egypt's fresh water and supports a growing population. However, countries like Ethiopia who were not a part of these agreements do not accept them as legitimate. Egypt and Ethiopia have traded bellicose rhetoric over the Grand Ethiopian Renaissance Dam, which will be one of the largest in the world and is the linchpin of Ethiopian economic dreams.

The social conditions under which food is produced, meanwhile, involve pressure from international markets and subsidies that benefit some domestic constituents over others. Tunisians remember the "bread riots" of the 1980s, triggered by an austerity program handed down from the International Monetary Fund that exposed people to market forces while the government removed food subsidies. Similar unrest occurred in Marrakech and Khartoum in 1984 and 1985. While subsidies are known to create economic dependencies,

this history shows that, especially for people who live on the margins of subsistence, governments at all levels (municipal, provincial, and national) have a duty to protect citizens from the whipsaw of markets. This does not have to mean providing direct subsidies, but could materialize as crucial government services from education and healthcare to environmental protections, not to mention the construction and enforcement of just institutions.

Unfortunately, North African governments are known for instability and repressive tendencies. Furthermore, just institutions that would better ensure the even distribution of wealth are also not common in the region. Even while states like Morocco, Algeria, Tunisia, and Egypt have liberalized markets, ruling elites still control the distribution of critical resources, including government services. Climate change, droughts, and food shortages will be far more difficult for people who are forsaken by their government, and in this author's discussions with the Amazigh people in the High Atlas mountains of Morocco, we were told, "No one asks about us" and that the people of the mountains "don't matter" to the government or urban society, even when a little support could go a long way (this particular group still expressed gratitude for a road built in 1963 that led into the city).

Complex Problems, Integrated Solutions

The fact that food, energy, and water are integrated problems means that integration is clearly a part of the solution. Policymakers cannot successfully keep each component segregated in silos. Planning will be more successful, and people will be better off, if resources are considered as interdependent parts of larger systems that fundamentally include social condition and capacities. In another village in the High Atlas, we spoke to a men's association which, short of alternatives, burned plastic waste to heat water. It is hard to imagine a more radical energy poverty, and this makes other things that require energy, such as drilling more wells, or digging them deeper, difficult. In this village, there are three wells, but only one works in the summer. Of course, in an arid environment, recharging aquifers is a slow process that is more vulnerable to overuse, and both conditions make irrigating crops much more difficult even though a third of the High Atlas population is fed by irrigated agriculture. One person commented that, "There was more water in the springs ten years ago, but if the pattern continues, in twenty years there will be no water," and for his people that means a loss of livestock, crops, and ancient land relations. He feared that there will be "no alternatives".

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In contrast, we spoke with a leader of a small city who expressed to us that

water was not too problematic, and that life was pretty good. Snow-covered mountain peaks bordered the town and you could see where their water came from. However, he was also a member of the provincial government and inside the circle of patronage. He noted that the government had even provided the town a refrigerator for their harvests of things like walnuts. Afterward, we drove by the refrigerator, which was an entire building.

Areas, in particular rural communities, that are outside the circle of patronage do not receive refrigerator buildings, or really much of anything from their governments, and this in itself is a major obstacle to sustaining North Africa because, even now, these communities are not being sustained. One person noted that in the surrounding ten kilometers "maybe two people are okay"—few are really making ends meet. Worse, if they organize and protest, they are arrested. And while people in the communities we spoke to said they see education as the path to a brighter future for their children, for many it is simply unaffordable. The cost of books alone keeps children out of school.

Openings to Reverse the Wickedness

The problems above are wicked and some can only be managed or adapted to, not solved. All the efforts of North African countries to reduce greenhouse gases under the Paris Accord will not even come close to affecting global average temperatures and precipitation because the problem is global. However, there are some things the people and governments of North Africa can do to soften the impact of climate problems.

Strengthen the linchpins

When working on problems that cascade and multiply, it makes sense to think about where problems converge, and slow or reverse problems that give birth to five others. One very important opportunity for sustaining North Africa is reversing soil erosion and restoring grasslands and forests. Left unchecked, erosion can spiral out of control and take down whole civilizations. Soil erosion often does spiral out of control because the effect of erosion amplifies the causes of erosion—that is, erosion mechanisms are a "positive feedback" of ecological decline in watersheds. Indeed, the UN reports that half-a-billion people live in areas becoming deserts, and the Maghreb is on the front lines of desertification. Since the 1980s, the grasslands in the high steppes of Algeria, for example, have almost entirely been lost. Overgrazing is one of the main culprits, though desertification has several human and natural causes. When restored, however, ecosystems with healthy soil systems become vital ecological assets. Slowing positive feedback loops is thus crucial to managing food-energy-water systems.

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Soil holds water and can work as a bank. When mountain areas maintain their soil, the green cover can grow and these areas are wetter and cooler than areas that absorb heat, like asphalt. Soil is often underappreciated, but it is a basis for all terrestrial life. Soils are a central meeting point for food-energy-water systems because soils are tied directly to food production, water storage and flow, minerals, medicine, carbon sequestration, decomposition, water filtration, nutrient cycling, primary production, not to mention community health and heritage. So, soil is a good place to focus, because when soil erodes, the short and long-term consequences are readily apparent.

Erosion is a problem we can solve by reversing its causes, such as deforestation, with concerted efforts in conservation and reforestation. However, conservation of soils and ecosystems requires a different kind of thinking than most governments value, and certainly a different logic than markets looking to maximize revenues. Much of agriculture operates on a model of maximizing production and yield. On first blush, we might see this as entirely rational, but when we maximize yield, we subordinate other things that produce the food in the first place. Maximizing yield will require farmers to "mine" the soil, depleting it of nutrients over time until the soil is bankrupt, and often reducing the biodiversity of an area, even though both the nutrients and biodiversity are essential to future yields. A different approach would maximize the health of the system, so that food can be produced in a place for much longer. Such places are a great deal more stable, both ecologically and socially.

This approach is common to lands and coastlines managed by indigenous peoples. For example, the coastal people of what is now the northeastern United States, the Lenape, once intensively harvested the area's oysters. However, they knew that they had to care for the needs of the oysters and the larger coastal ecosystem, because if they just took as much as possible, the population would collapse. By keeping the system that grew the oysters and the needs of the oysters themselves a priority, the Lenape were able to fish for them for at least eight thousand years. When Europeans came to the area, there were over 350 square miles of oyster reefs in what is now New York harbor, and the oysters were almost a foot long, indicating that they were quite old. Settlers maximized yield and collapsed the oyster population by 1810 in an effort to produce revenue. Examples like this abound. Likewise, in North Africa, there is tremendous indigenous knowledge about how to manage forests and agricultural resources with time-tested institutions.

For example, across North Africa there are Amazigh patrimonial systems guiding grazing. These Agdals protect the land from degradation and date back at least three thousand years. Agdals are connected to the key Amazigh values of honor and *baraka* (meaning blessing, and in this case the sacred source of good things, realized through the interdiction of saints devoted to protecting

a given resource). Agdal sanctuaries are deemed sacred and forbidden to be used, which preserves them amid other areas that are used. This is akin to the Hawaiian concept of *kapu* (which later became "taboo" to English speakers) that preserves certain fish from harvest except in times of crisis, thereby acting as a preservation tactic.

Agdals are complex, but they provide specific groups with detailed collective rights and govern all aspects of resources, including things like leaf fodder for goat and sheep forage. The practice uses grazing rotation strategies, enforcement of rules by a guardian paid by the collective, and clear timing for the opening and closing of a space, which always leaves some areas entirely untouched and gives others seasons to recover. At the heart of the Agdal concept are sets of rules for restraint that curb overuse.

One effect of this institution is that forests actually grow, and over time, the number of organisms in an area that create food and fuel (biomass) increase overall. This has long-term positive impacts, and provides a reserve resource in the face of crisis. Unfortunately, many contemporary herders of goats and sheep have become sedentary because they do not have access to sufficient state land, and the benefits of the Agdal are forfeit; however, the institution remains and is still in limited use. This practice shows that deliberate grazing rotation strategies can actually be used as a conservation strategy and a way to fight back against desertification.

Support locals and conservation groups

Another opening is political. In Morocco, the kingdom has embraced the United Nations Sustainable Development Goals (SDGs), which might just build political options when they need them the most. The kingdom's adoption of the SDGs provides a rationale for advancing projects that could encourage allocating more land for Agdals, among other policies. It also gives cover to civil society groups to organize and work on projects essential for land and water conservation.

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In the mountains around Marrakech, like the women discussed above, villagers are organizing into formal collectives, either co-ops or associations, thanks to a relatively recent emphasis on local governance introduced in the new 2011 constitution. While only co-ops can make a profit, both have elected leaders that can approach their provincial government, giving the villages a sorely needed voice that was not available in the past. Some of these collectives are growing tree nurseries as part of a national goal to plant a billion trees that would absorb carbon emissions, clean the air, and fight erosion.

In some places this is done using traditional practices like terracing, which is another way to build soil capacity and fight erosion. This plan is coming to a close and did not reach its goal, but the HAF is capitalizing on the momentum created in the program to continue.

Morocco's High Commission of Water and Forests and the Fight Against Desertification, a government agency which has been an important progressive force, granted the HAF the in-kind use of its land for organic fruit tree nurseries to benefit farming families and schools. Their goal is poverty alleviation. At the same time, these practices are protecting whole watersheds as well as the future water that will collect and flow through these ridges over decades. Thus, these projects work to reverse some of the "wickedness" in food-energy-water problems.

These collectives strengthen both social and ecological systems. They build networks of knowledge, trust, and reciprocal responsibilities in civil society. They also mean that people do not experience the sharp edge of survival alone. Every single group we spoke with was concerned about the future of water in Morocco. However, every group also expressed a profound solidarity for one another, saying: "we are like one", "we help each other," and "we are one family".

This solidarity will be necessary for the region as well to sustain North Africa. While civil society groups like the HAF are currently the region's best hope to create locally oriented programs that foster hope and empowerment, it is imperative that governments begin to better serve their populations and the public good. Right now, the most vulnerable have all but been abandoned by their leaders, and that is neither sustainable for their people nor their legitimacy. Ultimately, the water is needed "in its time" and 2050 draws near. In the closing words of one Amazigh woman, "God give us all plenty, and that this project will succeed, and that the water will come". ℝ