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Water Scarcity in Jordan

As our climate shows signs of changing, more attention is being given to environmental issues such as water scarcity. A problem that has been present in the Middle East for centuries, its solution is always just out of reach. As these counties grapple with water rights and possible solutions, the problem continues to escalate due to population increase and more consumer demand, which requires large amounts of water.

Jordan sits between Iraq and Israel. It is considered one of the Middle East's poorest countries (22 Beaumont) and "of all the parties involved in the Jordan River basin, Jordan is the one in most acute water shortage" (178 Kay and Mitchell). Jordan receives most of its surface water from the Jordan and Yarmouk rivers, while also draining nonrenewable aquifers that rest under Jordan's soil (23 Beaumont). In recent years, Jordan has placed an emphasis on agriculture, hoping to become more self-sufficient and generate more income. Increasing agriculture in Jordan is difficult, as only 11 percent of the land is arable, with 88 percent mainly desert and 1 percent forested (22 Lowi). On top of this, only 3% of the land has a dependable annual rainfall greater than 300 millimeters, the bare minimum for non-irrigated agriculture, while more than 90 percent of the land receives less than 200 mm/year (169 Hillel). Agriculturally, the country focuses on olives and bananas, while also growing tomatoes, cucumbers, and strawberries ("Jordan").

Over the summer, I had the privilege of visiting Jordan, where I stayed with a Jordanian family for four weeks. My host sister, Sara, lives with her mother, Dalal, her twelve year old brother, Adnan, and her stepfather, Said. They are Muslim, but Sara and her mother are not hijabi, meaning they choose not to wear the Muslim headscarf. Sara is nineteen, and she attends a local college in Amman, Jordan. She also works for a large hotel in Amman as a receptionist. Dalal works as a secretary for a local construction company. Sara's family lives in a three-room apartment in the east side of Amman, which is a source of pride for them after working their way up from the poorer west side of the city. Adnan was able to test into a private school nearby, ensuring a decent education. They all speak English well, as it is considered a way to move up in any career. They have a small kitchen with a half-sized refrigerator, and their bathroom boasts a washing machine that holds about ¼ of the load that fits in my washing machine back home. They also have a small portable air conditioning unit that needs to be manually fed ice, which they wheel around to the room that needs it most at the given time. They are considered a middle-class family, and they don't see water scarcity as a large issue in their life.

Every week, drinkable water is delivered to my host family in plastic barrels. According to Diane Raines Ward, "Many towns in Jordan receive water only twice a week, yet their water needs will double in the next two decades" (189). In my host family's apartment, the water that comes from the tap isn't guaranteed to be safe, so it is only used for showers, laundry, washing dishes, and cooking, where boiling kills the harmful bacteria. With a set amount of drinking water given to them each week in these barrels, it's important to make sure it isn't wasted. One night during my stay, I had gone to the fridge to pour a glass of water from the water jug. However, all of the water bottles were empty, so I went to ask Sara where the water was. She came into the kitchen, obviously flustered that we had run out, and then she sent Adnan to the supermarket to buy a bottle of water. We had no other choice, because they wouldn't deliver more water until the next day. Before I even left for Jordan, I was warned about water scarcity, and I was told to limit the amount of water I wasted. This meant taking shorter showers and doing laundry less often. For me, it was a significant change, but for Jordanians, this is how they live, and they don't see it as hard or even out of the ordinary.

After seeing firsthand the importance of water to the Jordanian people, researching the issue of water scarcity has become especially significant to me. The focus of my paper will be adapting farming practices to water scarcity and climate change in Jordan. Instead of focusing on miraculously increasing the amount of water available, my paper will highlight ways to save what's already there. "In Jordan… the annual water supply could be increased by one-quarter if the disappearing water was made to reappear" (301 De Villiers).

In an urban setting, one of the main problems with water scarcity is water being wasted. In a rural setting, water scarcity is elevated because the farmers make unwise crop choices based on consumer demand. For example, the consumers of Jordan want bananas grown, but bananas are an extravagant waste of Jordan's scant water supply.

> Many ways exist for saving water, and this issue has great importance throughout the world, and in the Middle East particularly. One of these ways is to reduce agriculture and to import food…, and thus water presently used to irrigate crops in the arid Middle East would be saved and put to direct use of the population…A further mode of saving is avoidance of growing water excessive crops, such as cotton, bananas, sugar beet, rice, and citrus, and concentration on water-saving crops. (253-254 Soffer)

Bananas are a main crop grown in Jordan, but they use up too much of Jordan's water. For this reason, I think one of the first steps to conserving water in Jordan is to focus on more water efficient crops. The Jordanian farmers want to grow crops that are in high demand and will provide them a high return on their investment, but continuing to grow their current crops is not an effective long range policy for these farmers or for Jordan's water supply. Plenty of other crops are used every day in Jordan and require far less water. One such crop is wheat. It is well known that wheat requires less water than bananas, and the wheat produced wouldn't go to waste in Jordan because pita bread is a main part of a Jordanian's daily diet. By switching bananas to wheat, high demand still exists but less water is wasted. Bananas yield high prices for the Jordanian farmers but also require high input cost. Farmers need to consider alternative ways to maintain their incomes while conserving water supplies.

However, by changing crop types we do not automatically solve the problem. Wheat, though not as popular, is currently grown in parts of the country. The irrigation methods currently used to water the wheat crop wastes water, which means changing crops may still leave us with a large water scarcity issue.

> At the moment in parts of south Jordan high-quality water is being squandered on wheat production…every time a ton of wheat is grown by irrigation it is a loss to the country of about US $4,800 in terms of the replacement value of the water for other uses (Beaumont 28)

The answer in solving this problem lies in irrigation. Irrigation is what wastes such a large amount of water, so by increasing irrigation efficiency, we increase water use efficiency. One irrigation method that should be considered is drip irrigation.

> Drip systems rank high among irrigation technologies with significant untapped potential. Unlike flooding techniques, drip systems enable farmers to deliver water directly to the plants' roots drop by drop, nearly eliminating waste. The water travels at low pressure through a network of perforated plastic tubing installed on or below the surface of the soil, and it emerges through small holes at a slow but steady pace. Because the plants enjoy an ideal moisture environment, drip irrigation usually offers' the added bonus of higher crop yields. Studies … have shown time and again that drip irrigation reduces water use by 30 to 70 percent and increases crop yield by 20 to 90 percent compared with flooding methods. (Postel)

Solving water scarcity problems with crops like wheat is as simple as using more efficient technology to decrease water waste. Asking Jordan to decrease crop production is unlikely to happen, as the country has valid reasons to increase said production. However, by taking that willingness to spend on agriculture and directing it toward more sensible agricultural methods, we come a long way to addressing the water scarcity problem. Sandra Postel goes on to say in her article that,

> Much potential lies in scheduling the timing of irrigation to more precisely match plants' water needs. Measurements of climate factors such as temperature and precipitation can be fed into a computer that calculates how much water a typical plant is consuming. Farmers can use this figure to determine, quite accurately, when and how much to irrigate their particular crops throughout the growing season. A 1995 survey conducted by the University of California at Berkeley found that, on average, farmers in California who used this tool reduced water use by 13 percent and achieved an 8 percent increase in yield--a big gain in water productivity.

Farmers are unlikely to be able to use this technology without outside help, as most don't have the finances available to invest in a computerized system. However, computing the exact water requirements for the crop could be considered a long-term goal for Jordanian farmers, who will already be increasing yield through the drip irrigation technology. Computer measurement of water usage could also be a viable option to aim government spending towards, so that this technology is available to more Jordanian farmers.

If farmers make better crop production choices and increase irrigation efficiency, Jordan will be able to promote agriculture while also conserving what little water it has. However, the purpose of this paper is to highlight what Jordan can do to conserve its water, and so much more potential exists than the changes I have already outlined.

While Ms. Postel's article focuses mainly on irrigation technologies, she also addresses the possibility of hybrid crops or genetically modified crops.

> Developing new crop varieties offers potential as well. In the quest for higher yields, scientists have already exploited many of the most fruitful agronomic options for growing more food with the same amount of water. The hybrid wheat and rice varieties that spawned the green revolution, for example, were bred to allocate more of the plants' energy--and thus their water uptake--into edible grain. The widespread adoption of high-yielding and early-maturing rice varieties has led to a roughly threefold increase in the amount of rice harvested per unit of water consumed--a tremendous achievement. No strategy in sight-neither conventional breeding techniques nor genetic engineering--could repeat those gains on such a grand scale, but modest improvements are likely. (Postel)

The most viable way to conserve water in Jordan is to invest in multiple approaches. By changing crop types, using more efficient irrigation, and looking into drought-resistant crop varieties, Jordan will greatly decrease its water usage. "Biotechnology is recognized as a tool to be used in conjunction with other tools, not as an end in itself" (Serageldin).

During an interview with the Jordanian Embassy, the representative speaking to our student group stated that, though Jordan was not currently using or researching genetically modified crops, the government was not opposed to the idea, either. For this reason, there is nothing preventing Jordanian farmers from taking advantage this technology.

> The relevance of biotechnology and, specifically, agricultural biotechnology to development, is now at the forefront of international interest… The application of biotechnology can create plants that are more resistant to drought and soil acidity and salinization. These attributes are critical to the development of agriculture in the poorest areas where soils are poorly endowed. (Serageldin)

With Jordan using all possible technology to conserve water in the agricultural sector, the country is less likely to feel the strain of intense water shortage. However, water conservation is a two-pronged approach, where conservation efforts need to happen in agriculture as well as in urban settings. This urban conservation needs to occur in big cities, as well as in resort areas like the Dead Sea. According to Mr. Arnon Soffer, "The principal water shortage in Jordan is felt today in domestic consumption, primarily in Amman, where domestic consumption has steadily grown since the 1970s." If Jordan's cities are wasting water, then conservation on the farmers' side is all for naught. Jordanian citizens in Amman must fully recognize the water scarcity issue in order for the problem to be relieved in any amount. In his book about water scarcity in the Middle East, Daniel Hillel tells us that Jordan needs to improve efficiency of water use in all areas of the country in order to conserve its water supply (175 Hillel). Conserving water in agriculture simply isn't enough. Jordan has to explore and take advantage of every conservation method available.

During my stay in Amman, our school bus would frequently drive by a fountain located next to one of the city's many roundabouts. The fountain was one that children could play in, with water shooting fifteen feet in the air from twenty or so holes in a metal grille. Every time we drove past this fountain, I kept thinking about how much water would be wasted over the days and months that the fountain was running. After King Abdullah succeeded his father and started ruling Jordan, focus shifted to increasing Jordan's international position. The shift has especially targeted tourism, which in turn led to this fountain's creation. Relatively speaking, the water wasted from this one fountain is nothing, but this fountain is just an example. Methods of drawing tourism should shift from mimicking Western art (like the building of fountains) and focus more on highlighting Jordan's natural beauty. Water waste within the city is just as serious as waste through agriculture.

> In the [Jordanian] capital's public parks, the lawns were kept alive year round with sprinklers. In all, 50 percent of pumped water is lost, either to outright theft or to leaky pipes, some of them dating back to the time of the Palestinian Mandate. (198 De Villiers)

Another important step in conserving water is doing more to educate the Jordanian people about the water problem. If Jordanian citizens stopped seeing the water shortage as normal, they would better understand the dire consequences involved with it. People would be more likely to follow laws against water use, and the man living in the apartment next to Sara's would be less likely to wash his car every week.

The changes I'm proposing won't solve the water problem, and I can't guarantee that they'll even make a large dent in the issue. The goal here is to conserve what Jordan already has, so that methods of buying water or finding other sources of water are able to make more of an impact.

One of the main problems preventing most of the suggestion in my paper is money. Jordan is a country scarce in resources, and many people would say that it can't afford to invest so much time, money, and change into these ideas when it has so many other priorities to consider. In response, I would say that Jordan has no choice but to do just that.

In some ways, we can compare Jordan's water problems to the Great Depression in the US. President Hoover was either unwilling or unable to take drastic measures to solve the economic crisis, so

it dragged on. Only when President Franklin Roosevelt took Hoover's place did the whole ordeal gain hope. Roosevelt gambled everything and left no path unexplored. His efforts to end the Depression spent huge amounts of money, but without that push, the Depression would have dragged on longer. Jordan's water problem needs that push. Jordan can't afford to take half-steps concerning the issue, and water needs to be turned into a bigger priority. Only then can Jordan truly continue to grow on the international level.

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