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## **Water Scarcity in the Middle East**

### **Introduction:**

There are problems in the Middle East that are often overlooked amongst the sectional violence. News programs report on terrorism, but they do not report on the food insecurity, water scarcity and resource degradation. They report on countries rich in oil, but overlook those struggling to make ends meet. Middle Eastern countries are often slightly better off than many African countries, but underneath their conflicts lies the same struggle.

The largest problem facing Middle Eastern farmers today is water scarcity. As climate change causes the world to heat, they are beginning to see its results as rivers dry up and temperatures become too hot for crops. What has always been an arid region is now becoming a place desperate for water. They are choosing between water for food production, water to drink and water for industry. For years, they have dug wells that have become increasingly deep in their desperate search for more water and now those water levels are dropping drastically. Not having enough water to live as they have been is becoming a reality.

This lack of water is hurting the food supply as well. Although they live in a very arid region, much of the agriculture depends on irrigation in order to produce enough food. When farmers are unable to obtain enough water, their crop yield drops dramatically. This means that their food supply and the food supply of urban families drops as well. As this situation worsens, Middle Eastern countries must take the water scarcity seriously before the water is used up and they are left without water and without food security.

### **“Typical” Middle East:**

While it is difficult to express the “typical” family in many regions of the world, this is especially true in the Middle East. One reason for this is that there simply are not many statistics to learn from. Much of the region is experiencing large amounts of sectional violence at this time and has been for many years. Due to this, it is difficult for an organization such as the United Nations to send surveyors throughout the area, for fear of their own safety. Another reason is that that statistic databases need the cooperation of the country’s government for reliable statistics. These two factors alone mean that there are many gaps in the statistics for Middle Eastern countries that are not present in the statistics of other regions.

Another reason for the lack of typicality in the Middle East is that it is a very diverse region. In parts of Africa and Asia the majority of people are emerged in the depths of poverty and it is easier for everyone to agree on the level of poverty. The Middle East, however, is an incredibly diverse region with an astounding income gap. One of the richest countries of the region is Saudi Arabia, the world's largest exporter of oil. It has a GDP per capita of \$23,200 (CIA Factbook, 2007 est.), which is extremely high for the region. (However, it is important to note that the United States has an average GDP per capita of over \$40,000, so this is relative wealth.) One of the poorest Middle Eastern countries is Yemen is also an oil-producing country, but has a GDP per capita of only \$2,300. These two countries show the difficulty in giving the Middle East a general and simplified face. The issue is that many times the Middle East is personified as a wealthy, oil-producing region, causing countries like Yemen to be overlooked. Due to these difficulties in determining a “typical” family, the most efficient way to illustrate Middle Eastern life is to look at a few specific countries.

A general Middle Eastern country naturally has petroleum as one of their top exports. One prime example of this is, as stated before, Saudi Arabia. Oil accounts for 90% of the export earnings and 75% of the budget revenues for this country. Other countries such as Iraq and Yemen also export oil for a large part of their economy. Although a large part of the population in these countries work in industrial jobs, a growing number of countries are trying to encourage non-oil sector jobs in order to decrease dependence on oil. One example is Yemen, which began economic reform programs in 1997. This is creating a larger population of wheat farmers, the Middle East's second most popular product. As the world focuses on ways to lower its own dependence on oil, these non-oil sectors will become more important as demand for oil lessens. Already, 86 million of the 296 million people in the Middle East are dependent upon agriculture (including livestock and fishing) for their livelihood. (FAO Corporate Document Repository)

While a typical farm size varies throughout the region, most are small plots of land owned by individual families. Most of the region is either arid or semiarid, so farmers choose crops that can survive in such an environment. Wheat is by far the most popular crop, but other crops such as barley and legumes are also farmed in smaller quantities. As stated before, there are also livestock farms, but there are not as numerous as in other parts of the world.

For a region of the world that is infamously low on water, irrigation is a very large part of farming practices. While crops such as wheat can grow without irrigation, it stunts the amount of wheat produced significantly. It is estimated that it takes 1,000 tons of water to produce 1 ton of grain. Or to put it in perspective, it is estimated that the water to produce farm products in the Middle East and North Africa is equal to the annual flow of the Nile River at Aswan. (Plan 2.0). Although most farmers use irrigation in some form, there is not a uniform way to irrigate the fields. The lack of water availability and resulting resource degradation are by far the largest barriers to subsistence farm families in the Middle East.

### **Problems:**

The situation of water scarcity and natural resource degradation is very serious and severe in the Middle East. Farmers gain their water through either fresh water areas (such as lakes or rivers) or underground water (also called aquifers). To put it simply, farmers are quickly draining both of these water sources to the point where they are not returning. The resulting water deficit means that farmers cannot irrigate their crops, resulting in large cut in crops. Climate change is merely aggravating this downward spiral. Overgrazing and desertification are also making it harder for Middle Easterners to farm.

A large part of the water scarcity problem is that many countries are overpumping their aquifers and draining their rivers. Communities begin by using the available ground water. They dig wells and use the replenishable aquifers, but have since found these sources of water to be inadequate. This causes them to dig deeper wells and to tap into their nonreplenishable aquifers. The problem, as you might imagine, is that once the nonreplenishable aquifers are used up they are finished. Even with the differences discussed earlier, Saudi Arabia and Yemen are both particularly severe examples of this phenomenon. In Saudi Arabia, it is thought that only half of the 462 billion tons of nonreplenishable water reserves reported in 1984 remain today. This is no doubt partly due to the fact that many Saudi Arabian farmers must create wells that go for nearly 4/5 of a mile to get water. This has led many to people that irrigated agriculture will all but disappear in the region within a decade or two. (Plan 2.0) In Yemen, the water table (the level at which the ground is saturated) under most of the country is dropping by about 2 meters a year. In its Sana Basin, the overpumping is most severe where 224 million tons of water is extracted. This exceeds the annual recharge rate of 42 million tons by a factor of 5, which is dropping the water

table for this region by an unbelievable 6 meters a year. The World Bank projects that Sana's Basin will be completely pumped dry by 2010. It is home to the capital of Yemen and 2 million people.

Important Middle Eastern rivers and lakes are also being drained of their important water. One example is the Tigris and Euphrates Rivers which originate in Turkey and flow through Syria and Iraq until they empty into the Persian Sea. These rivers are being vastly overused and the creation of large dams in Iraq and Turkey has helped to destroy over 90% of the wetlands in the region. (Plan 2.0) Another example is the Jordan River which feeds the Dead Sea and passes Jordan and Israel. What used to be a large river is now barely more than a creek, resulting in predictions that the Dead Sea will disappear by 2050.

As time goes on, agriculture is dealing with an increasing demand of water for other purposes. Right now, 70% of all water use is for agricultural purposes, 20% for industry and the final 10% for residential purposes. Many parts of the Middle East are facing rapid population growth rates due to the high fertility rate of females. For example, the fertility rate of women in Yemen is 6.41 children born per woman. (CIA Factbook) This is contributing to a higher demand in water for residential purposes. Agriculture also has to deal with the demand for water in industry when it is simply more economical to invest water in industrial products vs. agricultural. One example of this is that it takes 1,000 tons of water to grow a ton of wheat worth \$150, while it only takes 14 tons of water to make 1 ton of steel worth \$550 (Plan 2.0). When faced with scenarios such as these, government officials often decide to allocate water away from agriculture leaving farmers with little to irrigate their crops.

Climate change is also an important barrier to farmers for it is not only one of the causes of water scarcity, but is also directly responsible for crop loss. Rivers are replenished with water during the summer dry season by snow and ice masses in mountains. Studies have shown that even a 1°C change in temperature can reduce the amount of snow precipitation and increase the amount of rain precipitation. This means that there is more flooding during the rainy season and little snow for the dry season. For regions that depend on rivers for their irrigation, this means drought during dry seasons. But the rising temperatures can also affect crops directly. Most of the world's crops are already being grown in areas that are the optimum temperature for their specific growth. So, even a small change in weather pushes past their optimum temperature and decreases crop yields. The increased temperatures can stop photosynthesis and pollination and can also dehydrate plants.

Another barrier to farmers is that desertification that is resulting from cattle herders overgrazing. Half of the world's grasslands are lightly to moderately deteriorated and 5% are severely deteriorated and the Middle East is a prime area where overgrazing has become a problem. Iran is the best example of overgrazing. It is a country in which goats and sheep outnumber the human population by almost 20 million due to mutton and wool production. This has caused rangeland to deteriorate. While this only means less livestock productivity now, severely deteriorated rangeland leads to a loss of vegetation, soil erosion and eventually desertification.

## **Solutions**

Even though this paper is merely discussing the impact of climate change, resource degradation and water scarcity, nothing substantial can be done about these problems without addressing others. One aspect that needs to be addressed is the population increasing which is putting excess demands on our natural resources and water. In order to limit these demands, we must increase women's access to family planning and encourage these methods. This would be

the role of the national governments and private organizations within the country. All people and especially women need to be given the opportunity of school. This would help stabilize population by keeping women in school during their most fertile years and would also benefit farmers by giving them more education about efficient farming techniques. These changes, along with a better health care system would decrease the strain on resources and encourage better productivity.

In order to halt desertification, there seems to be little choice but to diminish the size of cattle herds. The animals eat the vegetation on the land and also disrupt the soil cover with their hooves. In countries with massive amounts of cattle, this is an even larger problem. One way that people have found to cope with this is to enclose smaller amounts of cattle and bring the vegetation to them. India has successfully adopted this plan. In order to repair the damage done in deteriorating rangelands, Middle Eastern countries should plant trees and other vegetation. They slow down the wind and help to protect the soil from erosion and can also be planted at the edge of deserts to help stop them from spreading. After this, there is nothing to do but wait for the protective layers of soil to slowly build up again.

Farmers must also be taught the most water efficient ways to farm in order to begin using water within the available limit. Since many of the wheat farms of the Middle East are smaller farms, it will be easier to replace the furrow system to overhead sprinklers or the drip system. Furrow irrigation is when water moves along dikes to the plants. This is very water inefficient compared to the overhead sprinklers (which cuts water use by 30%) and the drip system (which cuts water use by about 50%). The drip system is where water is essentially dripped onto the plants, watering in a slow drop-by-drop fashion. This drastically reduces run-off and evaporation while still watering plants efficiently. By implementing these methods, Middle Eastern farmers could drastically reduce their water usage and thus the strain on water resources.

In order to solve or lessen the problems of the Middle East, many different people will need to work together. Those who do not belong to a private organization and government can do their part by stopping the decline of the climate through alternative energy and conservation. Separate national governments need to ensure education, family planning and healthcare so that the population of the Middle East is as productive as possible. It is the job of private and civic organizations along with other countries to take a stake in the Middle East's need to improve. They must ensure that there is necessary funding and that goals are being met. In order to solve problems in the world, we must all invest in their solutions.

## **Conclusion**

The problems affecting Middle Eastern farmers are serious, but they are not without hope. For years, Middle Eastern countries have been overpumping nonreplenishable aquifers and slowly lowering their water tables. Without action, these aquifers will dry up and there will not be enough water for everyone. However, if we take preventative measures now, we can adopt more water efficient farming methods and decrease water use to the recharge level. For decades, sheep and goats have eaten away at the rangelands of the Middle East until much of the land was deteriorated and useless. If they were to continue this process, the animals would most likely destroy the top protective layer of the soil until the land eroded away into desert. But now, they can decrease the amounts of cattle and designate areas for them to reside. They can plant trees and allow the topsoil to return to those once deteriorated lands.

In order to create a food secure Middle East, we must all address these problems of water scarcity and natural resource degradation, including the climate change that aggravates them. With national governments raising the standard of living, the population will have increased

productivity. With other countries and organizations ensuring that goals are attainable and met, the countries will have the means of food security. When those in the world decide to invest in the future of an improving region, we can start to solve these seemingly insurmountable obstacles.

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