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Where's the (Mongolian) Beef?

Sandwiched between the two ever growing powerhouses of Russia and China sits the developing country of Mongolia. This land, that has been a democracy since the early 1990s, holds the title of the fastest growing economy. This economic boom is attributed to Mongolia's recent exploitation of its natural resources: gold, copper, and coal. As a result of the rapidly growing economy, Mongolia's Gross Domestic Product is looking to double in the next decade. While the discovery and utilization of these precious metals is great for the economy, it is pitting working class miners against farmers and nomads when it comes to water. Mongolia's freshwater resources are slim and strained to begin with. By taking away water from one section of the economy, agriculture, to give to the other, mining, can and will create problems. However, a solution can be found to these water woes through both conservation practices and new technologies. By implementing water scarcity management techniques, Mongolia will be able to meet the Millennium Development Goals of reducing hunger and poverty as well as achieve environmental sustainability throughout the whole country.

The landlocked country of Mongolia encompasses a vast area. This area includes five ecological zones based on geography and climate. The zones range from high mountains, forest steppe, and steppe, to desert steppe and desert (Jamsranjav 2). Different terrain, climate, flora, and fauna make these areas unique for both their uses and the lifestyles that they support. These different regions of Mongolia provide distinctive social and economic opportunities to the people who live in them. Even though there are five separate ecological zones, nearly 90 percent of the land can be used for agricultural or pastoral uses with animal husbandry accounting for 84.9 percent of the agriculture sector (Seed Policy and Programmes). To add even more importance to agriculture in Mongolia, 20.5 percent of its GDP is produced by the farming sector with a majority of it coming from livestock husbandry. Agriculture also supports 40.2 percent of the total labor force in the country, but all of this is at stake due to a changing climate (Gombo and Chagnaa).

The continental climate in Mongolia means that this nation is one of extremes when it comes to weather. The temperatures in Mongolia can range from 40 degrees Celsius in the summer to -40 degrees Celsius in the winter. Mongolia's annual precipitation is low throughout the five different zones, but especially in the Gobi-desert (Gombo and Chagnaa). This climate, however, is changing drastically with potentially devastating consequences for the people of Mongolia as Dr. Gombo and Dr. Chagnaa, professors at Mongolian Agricultural University, stated:

According to the forecast released by the state meteorological institute, it is estimated that the air temperature in a summer season will be increased by 3.53°C in the year of 2020, by 6.35°C in 2080 respectively in Mongolia. When it comes to an annual precipitation in summer time, it will be decreased by 5.2 mm in the year of 2020 and by 13.6 mm in 2080 respectively (Gombo and Chagnaa).

This rise in temperatures will prove to be devastating to Mongolia as once green pasture turn to dusty desert. Climate change will affect everyone on Earth; however, some, like the people of Mongolia, may feel a deeper impact because large majorities of people in Mongolia rely on the land for food and income.

Mongolia is being threatened by a warming and drying climate that is leading to desertification, soil erosion, and a depletion of water resources and biodiversity (Gombo and Chagnaa). Climate change, however, doesn't bare all of the blame when it comes to Mongolia's farming woes. Currently, there are four unique subsectors in Mongolia's agriculture. The first and second subsectors have to do with the

raising of livestock, whether it is extensive, the traditional semi-nomadic pastoral system, or intensive, which includes the housing of dairy cattle, pigs, and other animals. Combined, these two animal-focused sectors make up more than 80 percent of the total agriculture sector. The remaining two sectors involves the mechanized large-area crop production of cereals, and the intensive farming that produces vegetables, mainly potatoes, by both mechanized and simple production methods (Seed Policy and Programmes). These sectors all have some of the blame when it comes to the massive soil erosion and desertification that is plaguing Mongolia. Due to old and harmful grazing practices and the influx of grazing animals since the fall of the communist government in the 1990's, little regulation or conservation has occurred. This has led to overgrazing and the reduction of vegetative ground cover (Jamsranjav 6). With the use of frequent mechanical soil cultivation and tillage operations, the soil is eroding at unprecedented levels. When poor tilling practices are combined with the loss of soil moisture, conditions in Mongolia start to look eerily similar to those found in the United States during the 1930s. As you can see, Mongolia's water woes turn into agriculture woes which turn into social woes due to the lack of homegrown food and the lack of jobs.

When we look at the top layer of people affected by the water troubles, we have to peer into the life of a middle class family in the country's capital of Ulaanbaatar. Ulaanbaatar is Mongolia's largest city with a population of around 1.2 million. Many people live in Soviet style apartments in the city or in what are called gurs. These gurs have been described as fancy huts set up by squatters just outside the capital. Income, for many Mongolians is low with 75 percent of the population living on less than two United States Dollars a day (D'Aluisio 119). The Batsuuris are a typical urban Mongolian family. The Batsuuri family lives in a single-room home. Faith D'Aluisio, author of *What the World Eats*, tracked the Batsuuri family for one week in May and recorded what they bought and how much it cost. A week's worth of food for this family cost 41,985.85 Togrogs, or about 40.02 USD. Like many families that live in urban population centers, the Batsuuri family spent a majority of their money on food items that are not prone to spoiling and that don't go out of season such as meat, dairy, grains, and root vegetables (D'Aluisio 119). What the Batsuuri family spends on food will continue to increase as Mongolia's agricultural abilities dwindle due to a lack of water.

The rural communities of Mongolia consist of nomads who control a herd of grazing animals. These nomads live in huts called yurts or gers and maintain a diet that is similar, but much smaller, to that of their urban counterparts. Some nomads choose to live in district centers called soums, which consist of a few hundred families and provide easier access to health care and education ("Rural Poverty in Mongolia"). In the early 1990s, state collective livestock was privatized, but the pasture land remained state owned. This privatization of state collective livestock created an incentive for Mongolians to turn to herding and farming (Jamsranjav 9). Rural communities grew in both human and animal populations where both put more stress on the already fragile land. To make matters worse, there were almost no regulations or incentives for herders to have their animals practice sustainable grazing. Rural life was not an easy one to neither start nor maintain as an International Fund for Agricultural Development article explains. "Smaller herds barely support a simple life at the subsistence level . . . herders are among the poorest of the poor in Mongolia."

What makes nomadic life in Mongolia so unique is the fact that Mongolia has a free-market economy with public ownership of land (Sumber). This public land is in deteriorating condition. The soil the farmers and herders depend on is starting to erode away leading to lower crop yields. These troubles and issues can all be traced back to the simple fact that there is a lack of water and insufficient technology to gather or transport the life giving liquid. When you throw in Mongolia's recent mining of precious metals, you get an enormous strain on already low water levels. Due to climate fluctuations and greater demand for water in agriculture, mining, and the private sector, aquifers are being drawn down (Nuttall 2). Dr. Young-Woo Park, United Nations Environmental Programme Regional Representative for Asia

and the Pacific explained: “If the status quo for water management in Mongolia continues, the country will not be able to provide sustainable water resources for its population under the future climate change.”

Before you can start to look for a solution to Mongolia’s water shortage issues, you have to look at the several items that are using large quantities of water. Mongolia is now exploiting its vast mineral resources. Through the utilization and mining of its natural resources, Mongolia will be able to provide more opportunities for its citizens to escape poverty; however, it will come at the expense of Mongolia’s environment and water resources (“Mineral-Rich Mongolia Rapidly Becoming...”). The mining of gold, copper, and coal has rocked Mongolia’s economy to be the fastest growing in the world. However, what about the biggest part of Mongolia’s economy, farming? Solongo Namjil, a 22-year-old clerk for the Oyu Tolgoi mine located in the middle of the Gobi, states: “I’m really concerned about that . . . that there won’t be enough water for our children and children’s children” (“Mineral-Rich Mongolia Rapidly Becoming...”). This feeling is mirrored by Mijiddorj Ayur, a nomad whose livestock graze near the Oyu Tolgoi copper mine: “My greatest fear is we won’t have water. I don’t care about the gold or the copper, I’m just afraid there won’t be water” (“Mongolia’s Dilemma: Who Gets...”). Mijiddorj claims that the well water that he and his herd depends on has dropped eight inches in the last couple years and the pasture grass that his camels feed on has shrunk as well.

How do herders recover from the blow by climate change and a mine that, at full capacity, will pump about 180 gallons per second of water from the same aquifer that herders depend on (“Mongolia’s Dilemma: Who Gets...”) Oyu Tolgoi’s principal advisor Mark Newby stated that if worse came to worse the mine would bring in truckloads of treated water for the herders (“Mongolia’s Dilemma: Who Gets...”). While this may be comforting to some, it does not fix the water woes elsewhere in the country. A seasonal lake in the South Gobi province was labeled as a protected area by the local officials. This was overturned by the central government to allow a coal mine to pump water from underneath the lake which is the only freshwater source in that area (“Mongolia’s Dilemma: Who Gets...”). Why would the central government repeal the protective title for a lake? The answer can be found in who owns the mines. Oyu Tolgoi is owned by global mining giant Rio Tinto and Canada’s Ivanhoe Mines, as well as the Mongolian government who also owns the coal mine in the South Gobi (“Mongolia’s Dilemma: Who Gets...”). If Mongolia ever wants to solve its long term water crisis, it cannot use short term solutions. The local and central government need to work together for the people of Mongolia.

With the help of outside sources and the use of innovative technologies and education programs, Mongolia can alleviate its water troubles even when it seems like giant corporations and even its own government is working against them. Some very successful programs are currently solving these water issues. The Integrated Water Resources Management-Model Region Mongolia has a budget of € 8 million from the German Ministry of Education and Research and is working with representatives from four national ministries of Mongolia and several universities in the area (Karthé and Borchardt 4). The IWRM MoMo project, which started in 2006, focused on the Kharaa river basin that lies north of Ulaanbaatar and just south of the Russian border. The project’s goal was to implement integrated solutions to the problems that plagued the Kharaa watershed area, such as pollution, lack of adequate water supply, mining impacts, and poor infrastructure (Karthé and Borchardt 10). To fix these problems the IWRM MoMo started numerous pilot and monitoring programs focused on water sanitation, transportation, storage, and irrigation. In early 2012 IWRM MoMo had constructed a wetland and implemented probes to water supply systems that are able to detect leaks that currently led to the loss of around 50 percent of water entering the distribution network (Karthé and Borchardt 14). By implementing larger projects that focus on conservation techniques, improving and expanding the current infrastructure and irrigation system, and using genetically modified seeds, Mongolia can start to mitigate its water troubles.

The Food and Agriculture Organization (FAO) of the United Nations has been assisting Mongolia with technical support and projects in the areas of food security and safety, water management and irrigation, and actions against soaring food prices. The Special Programme for Food Security and National Programme for Food Security by the FAO and the Mongolian government have been working together to implement and provide small scale irrigation and demonstrations on conservation farming to improve cereal and vegetable production (Mongolia and FAO Achievements 2). More recently, the Mongolian Ministry of Food, with the help of the FAO, started the Sustainable Irrigation Management project. This program implemented new and advanced irrigation technology and practices through the government's Irrigation Rehabilitation and Establishment Programme. It also established and empowered a Water User Association and educated farmers on proper irrigation and conservation techniques such as crop rotation and diversification (Mongolia and FAO Achievements 12). The FAO and the IWRM MoMo have done quite a bit, and will continue to help Mongolia reach the Millennium Development Goal of reducing hunger through education and technology.

What the FAO and IWRM MoMo have done is a fantastic example of what needs to continue if Mongolia ever wants to attain food security. Thanks to the UN, foreign countries, numerous Mongolian national ministries, local governments, private companies, and donations, Mongolia has the funding it needs to research and implement water saving projects. It would be in the best interest of these stakeholders to continue investing in a country with a bright future. In this bright future, investors should partner and work with the youth of Mongolia by utilizing the minds that fill Mongolia's universities. These academic centers hold Mongolia's answer to several of its water issues as well as the people who will educate their fellow citizens on the new technologies and techniques as well as the importance of conservation needed to get the job done. Mongolia should also look to its neighbors, Russia and China, for help when it comes to funding and technology. Any water that isn't used up entirely in Mongolia flows into either Russia or China. If those nations want to safeguard the quality and quantity of water that enters its country, all they have to do is look upstream and help fix what may be broken.

Internally, Mongolia should beef up regulations concerning water usage and waste disposal for its mining operations. Severe fines should be implemented for those who violate clean water ordinances. Encouraging its youth to pursue a college degree in a field that can help Mongolia in its quest to achieve food security will help in the long run when foreign investments run dry. The leaders and citizens of Mongolia (as well as the world) should strengthen their feelings of selflessness. To reach a level of national (and global) food security, people need to focus on what is best for the most people when it comes to the long term. From mining executives to nomads, everybody has the power to help resolve the water shortage problem; all they need is a plan of action and support from the government, private companies, and international organizations. This blueprint should include genetically modified organisms and seeds, new irrigation technology, conservation efforts, and updated infrastructure.

Genetically modified seeds may prove to be one of the most powerful tools in combating water shortage. Less water will be needed for irrigation if drought resistant or tolerant crops are planted. These plants can also be planted in areas that were once thought to be non-arable. Modern day scientists and companies can use plant genetics to their advantage just as Dr. Norman Borlaug did for Mexico, India, several African nations, and more during the Green Revolution. These seeds should play on Mongolia's strengths. Farmers should continue to plant what traditionally has worked, root vegetables, but also may want to try new varieties of grain and corn. If Mongolia wants to gain food security and help feed the world's growing population, GMSs are an essential part of a complicated solution. Although these seeds require less water, they still require some moisture to grow and produce the food we desperately need.

In 2012 Dr. Daniel Hillel was awarded the World Food Prize for his achievements in micro-irrigation that brought water to the arid Middle East. His revolutionary drip irrigation system turned dry land into fertile soil that was able to sustain crops with less water than traditional irrigation systems ("2012 Laureate-Dr.

Daniel Hillel"). Mongolia's grain and vegetable farms could benefit greatly from similar systems that use less water but produce higher yields. Drip irrigation simply won't do when it comes to the nomadic herders throughout Mongolia. Short of reversing climate change, the outlook is somewhat bleak for the nomads and their herds. There are, however, some solutions that will alleviate the spread of desertification and low water levels. The basic and perhaps most effective way to turn the tide on soil erosion and water shortage is through conservation.

Conservation is essential when it comes to limiting water usage. Farmers who plant crops should be encouraged to use practices that limit water consumption and soil erosion. Drip irrigation and infrastructure that does not waste water need to be implemented on the farm as well as in the city. Residence of towns, farmers, nomads, and mining operators are all responsible for curbing water usage and using water wisely. Topsoil should and can be prevented from washing into streams or blowing into the sky. No till farming coupled with grassy waterways and buffer strips allow for excess water to flow into nearby streams and lakes without carrying silt particles off the land (Charman 13, 97). When it comes to the nomads, reducing overgrazing will not only help the land but other nomads as well. Since the Mongolian government owns most of the land in the country, they can assist the conservation efforts by opening and closing tracts of land to grazing based on the season, the stocking rate of each section, and the amount and access to fresh water. If the national government doesn't manage the land, then the other option would be to sell parts of the land to private owners. The major problem with privatizing the land is that it would completely violate the nomadic livelihood and eliminate the ability to roam from one pasture to the other (Sumber).

Mongolia will need to update and expand its infrastructure in order to catch and transport water. To store snowmelt and water from heavy rainstorms, dams and reservoirs may be needed on rivers and streams. The dominant problem lies with the fact that you are destroying an existing ecosystem to create a different one. A dam coupled with global warming could spell the end for native plants and wildlife. As we have seen in the United States with the Colorado River, damming and overusing a river can have a devastating effect on the river itself. A better option for Mongolia would be similar to the previously mentioned IRWM MoMo project. Natural and constructed wetlands not only provide habitat for wildlife but also store water and recharge underground aquifers which will in time raise water levels in surrounding wells. Once you have the water in one place, whether through dams or wetlands, the next issue is transporting to where you need it most. Many pipes in Mongolia are outdated and riddled with leaks. By ensuring 100 percent of the water collected gets to its intended destination, more water can remain in the natural environment while still growing crops and quenching the thirst of thousands of cattle, goats, or horses.

The land of the nomads has a bright future ahead of them that is helped by a booming economy. The roadblock that is holding Mongolia back is not a unique situation, but a problem that is plaguing many nations around the globe –water shortage. What is unique to Mongolia are its rich deposits of precious metals and coal. It is imperative that Mongolia reaches a balance between mining and farming. If the mining companies continue to ransack freshwater sources, then the title of “fastest growing economy” will mean nothing to the Mongolians who are starving and thirsty. Past projects by the FAO, German Ministry of Education and Research, and Mongolian Agricultural University have shown that progress is obtainable. The current funding sources, which is comprised of international aid, foreign investments, national tax revenue, and private donations, needs to continue in order to implement any plan of action. Mongolia can utilize water more efficiently, by using a multi-step approach that includes: government regulations, GMOs, new technology, updated infrastructure, and conservation techniques. With less water wasted and more going to the field and prairie, farmers and herders can grow more crops and raise more animals which will lower food prices and reduce Mongolia's dependency on imported food. The Millennium Development Goal of reducing hunger can be achieved in Mongolia and doesn't have to come at the expense of its diverse environment.

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