

Kristen Lowe  
Union High School  
La Porte City, IA  
Maldives, Factor 6

### **Maldives: Troubles in Paradise**

A newlywed couple, having just hosted the perfect wedding, desires to experience an equally magical honeymoon. Their vision of serene beaches, constant balmy winds, relaxing in privacy, and romantic ocean sunsets can become a reality through a trip to the beautiful tropical islands of the Maldives. The islands, located in the Indian Ocean directly south of India, sit on top of a vast submarine mountain range. Considered to be an archipelago, the islands were formed from the gradual buildup of coral. Warm turquoise waves gently lap at the white sandy beaches and the palm trees wave in the slight tropical breeze. The warm 70- to 90-degree Fahrenheit climate is consistent year-round. Everything seems perfect in the Maldives, but if you look past the beautiful tourist resorts and well-kept beaches, you may find many more problems than you had first expected.

The first and most obvious problem Maldives faces is the fact that it is the lowest elevated country in the world, with a natural maximum elevation of 2.4 meters and an average of only 1.5 meters above sea level. More than 80% of all the land in the Maldives is less than 1 meter above sea level. The total land area is only 300 square kilometers, which is comparable to the size of the city of Washington, D.C (“Central Intelligence Agency”). At the current rate of ocean level rising, by the year 2100, the country will lose an approximated 77% of its land surface (“Climate Hot Map”). Out of the 1,190 islands, only 200 are inhabitable, and are home to more than 320,081 people. Because of the small amount of land, Maldives has one of the highest population densities in the world: more than 1,316 people per square kilometer (“Central Intelligence Agency”).

Travel between the islands is a challenge for Maldivians as the Maldives encompass a territory of more than 90,000 square kilometers across the Indian Ocean. Because of this, many cities on the larger islands have become overcrowded; Maldivians want to live where the jobs and provisions are. The country’s capital of Malé hosts over one-third of the population (“Central Intelligence Agency”). Among all 200 inhabitable islands, there are less than 30 major cities and towns in the entire country.

This inhibition of travel has created a citizenry that is both unique and diverse. The first inhabitants of the country migrated from Sri Lanka, located just to the northeast, and South India. Maldivians are a very unified people because of their common history. The language spoken is Dhivehi and the main religion practiced is Muslim. Because of its location in a major sea route, the Maldives has been a frequent stop for mariners traveling between Africa and Southeast Asia. As a result, Maldivians today have a diverse and rich cultural background. Even so, they seem to have formed close-knit island communities. There is much respect for the heads of households, community leaders, and government officials. A system of extended families is the norm, as many members of the family contribute to childcare and daily family life. Traditionally, men go out fishing daily, leaving women to look after family affairs and the communities. As a result, women hold key positions in community governments (“Maldives History”).

Overcrowding in major cities and the capital has made the availability of fresh water an additional problem. More than 75 inches of rainwater falls during the monsoon season, which begins in May and ends in November. It is collected and harvested for drinking purposes. Also, water collects in freshwater lenses under the atolls, on top of the saltwater. Heavy abstraction of this fresh water has depleted the stores and has caused saltwater intrusion. The only renewable source of water, groundwater, can be collected after being recharged by a rainfall, but is contaminated from running through the soil which is highly polluted with human and organic waste. Water for agricultural purposes comes mainly from wells

and irrigation systems. However, most of the water evaporates before it reaches the roots of the crops, therefore making this system highly ineffective and wasteful. The Maldives cannot afford to waste any of its meager fresh water. If the country is to proceed and update its agricultural industry, a more suitable method of irrigation must be made available (Zuhair).

Along with the shortage of water, the Maldives has to import much of its food because of the lack of arable land on the islands. For every 1,000 people, there are only 0.3 square kilometers of agriculturally used land. To put this into perspective, the United States has almost 14 square kilometers of land used for agriculture per 1,000 people. Maldives' agriculture is limited to only a few subsistence crops such as coconuts, bananas, breadfruit, papayas, mangos, taro, betel, chilies, sweet potatoes and onions (Hameed). The main imports shipped to the country are vegetables, prepared foodstuffs, mineral products, machinery and electrical equipment, and vehicles (Central Intelligence Agency).

Although agriculture is struggling, the Maldives' natural resource of fish is more than plentiful. In the words of former Maldivian President Maumoon Gayoom, "Fishing, and our country and its people, [are] one and shall remain inseparable forever." The fishing industry comes second behind the tourism industry in gross profit, employs about half of the Maldivian workforce, and has been positively progressing since the development of fisheries in the late 1990s. The Maldives has a 900,000 square kilometer exclusive economic zone, or EEZ, that gives special rights to the fishing industry. The area of the EEZ where the Maldives makes its greatest profit is the deep ocean zone, where they catch their most important fish - tuna. Tuna is sold in local fresh fish markets, as processed fishmeal for livestock, and as a canned product. Over half of the country's exports are fish products. Because this industry is so vital to the Maldivian economy, if a natural or man-made disaster were to somehow halt fish harvest and production, the country would greatly suffer (Fishery and Aquaculture Country Profiles – Maldives).

Fortunately, because of the natural beauty of the islands, more than 900,000 tourists visited the islands last year - more than triple the country's total population. The tourism industry employs more than 12 percent of all native Maldivians. Even though tourism brings in about \$325 million per year, the Tourism Employees' Association of Maldives (also known as TEAM) argues that many of the more than 25,000 tourism employees face poor living conditions and low wages (Maldives Visitor Survey Report 2011).

The living conditions in the Maldives show this dichotomy. While they work in luxurious resorts, many of the poorer families in large cities live in thatched palm- and tin-roof houses. Their meals consist of mainly rice and fish. It is estimated that almost 50 percent of children suffer from stunted growth and physical wasting. This is chiefly caused by the limited agricultural potential on the little land available for crops and livestock. Supply and food imports cost much money, and with low incomes, many families can only afford to pay for staples such as rice and fish. Consequently, a survey found that less than 30 percent of children eat any fruits and vegetables (Maldives – Poverty and Wealth).

Because of the unique geography of Maldives, the healthcare in different regions is also just as distinctive. There are essentially three different sections to the Maldivian healthcare services. In the capital, there are no primary care centers, so people seek out hospitals when they feel ill or have a disease or injury. There are two hospitals in Malé: the government-owned Indira Gandhi Memorial Hospital (IGMH) and the privately owned Abduarahman Don Kaleyfan Hospital (ADK). Both hospitals perform small general and orthopedic surgeries, but the country as a whole has no trauma or intensive care units. The second of the sections of healthcare are regional hospitals located on one of the islands in each of the 26 atolls. Specialists are hired for each hospital but see very few patients depending on their specialty. Most people prefer to travel to the IGMH or ADK hospitals for what they believe is a better healthcare treatment. The third section of healthcare is small unit hospitals on islands with 600 people or fewer. These hospitals have plenty of beds, but like the regional hospitals, are generally not busy. There are no major infectious or viral diseases in the Maldives besides gastroenteritis and fevers. The most common

medical concerns are snake bites, shark attacks, and other sea urchin injuries. The problem with the Maldivian healthcare system is the general lack of education by the patrons and even the doctors. Simple health problems that could be corrected by going to one of the small unit hospitals or regional hospitals are clogging up the main hospitals located in Malé. Also, individuals tend to have to make frequent visits to the hospital for reoccurring symptoms because the medical staff have been known to make quick fixes rather than finding the root cause of the illness and treating it (Heller).

Education has been and continues to be a challenge for Maldivian families. Children first attend a primary school called a Makthab. These schools mainly teach the young how to read and write in Arabic and Dhivehi, and do simple mathematics. While enrollment at primary schools is very high, secondary schools only enroll about half as many children. Before 1978, there were only two secondary schools outside of Malé, which had the effect of limiting secondary education to the more wealthy tiers of Maldivian society. That year, President Gayoom declared that every atoll in the Maldives would have a secondary school. Since then, the literacy rate has improved from 70% to 98.82%. While schools have managed to improve the literacy rate, little else has changed. The Maldives currently has to employ many foreign workers because its school system provides less than proficient instruction to properly educate the native people (Hameed).

As we've seen, the agricultural industry already has very little land on which to produce food. Even so, significant soil erosion occurs on shorelines and in areas of agricultural production. Practices such as coral mining deplete the buffering effects of the reefs. Therefore, the continuous action of waves erodes the islands' coastlines even further. Another factor that is destroying the precious soil needed for food is over-cropping. Because of too few crop rotations or fallow periods, the organic matter and nutrients in the soil have been depleted on some islands. Maldivians need to be better educated to learn how to properly use the fragile land that is available for crops. Currently, plots of land are leased to individuals for short periods of time, usually only one growing season. Because of this, farmers make little effort to rehabilitate the soil after their harvest (Zuhair).

The benefits of using fertilizer on the island's highly alkaline soil and the proper use of pesticides are poorly understood by Maldivian farmers. The freshwater lenses, upon which the country relies heavily for clean water, are very vulnerable to fertilizer and pesticide pollution. The organic matter in the soil is dangerously low, resulting in the leaching of chemicals into the groundwater. As if the water contamination wasn't serious enough, frequent pesticide spraying has become too intense, leaving residue on the harvested crops. On some islands, crops are sprayed six to ten times in a growing season, far exceeding the manufacturer's recommendations. This has caused the death of a number of beneficial insects, and may create a rise in pest resistance. Also, because of the small area of land on the islands, pesticide drift while spraying has become an issue as it spreads to communities and other crop plots (Zuhair).

Many of the problems in Maldives stem from the issue of the small quantity of land and the abuse of the soil needed for agricultural purposes. As stated earlier, the Maldives has only 300 square kilometers of land, is the lowest elevated country in the world, and has one of the highest population densities. Add in the lack of education, limited water supply, environmental pollution, and infertile soil, and it becomes clear that this is more than a passing issue. All of these factors pose a growing problem when it comes to agriculture and the ability to sustain its population. The Maldives needs to combat erosion, regulate over cropping and land use, and improve chemical application methods. I would like to propose some solutions to aid the Maldives in becoming more food secure by improving higher education, protecting its freshwater source, and implementing better practices for sustainable agriculture.

Although Maldives has done well in beginning to improve the quality of education for its children, it needs to provide facilities for higher learning. Alternatively, the government needs to cultivate

relationships with existing foreign colleges and universities to create opportunities for Maldivian young people to study agriculture. Many of the problems in the agricultural industry stem from the lack of higher education accessible to agriculturalists. At the existing schools, agricultural based courses need to be offered. Only one center in the Maldives offers studies for those interested in agriculture. The knowledge of practices such as erosion control, proper pesticide application, updated fertilization methods, and the maintenance of fragile soil would help the Maldives in moving forward in their agricultural industry.

Higher education for native Maldivians striving to become doctors or nurses needs to be encouraged and provided as well. Many doctors are hired from overseas and are on contracts that make it difficult to refuse requests from patients with minor ailments. When the patient expects a prescription, doctors are pressured into fulfilling the request for fear of jeopardizing their contract. Overseas doctors often require an interpreter to translate the language of their patients. Because of this, much of the understanding of ailments and issues is lost between the doctor and patient. If there were to be more native Maldivian doctors, they would be able to understand the patients more fully, therefore be able to communicate procedures, treatments, and healthy practices. An improved educational program and enhanced educational opportunities will motivate Maldivians to achieve the level of education needed to succeed in the healthcare sector (Heller).

The Maldives needs to focus on implementing updated ways to provide fresh water. While the growing population and increasing agricultural activities are creating a large demand for water, the needs of both can be met through conservation techniques. Catching rainwater during the monsoons needs to be implemented at a household level. Small communities should be able to collect rainwater during the monsoon seasons to store in tanks for use throughout the year.

Freshwater lenses can be utilized as well, but their use must be regulated. Currently, saltwater on the edges of the lenses partially replace the freshwater when the lens become nearly empty of freshwater. When it is recharged with rainwater, some of the leached saltwater remains and mixes into the rainwater. The level of salinity will continue to increase with each repeated process, even if the amount of freshwater stays the same. This process only happens when the freshwater lens is over-harvested. Careful regulation of the withdrawal of freshwater is needed to preserve the lenses. Slow and limited withdrawals are the appropriate and conservative technique needed to keep this sustainable resource (Zuhair).

Conserving the country's soil is just as important as conserving the freshwater. The most alarming problem is the erosion of the islands. Materials derived from coral mining are used to provide stone for buildings and roads, but this coral removal disturbs the natural buffer for the islands. The Ministry of Fisheries and Agriculture has developed a license system which only allows specific amounts of coral to be extracted at certain locations. This is a step in the right direction, but the country needs to keep in mind that with a disappearing land mass, fewer buildings need to be constructed. Importing concrete or other building materials may be a beneficial alternative. The importance of conserving the already meager amount of land outweighs the need for coral brick (Zuhair).

Another strategy to conserving the fragile soil is the correct use of fertilizer and organic material. Because fallow periods are becoming shorter because of the single-growing-season leases, nutrient deficiencies in the soil are increasing. Farmers need to incorporate mulch, compost, and other organic material onto their fields to increase the amount of organic matter in the soil which will increase water-holding capacity, improve soil structure, and prevent erosion (Funderburg). Improvements such as erosion reduction, water capacity, and nutrient development will begin to appear in as little as one to two years (Soil Scientist).

Application of organic material will be best utilized if farmers are allowed more than one growing season per plot. Extended leases, such as ten to twenty years per plot would encourage leaseholders to be active stewards applying sustainable soil building techniques which could be a viable solution to the current

negative effects caused by short-term land leasing practices (Zuhair). After the reconstruction of the soil, plentiful harvests will bring in more profit therefore allowing the farmer to possibly purchase the plot of land instead of having to lease it.

Public awareness about the dangers of the indiscriminate use of pesticides needs to be significantly higher. The people are not aware of the dangers of chemical misuse in the environment, their citizenry, and their two main industries in the country, tourism and fishing. Leaching pesticides can result in coral death, which would cause a severe ecological disturbance and possibly threaten the fishing industry. Tourism also would decline if the water is unsafe for recreational activities. To improve the level of agriculture on the islands and conserve the ecological assets for the other main industries, The Maldivian Ministry of Fisheries and Agriculture needs to highlight the awareness of proper chemical use. Once the public is aware of the impending problem, changes such as reduced pesticide use and proper fertilization should be put into effect.

While the total land mass of the Maldives is extremely low, efforts to productively and sustainably utilize more of the uninhabited islands by leasing to farmers for industrial agriculture should continue and even increase. Meanwhile, native Maldivians should also develop more home gardens in their villages and cities. Growing fruits and vegetables in their own backyards will contribute to food security, nutritional diversity, and saved income. Decreasing imports of fresh foodstuffs is a step toward a self-sustaining food supply.

An effective solution in addressing all of these conservational issues is for the Ministry of Fisheries and Agriculture to create a new ministry for conservation. The Ministry of Fisheries and Agriculture should be obligated to create this conservation group because without the conservation of the country's soil, resources, and water, the fishing industry and agricultural industry will suffer greatly. This new conservational group would head educational and advertising campaigns for public awareness, enforce environmental and governmental regulations for coral mining, care of the soil, and lease agreements, and work with farmers to instill modern farming practices that would benefit the land instead of harming it. This group should consist of agriculturalists, public policy makers, and marketing experts who have the expertise and connections to apply for grants, create effective public policies, and connect with citizens.

Naturally, as with any solution, there will be some barriers and opposing opinions. Industry leaders may strongly resist the new regulations on coral mining and water use. Current government landowners may resist leasing plots of land for more than one growing season in an effort to increase lease income. Farmers using traditional farming practices may resist progressive techniques and continue to over-crop and use pesticides indiscriminately. While these possible barriers may arise, the benefits of the few simple solutions will out-weigh the problems, and opposing view-points may be turned. The groups that will benefit the most from the improved conservation techniques such as the tourist, fishing, and agricultural industries must stand firm and press the need for change. The citizens of the Maldives must also do their part by becoming aware of the problem, educating themselves, and doing what they can to better their own lives through improved conservation techniques and efforts to become more sustainable.

Soon, a new series of problems will arise as the polar icecaps continue to melt, causing the ocean level to increase. As more and more land erodes away from the islands, Maldivians need to become educated and implement updated farming techniques to be able to produce and provide for the growing population. Providing higher education for prospective agriculturalists, conserving the little land available for crops, and regulating more sustenance-acceptable methods of chemical use are key factors to improving the quality of agriculture in the Maldives. I believe that with hard work, cooperation, and an altogether willingness to become an ecologically and industrially aware country, the Maldives could become an oasis not only for the visiting tourists, but also for the native people to sustain and enhance this beautiful country.

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