

Isabel Ehrich
Wayne Community High School
Corydon, Iowa
Mali, Factor 10
The Tree of Life

Over 2 million people die each year from diarrheal disease caused by contaminated water. Many of these are children in Africa. The problem can be traced to unavailability of water and the difficulty of rendering it potable.

Water insecurity is a big factor in making Mali, West Africa one of the world's poorest countries. Seventy-two percent of Malians live beneath the poverty line.

Let's travel to the village of Konodimini, (meaning "Little Stomach Ache" in the Bambara language) population 13,000 as of 1998, Segou Region, Mali. Konodimini has little access to health care other than the village herbalist. Abdoulaye Coulibaly is a 35-year-old subsistence farmer (smallholder) who owns a four-acre farm. His first wife, Kadidia, 30 years old, has four living children: two daughters, Fanta, 10, and Awa, 4 and two sons, Adama, 7 and Saika, 2. She had two more children but they did not survive. The oldest died shortly after birth and the other died from dysentery at age 2. The infant mortality rate in Mali is the fourth highest in the world at 123 per every 1,000 babies born. Abdoulaye's second wife, Mariam is 19. She has two children, a boy Boubacar, 3, and a girl Bintou, 9 months.

Mariam has a small herd of goats that she brought into her marriage as her dowry. She and Kadidia share a half-acre vegetable garden of tomatoes and hot peppers that they sell at the weekly market in the nearby city of Segou, population 92,500. They go to market once a week. Abdoulaye farms millet, around 23 bushels to the acre, and peanuts. He also helps his two brothers with a herd of cattle, which has 20 head. The brothers take the cattle north across the Niger River, the main supply of water for Malians, during the rainy season (May-October) for grazing and return during the dry season (November-April). As many cowboys did in America, the Coulibaly families' cattle are free range, meaning fences don't enclose them. Without fences, someone always has to be watching and tending for the cattle, which can reduce the productivity of the villagers.

Neither Kadidia nor Mariam has been to school other than a couple of years at a Koranic school when they were young. Abdoulaye went to school through the 5th grade. Even though they are Muslim, they retain some of the animist traditions of Mali. Fanta went to school for two years, Adama is currently in school and attends Koranic school once a week. He helps Mariam with the goat herd, which has 12 head. In the next year or two, he will be required to go with his uncles when they take the cattle north. He helps his father with the millet when it is time to sow, weed and harvest, which is all done by hand. Fanta looks after Awa, Siaka and Boubacar when her mother and her father's other wife are in the garden. Bintou is still carried on her mother's back wherever she goes. Fanta is also expected to do most of the dishes, sweep the compound where they live, help her mother with the wash (which is all done by hand), help collect goat and cow dung for fuel, and help prepare the meals. During the dry season she will also help water the vegetable garden.

The weather plays a large role in family life. If the need arises, the vegetable garden can be hand watered from the well, but the millet field relies on rainfall at a certain time of year. The problem of desertification, the Sahara moving south farther than its normal boundaries, is impacting the family cattle business, since it is harder to find adequate grazing north of the river as the Sahel is eroded away by the encroachment of the Sahara desert. The goats are able to fend for themselves fairly well but there are years when, even for them, forage is sparse. There is also the problem of fuel. Many of the trees have been cut down long ago and made into charcoal. That practice hastens the process of desertification and

erosion. The women and children either have to spend much of their time walking about collecting wood or dung or they have to spend cash, which there is little of, to buy charcoal at the market. This makes it even more unfeasible to boil water to make it potable.

As living conditions deteriorate and survival becomes more difficult for the Coulibaly family and their neighbors, other realistic solutions for their problems must be sought.

One suggestion would be the *Moringa Oleifera* Lam tree (Order: Brassicales, Family: Moringaceae). The Moringa tree, native to northern India, is a hardy, softwood tree resistant to drought and easily established from seed and cutting. The Moringa tree was discovered around 2000 B.C. as a medicinal herb. Ayurvedic Medicine in India claims that the Moringa tree has the power to prevent 300 diseases. From India, the Moringa tree has traveled to the east and to the west. This hardy tree has gone west to Egypt, the Horn of Africa, around the Mediterranean, and then to the West Indies. It has gone east to lower China, Southeast Asia, and the Philippines. The Egyptians discovered the power of the Moringa tree, using Moringa oil to protect their skin from the desert sun. The Greeks also found uses for it. They passed on what they learned about the tree to the Romans.

The Moringa has been becoming more popular throughout different countries. In Africa, Ghana is the country using it the most. There have been Moringa tree projects in the north of Ghana where the terrain and climate are very similar to the area of Mali where the Coulibalys reside.

The Moringa tree thrives in growing zones nine and ten, arid desert climate. The Moringa is very easy to grow. A 6-foot cutting of the Moringa tree placed in a fertilized hole will become productive within 6 months. The Moringa tree can grow to a height of 36 feet and live as long as 20 years. The Moringa tree seed looks like a pod. It is similar in looks to what we know here in Iowa as a locust seed. The pod is narrow, and long. They can reach up to well over a foot in length, and can contain over a dozen large Moringa seeds. The seeds themselves are as large as a quarter and circular-like.

The Moringa tree is beneficial in many ways. It has nutritional benefits, is a fuel source, a medicinal herb and a water purifier.

According to the website, *Moringa USA*, what used to take months in improving malnutrition in people can be done in just days using Moringa tree products. It also has been said, once again by *Moringa USA* that Moringa products help prevent childhood blindness, which can develop from vitamin A and retinol deficiencies. The following table shows the nutritional benefits of the Moringa leaf gram to gram.

Fresh Leaves

4 times vitamin A of carrots
7 times vitamin C of oranges
4 times calcium of milk
3 times potassium of bananas
3/4 times iron of spinach
2 times protein of yogurt

Dried Leaves

10 times vitamin A of carrots
1/2 vitamin C of oranges
17 times calcium of milk
15 times potassium of bananas
25 times iron of spinach
9 times protein of yogurt

Babies and young children are particularly susceptible to diarrheal diseases. Immature immune systems, lack of access to clean drinking water, or the materials to make water potable are some of the major factors. Water-borne viruses, bacteria, and parasites, such as cholera, amoebic dysentery, giardiasis, and e.coli cause severe diarrhea leading to rapid dehydration and death. Nutritional deficits can further weaken the immune system increasing the risk of diarrheal disease.

Other dangers lurk in unclean water. The water-borne Guinea worm burrows into the skin causing painful, debilitating leg ulcers. Schistosomiasis flukes travel from water dwelling snails into the human host causing severe liver damage. Trachoma is another disease caused by unsanitary water. Trachoma causes an eye infection; after several repeated infections, children may become blind due to eyelashes scratching on their corneas. Not only do they go blind, but also the process is excruciatingly painful.

We can look to the Moringa tree for help. It has been demonstrated, by the Global Applied Research Network (GARNET), that the dried and then crushed Moringa seed produces an effective ‘flocculent’ in the clarification of water. A flocculent is used in the clarification of water by attracting suspended particles and causing the particles to settle to the bottom of the solution. These settled particles will carry with them some of the biological impurities.

The clarification process using Moringa seeds can easily be done with just a little bit of education. The process is called coagulation; this is the process of removing dirt and particles that are suspended in the water. The Moringa seed acts as a flocculent, which attracts these particles. Flocculants are tiny “sticky” or charged particles that, when the suspended particles stick to it, the weight of it becomes heavy enough to sink to the bottom of the container during sedimentation. Here is an example of the steps involved in this process:

1. Grind the Moringa seed to powder
2. Put powder in a small bottle; mix with about a teaspoon to tablespoon of water (2% suspension). Shake for about five minutes to get a good water extract.
3. Pour the mixture into the container holding the water intended for clarification.
4. Stir water mixture for five to ten minutes (fifteen to twenty rotations per minute). Use a wooden spoon/whisk. (Flocculation is working)
5. Let water stand for an hour or more with a cover. Make sure not to disturb. (Sedimentation)
6. Ladle the clarified water off the top, leaving the sediments (flocs) and most of the impurities, such as the guinea worm eggs or bacteria, in the bottom few inches of water.

That process clarifies the water, not purifies it. It has been proven, according to the World Applied Science Journal, that with use of this process, 90.0%- 99.9% of turbidities are removed. All that would need to be done from here would be filtration, chlorination or addition of iodine tablets. Iodine is less expensive and more readily available in the Third World than chlorine because of the fact it comes in a tablet, has a longer shelf life and is also much easier to transport.

This is a very doable process. One way to introduce the Moringa tree into Konodimini would be through a United States Peace Corps project. They would be a great source to educate and train the village people. With only twenty-five percent of Malians being literate, this will be a huge step in assuring the people of Mali understand the benefits the Moringa tree can provide to improve their lifestyle. I chose the Peace Corps as the trainers after interviewing Nurse Practitioner, Rebecca Ehrich, who served in Mali with the Peace Corps from 1981-1985. She explained how in the past there have been successful gardening projects in Konodimini introduced by the Peace Corps Volunteers (PCVs).

For 50 years, Peace Corps Volunteers have proven their ability to work cooperatively and sensitively with village agriculture and health education. Introduction of the Moringa tree would start with the Peace Corps Volunteers working with the village women who already have gardens. In Mali, the children are mostly taught what they know by what has been passed down generation after generation by oral tradition. The same thing can be done for the use of the Moringa tree. First off, Peace Corps Volunteers will have to speak to the local leaders of Konodimini to explain what the PCV would like to accomplish and how they plan on doing it. They have to gain the trust of the leaders or the women will not be able to participate. Once the leaders are on board the women gardeners in the village can be educated on the

Moringa tree. Once they are educated the adolescents who will be starting a family shortly could be included so they can pass the information on to their children. With hard work, cooperation and some luck, the villagers would hopefully realize the multitude of benefits arising from a successful Moringa tree project. According to Ms. Ehrich, the Malian people are very willing to learn and are wonderful people. If the Coulibaly family had been educated about the benefits of the Moringa tree and had the proper training, the death of Kadidia's children could possibly have been prevented. It is my wish that the United States Peace Corps Volunteers can provide the education and assistance to help the people of Mali live healthier and longer lives.

As I draw my paper to an end, I leave you with these thoughts. The Moringa tree has a wide spectrum of nutritional, medicinal, and fuel uses. But to me, the most important use is the water clarification. Hopefully within the next few years, the Moringa tree can be introduced into the village of Konodimini and help them prevent further illness and poverty. So ask yourself, what can I do to help bring "The Tree of Life" into Konodimini? Without the strong support of willing individuals this task cannot be mastered. These are a few of many organizations that support the Moringa Tree cause: Trees For Life, Moringa For Life, World Water Forum, Rotary Club, U.S. Department of Ag- Forest Services, Trees For Africa, and International Eye Foundation. Trees For Life have a donation page on their website, www.treesforlife.org. People are able to buy a share in a tree for a minimum of ten dollars or they can give a gift of a Moringa tree for 100 dollars. This is very reasonable and worth the money. The most important thing is to always remember that water is the giver of life.

Works Cited

- “Amazing Rejuvenation Properties of the Moringa Oleifera Tree.” *Healthy Referral*. N.p., n.d. Web. 1 Sept. 2011. <<http://healthyreferral.com>>.
- “Application of Moringa Oleifer Seed Extract and Polyaluminum Chloride in Water Treatment.” *International Digital Organizaton for Scientific Information*. World Applied Science Journal, n.d. Web. 21 Aug. 2011. <<http://www.idosi.org>>.
- Ehrich, Rebecca. Personal interview. 17 June 2011. Worked for the Peace Corps in Mali as a Nurse Practitioner.
- “Harvesting Potable and Storable Water with Moringa Seeds.” *United States Enviromental Protection Agency*. N.p., 26 Aug. 2010. Web. 18 Aug. 2011. <<http://water.epa.gov>>.
- Mongabay*. N.p., 10 Aug. 2010. Web. 22 Aug. 2011. <<http://population.mongabay.com>>.
- Moringa*. N.p., n.d. Web. 15 Sept. 2011. <<http://www.miracletrees.org>>.
- Moringa For Life*. N.p., 2011. Web. 20 July 2011. <<http://www.moringaforlife.com>>.
- “Moringa Oleifera: A Food Plant With Multiple Medicinal Uses.” *National Center for Biotechnology Information* . N.p., n.d. Web. 15 Sept. 2011. <<http://www.ncbi.nlm.nih.gov/pubmed>>.
- Moringa the Miracle Tree*. N.p., n.d. Web. 19 Aug. 2011. <<http://moringa-miracletree.com>>.
- “Moringa Through the Ages.” *Moringa USA*. N.p., n.d. Web. 29 May 2011. <<http://www.moringausa.com>>.
- “Moringa Through the Ages.” *Moringa USA*. N.p., n.d. Web. 15 June 2011. <<http://moringausa.com>>.
- “Moringa Tree History.” *Moringa Tree*. N.p., 2011. Web. 28 June 2011. <<http://www.moringa-tree.net>>.
- Trees For Llife*. N.p., 2011. Web. 19 Aug. 2011. <<http://www.treesforlife.org>>.
- “What Moringa is All About.” *Moringa Today*. N.p., 2008. Web. 26 June 2011. <<http://www.moringatoday.com>>.
- “A World Free of Blinding Trachoma.” *International Trachoma Initiative* . N.p., 2011 . Web. 6 Sept. 2011. <<http://www.trachoma.org>>.