

Anne Benson
Eden Valley-Watkins Secondary School
Eden Valley, MN
Eritrea, Factor 6

Permaculture to Combat Desertification and Generate Sustainable Agricultural Practices on the Rural Eritrean Farm

Eritrea is the youngest nation in Africa and its immature economy offers no alternative to the unorganized and uncontrolled resource harvesting practices that are now rampant in rural parts of the country. Drought and overworked soil together render approximately 33 percent of the land barren. Because of this, the majority of Eritreans either have extremely small and nutrient depleted plots of land on which to farm, or they move themselves and their families into cities. 78.4 percent of Eritreans choose to remain living in rural areas in the hope of having a higher crop productivity rate in the future (“Rural Poverty in Eritrea”). Even when drought isn’t an immediate concern, the national government still needs to import about half of the food the nation’s people require. This issue will only grow worse over time if the agricultural practices of rural farmers don’t become more sustainable. Reversing desertification and extreme soil salination, I believe, are key steps needed to improve food security for the people of Eritrea. I suggest it be done through the use of permaculture. This particular type of agriculture, if used correctly, could be the vessel used to grant the average farmer the capability to produce an adequate amount of food to feed his/her own family and to benefit their community.

In 2012, Eritrea was rated second worst out of 120 countries with hunger issues in accordance to three factors utilized by the Global Hunger Index. The first of the three is based on the percent of the population as a whole that is undernourished. The second and third determinants, however, have to do with the next generation’s access to adequate nutrition. They are the proportion of children younger than five who are underweight, and the child mortality rate in relation to caloric intake and unsafe or unhealthy environments. From this, we can conclude that the situation in Eritrea is devastatingly severe and it’s essential that the core causes of hunger must be addressed now.

“Rural households are the most severely affected by poverty because of the low productivity of their crops and livestock enterprises. Almost two thirds of all households lack food security.” (“Rural Poverty in Eritrea”) The majority of Eritreans living in rural areas are subsistence farmers, and living completely off the land is becoming increasingly difficult for them. Crops commonly grown by the average farmer are pearl millet, cotton, sesame, groundnut, tomato, pepper, okra, and watermelon (Shabait Administrator). Also sorghum and maize, but they usually require an irrigation system of some kind, so they are not a reasonable source of support for most farmers. One farm is customarily run by one family alone, which on average contains 5.3 people. The highest age groups on average are people between five and eighteen, with an average of 42.1 percent of the common family’s composition. Second comes the ages of nineteen through fifty four with 38.4 percent. Lastly, the age ranges of zero to four, and sixty and up, with percentages 12 and 7.4 respectively (“Eritrean Housing and Urban Development Policy Study-Household Survey”). This means a completely average rural family in Eritrea would contain one child below the age of four, two children between the ages of five and eighteen, and two adults ages nineteen through fifty nine, which is hardly enough to carry out all the duties found on a subsistence farm.

One solution to the problem of poverty is education, but regrettably, the system in Eritrea isn’t equipped to solve an issue of such magnitude. Schooling in Eritrea is compulsory for children

between the ages of 7 and 14, but it is estimated that a regrettably narrow percent of 39-57 actually attend the amount of primary school that is required of them. An even more forlorn 21 percent of teens attend secondary school. The poor attendance is attributed to the children not being able to excuse themselves from the inordinate amount of work they are responsible for in their personal lives. Only 67.8 percent of the citizens of Eritrea are literate. A measly amount compared to what it could be with the proper funding, infrastructure in place for children to be transported to school, and have the time needed to take part in the education system itself.

The health care system, however, is much more accommodated to fit the common peoples' needs. As opposed to many other developing nations, Eritrea didn't just adopt an already existing system of western medicine, but a government sponsored group called the Eritrean People's Liberation Front (EPLF) created its own in order to guarantee the effectiveness of it. It focuses on availability and affordability for the average family (LE, Sabo, and Kibirige JS).

Eritrea gained independence from its neighbor Ethiopia in 1991 after a brutal thirty year war, and although now free, the conflict still has a profound negative effect on Eritrea's agricultural capabilities. It is estimated that about 60,000 land mines buried during the war remain active and pose an obvious threat (Benhammouche, Abla). Because of the nature of war, these explosion sites are generally centered around land that is valuable to have, particularly the fertile soil around rivers.

However frustrating it is to not be able to farm the majority of the fertile land in the country, desertification generates much more agony than war ever will. Quality of land ranks higher than the availability of it in the country's problems. With access only to severely poor soil, farmers contribute time, energy, and money into nourishing plants that will likely never reach their full potential or give back. This lessens their already minimal household income. If the extreme hindrances of soil salinization and desertification are resolved, the communities of Eritrea will be equipped to maintain their own food security without the help of charities.

As previously stated, approximately 33 percent of the land in Eritrea is completely barren. Responsibility is partially accredited to natural courses and a changing climate, but root causes include overutilization of almost every single natural resource that is found within the nation's borders, unsupportable harvesting of forest products, and overgrazing. Limited productivity coupled with increasing demands creates a vicious poverty cycle that an overwhelming number of Eritreans are suffering from. The number of farms in Eritrea that are designed to last for longer than the immediate future are next to none. Sustainability is not a practice used commonly on the farm because of a lack of foresight and education of the theme. Instead, they are forcing themselves to work in an environment that is steadily being degraded. The widespread unsustainable practices that are in use are effecting everyone within the nation, particularly people native to rural areas or in poor urban ranges without a sufficient quantity of income at their disposal to supply food for their families or with a lack of access to outside aid. These people are condemned to poverty and hunger purely because of an absence of arable land in their region; a problem that has been created by human hands, and can be solved the same way.

In the fourteenth meeting of the group Subsidiary Body on Scientific, Technical, and Technological Advice, the members define sustainable agriculture as, "The ability of farmland to produce food and other agricultural products to satisfy human needs indefinitely as well as having sustainable impacts on the broader environment." ("Sustainable Agriculture and the Use of Agricultural Biodiversity: Concepts, Trends and Challenges.") Therefore, the trends of sustainable agriculture are difficult to measure exactly. Although more farmers are moving

towards a more environmentally friendly means of producing food, the vast majority of the land in Eritrea is continually being cultivated in a way that destroys ecosystems and isn't conducive to long term production. The situation for small-scale rural farmers right now is actually worsening, but this is only because the degradation that is presently going on is active, not passive. As it is now, the only changes that happen are when farmers receive enough information and resources to create a stable and sustainable area on their own land. Any change that will make a difference for *all* rural farmers will need to be a vast one.

Shifting to sustainable agriculture across the country *will* be a colossal change, but it will be accompanied by agricultural advances that will benefit the people of Eritrea for centuries to come. Restoring the soil and creating landscapes that provide stability and retain topsoil will enable farming communities to improve both the quality and quantity of their harvests by transforming the soil into arable land again. Thus permitting them to grow a sufficient amount of food for themselves. Bringing forth balance in the environment is critical in solving hunger in damaged areas, and this can be done effectively by implementing permaculture practices. "Environmentally, permaculture brings about soil conservation, as systems are designed to build organic matter and return nutrients to the soil." (Permaculture: Overcoming the Challenges of Climate Change.) Poverty and hunger are interrelated in many aspects, and when one improves, the other will often follow suit. When the rural farmers are producing sufficient or even ample amounts of food, they will be equipped to supply the urban people and markets with food as well, thus reducing hunger throughout the country.

The epitome of sustainable agriculture is a voracity to adapt and be resilient. This signifies that other considerable issues such as climate change, water deficiency, and population growth will cause the practices used to uphold sustainability currently to acclimate to the different situations. In short, the factor of environmental sustainability in relation to agriculture is an ever changing one, but it will remain stable.

To decipher the solution to any problem, the root of the obstacle must be identified. The lack of food in Eritrea can be fundamentally linked to the unplanned and destructive farming techniques put in place by the uneducated rural farmers that reside there. That, in turn, is causing desertification and soil salinization to annihilate valuable farmland. Acknowledging that aforementioned farming techniques are in fact what is causing so much devastation, both on land and in families, is a crucial step in resolving the matter of hunger there. I believe a viable solution to Eritrea's problems associated with a lack of sustainable agricultural practices is to implement permaculture techniques on the rural family farm. In 2001, as Geoff Lawton worked in the Dead Sea area in Jordan, he was actively "Greening the Desert" (Lawton, Geoff). The man behind the work is a permaculturist who has been a specialist in permaculture education, design, implementation, system establishment, administration and community development since 1995. He has done service in over thirty countries throughout the world, and has educated over 6,000 people in permaculture all over the globe. The system he used in the Jordan desert is extremely compatible to the situation presently found in Eritrea. Combined with other techniques, and with the help of dedicated world organizations, it will be possible to eradicate the earth encompassing hunger and poverty that far too many nations are experiencing today.

Farmers in Eritrea are accustomed to working the land with only their immediate family members, although some do work with others in their village. Beginning the transition to completely sustainable agriculture may be easier if the area in transit is manned by a larger group of people. That way, they will have access to a more considerable pool of resources with which to work. The first step on this particular path is to dig contour bunds, or swales. These will naturally catch as much water as it is possible to catch in that area and hold it until it is needed for crop

irrigation. Mulch is needed on the top of the side hills; around half a meter is most effective. Micro-irrigation can be put in beneath the mulch, but it can be costly, so the average farming community could benefit from avoiding that and simply watering by hand. Spreading biochar in the area under renovation is not a necessary process, but it will quicken the improvement of the soil. Biochar is a relatively inexpensive type of charcoal that is used as a soil amendment. It improves water quality and actually retains additional water because of its porous structure and high amounts of surface area. This particular cast of charcoal also reduces greenhouse gas emissions, an asset of its ability to sequester carbon in soil for extremely long periods of time. That, in turn, creates a better environment in which to grow plants of any kind (“What is Biochar?”).

On the uphill side of the swale, the farmers should introduce hardy desert trees that will provide shade, reduce wind and evaporation, and structure the soil for the remainder of the farm. On the downhill side of the trench, the food planting begins. In Geoff Lawton’s project, mandarins, figs, pomegranate, guavas, mulberries, and citrus trees were planted consecutively, but substitutions can be made if those specific trees cannot be acquired. All of this was formulated on just ten acres, and the effects were massive! In as short as four months, figs were being harvested. Fungi was growing along the boundaries of the bund and it was discovered that a coating on them was repelling salt lower into the ground, therefore desalinating the soil. Overall, only one fifth of the rainwater that was harvested was used on the original plot. Farmers will have the capability to distribute the remaining water to their friends’ and families’ farms that may be suffering from drought because they don’t yet have the means to actualize this distinct permaculture approach.

When it comes down to the basics, this method will solve the problems that a lack of sustainability has caused on only one, two, or three farms and their surrounding areas, at a time. It must be implemented on many, many farms in order to effect the overall environment permanently. This may seem daunting, but it is a major possibility. Grassroots approaches are often the best way to change a national problem. If each rural farmer in Eritrea took the responsibility upon themselves to dedicate their land to regreen the desert and provide more food for future generations, the problem of hunger would be solved.

“Food security remains one of the government’s main concerns,” the World Bank says, referring to the extreme situation in Eritrea. Yet all of their operations there have been centralized around the government developing, the last of which ended in 2011. If they partnered with the New Partnership for Africa's Development (NEPAD) to work towards Eritrea’s sustainability, this goal would indubitably be met by 2015. Actually, I would recommend that the project be scheduled to only last for a very limited amount of time. It is imperative that these organizations and others like them do not establish themselves as commodities for countries to develop a sense of dependency toward. They must find the balancing point between not doing enough to make a true difference and doing so much that the country can’t sustain their work once their help has subsided. It is of the highest importance that Eritrea can take control and manage its land after the organizations are gone. Most of the aid needed would have to do with work forces to assist smaller or older families to dig the swale itself. Most rural families wouldn’t have nearly enough manpower to undertake this task on their own. The mulch or fertilizer needed would be available on the many livestock farms in the country, but support of some kind would be necessary to transport and spread it. Monetary donations to the project would also be of value to pay the workforce, which should be local or from urban centers in Eritrea to stimulate economy, as well as for purchasing the biochar and the trees themselves. The national government could commit to providing benefits to farmers who adopt permaculture techniques, or any farming method that is sustainable. This will present a motivation for farmers who don’t have the education needed to

understand why shifting agricultural practices is a cardinal action in the fight for nutrition. The primary long term goal of *any* outside organization involved should be to enable the rural farmers to be able to execute and carry out these plans essentially on their own.

“You can't build a peaceful world on empty stomachs and human misery.” A Nobel Peace Prize winner for his life's work in stopping hunger, Norman Borlaug, stated in “*Eat This!*”. I find what he said to be very true in regard to how hunger affects the world. *Nothing* can be built upon hunger and poverty, and the nation of Eritrea is suffering from both. The country was ranked 177th out of 187 countries by the 2011 United Nations Human Development Index. The Index measures the overall development of nations based on life expectancy, education, income indices, etc. to procure the general quality of life in a given country at this point in time (“Eritrea Overview”). At only ten from the bottom, Eritrea has substantial room for improvement, but has also grown profusely over the past few years. Despite the stress caused on the country from massive droughts that transpired in the early 2000s, Eritrea has a wonderful medical system that works with the common people, not just the ones who are equipped to pay. The Desert Development Foundation and Sea Water Farms Eritrea also joined together to establish the world's first seawater farm (“Sea Water Farming”). A major milestone for the underdeveloped nation. It is predicted that if enough of these are put in place, Eritrea will have the resources to bloom into being an *exporter* of food. These sea farms are completely sustainable as well, which means the productivity of the nation will continue to be positive even after the first few seasons of use. Sustainability is not only the major factor in Eritrea's success story, but also in its development. Permaculture, the most sustainable variety of farming there is, is a route Eritrea can take to become a sustainable and prosperous country by 2015. An exceptionally notable characteristic of this course is its capacity to change by need. With this permaculture procedure in place, the small scale rural farmers of Eritrea can withstand anything that can be expected in the environment as long as they adjust to what they see coming in the future. With hard work, foresight, and sustainability, Eritrea will become a contender in the fight for nutrition.

Works Cited

- Benhammouche, Abia. "Enabling the Rural Poor to overcome Poverty in Eritrea." *Ifad.org*. Ifad, n.d. Web.
- "Eritrea Overview." *The World Bank*. N.p., n.d. Web. Aug. 2013.
- "Eritrean Housing and Urban Development Policy Study-Household Survey." Ministry of Public Works/UN-Habitat, n.d. Web.

- Lawton, Geoff. "Bringing Dead Sea Back To Life - Greening the Desert- Permanent Agriculture At Its Best." *YouTube*. YouTube, 17 Mar. 2012. Web. July 2013.
- LE, Sabo, and Kibirige JS. "Result Political Violence and Eritrean Health Care.Filters." *National Center for Biotechnology Information*. U.S. National Library of Medicine, n.d. Web. July 2013.
- "Rural Poverty in Eritrea." *Rural Poverty Portal*. IFAD, n.d. Web. July 2013.
- "Permaculture: Overcoming the Challenges of Climate Change." - *Science Omega*. N.p., n.d. Web. July 2013.
- "Sea Water Farming." *The Permaculture Research Institute*. N.p., n.d. Web. July 2013.
- Shabait Administrator. "Eritrea - Ministry of Information." *Types of Crops Grown in Eritrea /*. Eritrea-Ministry of Information, 22 Feb. 2013. Web.
- "Sustainable Agriculture and the Sustainable Use of Agricultural Biodiversity: Concepts, Trends and Challenges." Proc. of SUBSIDIARY BODY ON SCIENTIFIC, TECHNICAL AND TECHNOLOGICAL ADVICE, Nairobi, Kenya. Web.
- "The New Partnership for Africa's Development." *The New Partnership for Africa's Development*. N.p., n.d. Web. July 2013.
- "What Is Biochar?" *Biochar International*. International Biochar Initiative, n.d. Web. July 2013.