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## **Ethiopia: Managing Water in Ethiopia Will Manage to Save Lives**

### **Introduction**

One in seven people do not have enough food to be healthy. Hunger rates have been climbing for the last decade and now in 2012, malnutrition and hunger are the number one health risk world wide (World Food Programme). But the 925 million people who are chronically hungry are not spread out evenly across all nations. Over half of these people live in Asia and the Pacific while a quarter, about 231 million people, starve in Sub-Saharan Africa. In this region many countries are given the status “in crisis” by the International Food Policy Research Institute because of the drought and famine that have been extinguishing most crop growth for years.

Located in the horn of Africa, Ethiopia, a country 85% dependent on agricultural production, is home to a population 41% of whom are undernourished (Food and Agriculture Organization of the United Nations). Dry spells, infestation, crop diseases and poverty only add to the already challenging task of growing food among the rock and sand terrain. Rains are forecasted to continue to be below normal throughout 2012. Last season’s inadequate rains brought bad news for farmers as maize, sorghum and sweet potatoes planted in September could not grow without the Sapie rains from the Spring time (Famine Early Warning Systems Network). Without the rain water that is responsible for producing 90% of Ethiopia’s food: crops cannot grow, farmers have no grains or vegetables to sell and poverty and hunger take root.

As one of the least developed countries in the world, Ethiopia does not have the infrastructure to make effective changes. Food security in this country depends on the production, storage, distribution and transportation of the crops, all requiring money that Ethiopia does not have. In fact, 47% of the population is estimated to live below the poverty line. The estimated annual per capita income is equal to \$130 USD. In 2009, Ethiopia had the highest rates of malnutrition in Sub-Saharan Africa due to lack of dietary diversity, micronutrient deficiencies, undernutrition and stunting (Encyclopedia of the Nations).

Improving food security in Ethiopia is essential and can be achieved by teaching citizens how they can use innovative methods to transform their dry land into fields of bountiful crops. Ethiopia’s main concern is combatting water scarcity. This can be achieved through cooperation between Ethiopia’s government, subsistence farmers and aid from around the globe. Implementing small-scale farmer-controlled irrigation technology as well as conservation methods that convert erosion-causing runoff into plant available soil water will: increase yields, reduce vulnerability, create employment opportunities, increase livestock productivity and increase household income. By having farmers own and control irrigation systems, the aid will also help teach them how to remain self sufficient for years.

### **Typical Subsistence Farm Family**

Many things go into defining an average subsistence farm family including family size, composition, diet, and access to education and health care. Women in rural areas have, on average, 6 children, while women in urban areas have an average of 2.4 children (Population Action International). Comprised otherwise of a mother and father, duties for families are split up between household duties and farm work. The woman’s household duties include food processing, preparing meals, making tella (a local beer), fetching water, collecting dung and wood for fuel, cleaning and caring for the children. Chores done by women and children for livestock production include feeding, watering, milking, barn cleaning and manure

collection. Women also help deliver goods to the marketplace. Chores for children include herding the cattle, delivering milk and running errands. When boys reach the age of 12 they work on the farm with their father, make yokes, ploughs and handles, collect honey and learn management of the farm. The family's diet consists of bread, sorghum, wheat, teff and meat on special occasions. In a survey conducted by the Ethiopian Youth Forum in 2004, 18% of the children said they were missing out on schooling because of the housework that needed to be done at home. However, the largest issue recognized by the survey was that parents couldn't afford the school fees; this was the reason 69% of the students did not attend school. In 2004, over 7.8 million children (including 4 million girls) were not in school for reasons varying from not being able to afford required school supplies, to having too far to walk (UNICEF). Although 80% of the population lives in rural areas where they are unable to meet the high costs of education, the government has vowed to achieve free primary education for all children by 2015. The curriculum for grades 7-10 has been revised to include strategies on rural development, values to produce ethically good citizens and HIV/AIDS conscious students (UNESCO forty seventh session of the International Conference on Education). In 2006, first level education reached 89.4% of children and secondary education reached 30.9%. Also at this time about 100,000 university students were enrolled in government institutions and 91,000 students in private institutions. Unfortunately, health care in Ethiopia is not making the advances that education is. In rural areas, there is a lack even of physical access to basic health care facilities. Contributing to the unhealthiness of people in Ethiopia are: widespread poverty, poor nutritional status and low education levels. The average life expectancy at birth is 54 years. In 2005, 3.5% of 15-49 year olds had AIDS. But it is malaria that is the primary health problem, with 8-10 million annual clinical cases and large numbers of deaths every year. In Ethiopia, malaria contributes to 80% of all health problems that are due to preventable communicable and nutritional diseases. Health systems, as well as roads, are underdeveloped, making transportation to a clinic a severe problem. Consequently, 94% of births happen at home while less than 28% of all Ethiopian mothers receive prenatal care from a trained doctor, nurse or midwife. Before their first birthday, one in every thirteen children dies and before they reach age five, one in eight dies. Also, vaccination rates in urban areas are three times as accessible as in rural areas throughout the country (Population Action International).

Average farm size, crops that are grown and agricultural practices also help define a typical subsistence farm family. Size of individual landholdings range from 0.5 hectares to 5 hectares. Rainfed agriculture is dominated by the production of cereals and livestock. Agricultural tools and oxen are used to produce teff, wheat, barley, maize, sorghum, linseed, beans, peas and lentils. Annual crop yields range from 500 to 1000kg/ha. Access to chemical fertilizers and improved seeds is limited. Instead, most farmers own livestock kept for draught power, manure, milk, meat and hides (USAID). A typical farm would employ two oxen, a cow, a few sheep and one donkey. Farmers usually own stores and livestock sheds in addition to their home. Farm tools are made of wood fiber, leather and metal. Hides and skins are used for ropes, straps, whips and grain bags. The value of all a farmer's equipment does not exceed \$60 per farm. A typical farm with 2.5 hectares of land employs 1100 hours of labor for crop production every year. Two-thirds of the average labor input of 440 hours per hectare of land per year is supplied by the family, one-fourth by exchange labor and less than 10% by hired help (USAID). Farmers are also expected to assist aged or disabled farmers and families whose head is in the military. One strategy farmers use is compiling compost which has resulted in increased yields and productivity of crops. In one study, composted fields gave higher yields than those utilizing chemical fertilizers, sometimes double. This is because compost increases the moisture retention capacity of soil and can remain for up to four years--especially helpful in times of drought.

There are several barriers to improving agricultural productivity, employment and earning a living wage, and gaining access to food markets and adequate nutrition. One barrier is that 75% of the population live more than one day's roundtrip walk from an all-weather road. This makes it hard to access food. Transportation poses extreme difficulties for a majority of the people. Also, land is not owned individually, but is allocated by several local Peasants Associations (PAs), which all farmers belong to.

Each PA regulates about 800ha of land for its 250 members (Ethiopia Peasant Associations). Over 20,000 agricultural advisors keep close tabs on what farmers are growing, and although there are no laws against growing certain foods, these advisors function as tax collectors. Also, the government controls the distribution of fertilizer and seeds and sometimes restricts their sales. Another barrier to agricultural productivity is that only six percent of land is irrigated (See Feed Change the Future). This means that smallholder farmers are at the mercy of variable seasonal rains. Also, farmers suffer from weak market linkages, making it difficult to get food to the market. Other problems in getting the food to the people include insufficient packaging, the inability to meet international market standards, restrictive trade regulations, and limited capacity to support market development (See Feed Change the Future). In Ethiopia, children have to work for their families to have money to buy food. The minimum age for labor is 14. Although there are laws to protect children 14-18 years old such as not allowing them to work more than 7 hours a day, these laws are not often upheld. In 1996, the minimum wage was \$16 USD per month. The U.S. Department of State determined this amount was insufficient to provide a decent standard of living and that a family of five living in Ethiopia required a monthly income of at least \$61 USD (Encyclopedia of the Nations). Employees work on average 40 hours per week, but it often does not produce the means to live above the poverty line. Barriers to improving nutrition also come from lack of sanitary facilities, lack of potable water, cooking methods and hygiene (FAO).

### **Water Management and Agricultural productivity, household income, and quality**

Managing water scarcity has a direct impact on the insufficient amount of food being produced in Ethiopia. Lower agricultural productivity as well as higher levels of undernourishment and child stunting were found in areas that suffered most from water scarcity (Food, Agriculture and Development). More than 70% of direct rain falling on crop fields is lost either as non-productive evaporation or flows into “sinks” before getting to the plants (Food, Agriculture and Development). In rainfed agriculture, wastage of rainwater is a cause of low yields.

Because of Ethiopia’s land receiving low and unpredictable rainfall, only 11% of Ethiopia is considered arable (Food, Agriculture and Development). This present status indicates how severe of a problem water scarcity is since 85% of Ethiopia’s workforce engages in subsistence farming in the countryside, yet only 11% is determined capable of producing crops. Poorly developed infrastructure for capturing, managing and distributing existing water resources reduces water quality and quantity. Ethiopia’s economic growth is so sensitive to hydrological variability that even a single drought within a twelve year period decreases the average growth rates across the entire twelve year period by 10% (Food, Agriculture and Development). Historically, the average amount of time between droughts is much less than twelve years, averaging three to five years. And despite an estimate that 1-3.5 million hectares of land are irrigable, only 5-10% is currently irrigated (International Livestock Research Institute). Since farmers cannot grow crops due to lack of water, many families have resorted to selling firewood (which serves as a major fuel source). The environment has been degraded as a result. The forest area has declined from 40% to 4% of land area from the early nineteen hundreds to 1980. The rural poor are particularly disadvantaged because when resources become scarce, they are hit hardest, suffering the most. As competition increases for water, it reduces access to water for rural women. Improving water use efficiency is a key requirement for increasing agricultural productivity. More than 90% of the food in Ethiopia is produced by rainfall, yet 50-70% of rainwater is runoff that does not reach any plants (Food, Agriculture and Development). The situation is not getting any better and in many cases the rural poor suffer the most because of their inability to grow any crops.

Improving the management of water scarcity and adapting farming practices to reduce water supplies with improved technologies and conservation practices would increase farm families’ food supply and income. Irrigation creates options for extended production throughout the year, increasing crop yields. It also creates employment opportunities. In mixed crop-livestock systems, irrigation relieves pressure on

grazing lands and increases livestock productivity (International Livestock Research Institute). Thus, irrigation can increase the productivity of grazing lands when water is used for producing feed directly to the animals. This allows the crop residues to return to the soil and serves as a fertilizer. Livestock are important sources of income to rural people and improved feed would increase the productivity of the livestock. Overall, this would improve household income. A farmer's increased household income would be spent locally, helping to stimulate the rural economy. The development of irrigation would also benefit the poor by raising labor productivity, promoting production of high-value crops and provide farm employment opportunities. Irrigation systems can also be used as growth centers to stimulate other services, markets and overall employment. Irrigation schemes even help in poverty alleviation. Irrigation provides changes in crop choices and since poor farmers usually grow low value crops, making inputs available to the poor enhances the impact of irrigation even further. Reliable and sustainable water access will benefit the rural poor significantly.

Other major issues that affect managing water scarcity are Ethiopia's population explosion and inflation rates. Reduced water quality and quantity have resulted from the growing population. In 2008 Ethiopia's population was estimated at 80 million people which is double the size of the population in the mid 1980s. Since 85% of the people are small farmers, land is scarce. Often farmers cannot grow enough food to meet their own needs. Agricultural production has increased overall, but on a per capita basis it has declined (World Bank). The human population growth rate is so high that an increasing amount of what was permanent pasture land is now being cultivated. Farm lands experience more erosion and declining soil fertility. Because of the current low productivity among crops, food is becoming much more expensive. Maize, a staple food, costs three times as much as it did last year. And in August of 2011, the price of grain rose by more than 250% (UN). If prices continue to skyrocket in the next decades, this may have an affect on irrigation technologies because they may not be affordable.

### **Recommendations to improve food security and appropriate roles for local and international players**

By implementing irrigation technologies and conservation practices, food security could be improved in Ethiopia. Water scarcity is not necessarily caused by inadequate rainfall, but by the lack of conservation and sustainable management and use of available water (International Livestock Research Institute). Water resources often evaporate or flow into saline sinks before they can be put to beneficial use. Besides the challenge of poor distribution of rainwater, there are also periods of too much water that result in flooding and long periods of drought. Ethiopia needs the development and application of innovative technologies and management strategies for more efficient conservation and use of rainwater, surface water and ground water. Traditional irrigation systems can be enhanced, becoming simple, cheap and environmentally friendly. Good examples of this are hand pumps and shallow tube wells. Based on a survey of 50 communities in 2500 plots of land in 1999, irrigation was found to increase intensity of input use, improving the performance of labor, oxen, seeds and fertilizer. Irrigation contributes to increased crop production. The predicted average impact of irrigation was an 18% increase in crop production compared to rainfed fields. Small-scale irrigation should be implemented rather than large-scale systems because there are more advantages to them. Small-scale technology can be based on farmers' existing knowledge as well as local technical, managerial and entrepreneurial skills. Also, the resettlement of labor is not required and planning is more flexible. Overall they serve as less costly and more sustainable additions to society. Because in the current rainfed agriculture, wastage of rainwater can cause crop failure, there is an immediate need for infiltration, water holding capacity and water uptake by plants. Conserving water on fields for the crops will convert the erosion-causing runoff into plant available soil water. It also turns evaporation of rainwater into productive transpiration, which is the passage of water through a plant from roots to the atmosphere. People using the land upstream will benefit from the water conservation tactic because it provides higher availability of water that would otherwise be wasted as run-

off. Downstream workers will benefit because of the reduction of floods, sedimentation and a more smooth flow of water throughout the year.

The Millennium Development Goal, eradicating extreme poverty and hunger by halving the proportion of people suffering from these circumstances, could be used to solve this situation by 2015. Access to water for both domestic and agricultural uses has a direct impact on poverty and food security. Vulnerability to water related shocks, including droughts, can halt crop production. This contributing to poverty for farmers who cannot make a living without food to sell at the market or to provide for their family. Managing water scarcity through the use of irrigated fields has the potential for increased grain production, thus improving food security. Rural farmers make income from subsistence agriculture and livestock both of which depend on water. Therefore, to eradicate hunger in Ethiopia, irrigation systems must be implemented as well as conservation practices for farmers.

After a devastating famine in 1984, the Derg regime showed interest in small-scale irrigation and established the Irrigation Development Department (IDD). It was given the task of developing irrigation projects to benefit poor famers. However, their performance was slow, and in the end only thirty five irrigation systems were constructed over the next seven years. Then in 1994 the IDD was abolished. This project could have been scaled up successfully if the IDD would have worked closely with smallholder farmers. If they would have allowed farmers ownership and management of the systems, it would only have lead to an investment of the local resources. The active involvement of farmers along with simple and low-cost technology is the key to implementing small-scale irrigation systems that remain effective. For the development of farmer-controlled small-scale irrigation schemes, indirect investment strategies will be applied. This means that government agencies will get involved by providing farmers with grants, loans and technical expertise to implement irrigation owned and controlled by individual farmers or groups of farmers. This is different from a direct investment strategy which would mean that the government owns the irrigation schemes as it tried to do in 1984, but ultimately failed. The indirect investment method is better because leaving the ownership to the actual farmers often leads to complementary investment of local resources. Grants or loans from the World Bank will be needed to establish sustainable technologies. Expanding small-scale farmer-controlled irrigation would develop farmer experience with technological skills, and economic, social and institutional aspects of implementation. The use of simple and low-cost pumps will bring in timely cash returns to farmers. Rural farm families will be immediate beneficiaries and they will have active involvement in the project design and implementation. In 2008, less than 5% of aid from international donors went to long term developments such as irrigation (Los Angeles Times). Increasing the number of donations world-wide could impact farm families in Ethiopia by giving them enough money to construct an irrigation system able to provide water for farmers from rainfall in a system that would increase crop production and food security across the country.

## **Conclusion**

In 2011, 4.5 million people in Ethiopia were in need of emergency food aid during one of the worst droughts in decades (UN). However, the unpredictable weather patterns and rainfall is nothing new. Famine in 1984 and 1985 killed over one million people (The Boston Globe). Those people were so desperate for food that they ate the seeds that were meant for the next harvest. Even when there is no drought or crisis, 1 in 10 people in Ethiopia rely on international food aid to survive. However, food security can be improved through the management of water scarcity.

Irrigation technology increases yields. It also facilitates diversification of crops being grown. Irrigation opportunities reduce the vulnerability of Ethiopia's rural farmers because instead of depending purely on rainfall, sustainable water will present them with the means to grow crops and make a living. Employment opportunities will also be created by building irrigation schemes. In mixed crop and

livestock systems, irrigation will increase feed supply through increased crop residues which will reduce pressure on the grazing lands. The improved livestock productivity through better available food for them will increase the household income.

Irrigation and conservation practices have overwhelming benefits and should be implemented directly. They deter the environment from being degraded by stopping erosion and the cutting down of forests (which people were doing to sell firewood when crops did not grow).

Implementing irrigation schemes would lead to economic development and poverty reduction. Farmers would have a significant increase in income once they could grow and sell food which would give them money to spend locally. This would contribute to stimulating the rural economy. The poor would also benefit because irrigation development would raise labor productivity and promote the production of high value crops. Irrigation technologies would serve as places where entire markets, services and employment are also stimulated. This access to water would undoubtedly save lives.

The Millennium Development Goal to reduce the number of people who suffer from hunger by half by 2015 will not be successful without the implementation of irrigation technologies to manage water scarcity. In Ethiopia, agricultural productivity could be significantly increased by the addition of irrigation schemes because farmers would have water for their fields, resulting in crops to sell at the market. Sustainable and manageable water sources will improve food security, and only when those are installed and used will the goal be a reachable one.

## Works Cited

- Chaya, Nada. "Poor Access to Health Services: Ways Ethiopia Is Overcoming It." Population Action International. 23 Apr. 2007. Web. 01 Apr. 2012. <<http://populationaction.org/reports/poor-access-to-health-services-ways-ethiopia-is-overcoming-it/>>.
- "Coping with Water Scarcity, Challenge of the 21st Century." World Water Day 2007. UN Water, 2007. Web. 1 Apr. 2012. <<http://www.fao.org/nr/water/docs/escarcity.pdf>>.
- "Encyclopedia of the Nations." Ethiopia Working Conditions, Information about Working Conditions in Ethiopia. Web. 01 Apr. 2012. <<http://www.nationsencyclopedia.com/economies/Africa/Ethiopia-WORKING-CONDITIONS.html>>.
- "Ethiopia Multi-Year Strategy." See Feed Change the Future. United States Agency for International Development, June 2011. Web. 1 Apr. 2012. <[http://ethiopia.usaid.gov/sites/default/files/images/USAID\\_FtF\\_MYS.pdf](http://ethiopia.usaid.gov/sites/default/files/images/USAID_FtF_MYS.pdf)>.
- Gebremedhin, Berhanu, and D. Peden. "Policies and Institutions to Enhance the Impact of Irrigation Development in Mixed Crop–Livestock Systems." Web. 1 Apr. 2012. <<http://publications.iwmi.org/pdf/H032460.pdf>>.
- "Goal: Eradicate Extreme Poverty and Hunger." UNICEF -. Web. 01 Apr. 2012. <<http://www.unicef.org/mdg/poverty.html>>.
- Gryseels, Guido, and Michael R. Goe. "Energy Flows on Smallholder Farms in the Ethiopian Highlands\*." Energy. Web. 01 Apr. 2012. <<http://www.ilri.org/InfoServ/Webpub/fulldocs/Bulletin17/Energy.htm>>.
- Heavens, Andrew. "In Ethiopia, Better Education for a Better Future." UNICEF. Web. 01 Apr. 2012. <[http://www.unicef.org/emerg/ethiopia\\_34570.html](http://www.unicef.org/emerg/ethiopia_34570.html)>.
- Lina. "Education in Ethiopia: Where Is It Going?" Amplify. 21 Aug. 2009. Web. 01 Apr. 2012. <<http://www.amplifyyourvoice.org/u/Lina/2009/8/21/Education-in-Ethiopia-where-is-it-going>>.
- Meerman, Janice. "Making Nutrition a National Priority : Review of Policy Processes in Developing Countries and a Case-Study Of Malawi." Web. 1 Apr. 2012. <[http://www.fao.org/ag/agn/nutrition/docs/meerman\\_%20MAKING%20NUTRITION%20A%20NATIONAL%20PRIORITY.pdf](http://www.fao.org/ag/agn/nutrition/docs/meerman_%20MAKING%20NUTRITION%20A%20NATIONAL%20PRIORITY.pdf)>.
- "Potential Research Areas." Food Systems and Poverty Reduction IGERT Program. Cornell University. Web. 01 Apr. 2012. <<http://igert.ciifad.cornell.edu/research.cfm>>.
- "Report on the Development of Education in Ethiopia to the UNESCO Forty-Seventh Session of the International Conference on Education." Sept. 2004. Web. 1 Apr. 2012. <[http://www.ibe.unesco.org/International/ICE47/English/Natreps/reports/ethiopia\\_scan.pdf](http://www.ibe.unesco.org/International/ICE47/English/Natreps/reports/ethiopia_scan.pdf)>.

