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Water Needs in Kenya

Kenya is a small country on the eastern coast of Africa near Uganda and Somalia. Kenya's total area is 580,367 km sq. Kenya has 41,000,000 people living in it, and almost half of those people are under 14. This large population of youth is mainly due to high amounts of adults with AIDs, which dramatically shortens a person's lifetime. Also, half of the people in Kenya are living in poverty. The geography of this country has a little bit of everything, from long coastlines to humid jungles to dry deserts. Kenya's climate varies greatly across the country from hot humid areas to dry arid lands. This combined with the extreme geographical challenges proves to be a very difficult country to survive. The government has been very unstable in the last 40 years, which has caused high levels of violence in the population. Recently a new constitution has been put into effect, which will hopefully create a more stable government. Even with all of this political chaos, agriculture is the base of the Kenyan economy, providing 22% of Kenya's GDP. In Kenya, 75% of all laborers work in the field of agriculture. With this in mind it is easy to see why the average farmer is so important.

The Farmer

The typical Kenyan farmer farms .25 to 10 acres. Kenyan's grow a wide variety of crops. They grow corn, wheat, coffee, sugarcane, tea, and many more crops. The prices for these goods are maintained by KACE (Kenya Agricultural Commodity Exchange). The land that a Kenyan farmer uses can only provide a very modest living for them. They use their money to pay for education, healthcare, and food. There isn't much capital left, to be used to reinvest into the farm. Most farmers don't even understand how to make the investments to run and expand their farms, so they can't trade their produce. This causes the connection between agriculture and trade (The Millennium Goal) to diminish. Even if the Farmers do know how and what investments to make they risk their own land as collateral if they fail.

A typical Iowan farmer farms 350 acres. Most Iowa farmers grow corn as their main crop and produce on average 165 bushels of corn per acre. Recently the corn market has reached over seven dollars a bushel which brings very nice revenue for the farmers, roughly $400,000. Most make a decent living and live a moderate but comfortable life. These farmers are usually educated with at least a high school degree, and many go to college. Since these farmers are educated it is fairly easy to take out loans to expand their farm, or purchase new equipment.

Water Scarcity

Besides all of the economic problems with farming, there are other major factors affecting Kenyan farmers. One major issue is that the land in Kenya is roughly two-thirds desert, so there is not much land available for crop growth. Only 8% of Kenya's land is arable, and less than 1% is used for permanent crops. Kenya's climate is very arid in most of its interior, while the coastline is tropical. Most farming occurs on the coastline which is a small part of Kenya's landscape. Because much of the land receives small amounts of precipitation throughout the year, water scarcity affects most farmers. So I have chosen managing water scarcity and adapting farming practices to reduced water supplies with improved technologies and conservation practices, as my key factor.

With very little rainfall during most of the year in much of Kenya, alternative ways to supply water are necessary. One of the most obvious ways to do this is to irrigate the land. Irrigation is the artificial means of providing water to foster plant growth. Some of the basic methods of irrigation are; to use a center-pivot, a drip, to flood the land, or a sprinkler system. There is 1,030 km sq. of irrigated land in Kenya. That's only 2% of its' arable land. That is a very small amount of land compared with how much is in need of irrigation.

A central pivot irrigation system uses a long spray boom that is nearly half the length of the field it is used in. This boom rotates around a central pivot in the center of the field. There are advantages and disadvantages with using this type of artificial irrigation. One disadvantage is that since the boom rotates in a circular motion and fields are usually rectangular, the corners of the field don't receive much water. Another disadvantage for this method of irrigation is that the system costs $6,500 for a quarter mile system which is expensive. On the other hand, central pivot systems provide an even application of water over a field, and are easy to maneuver and repair, compared to other irrigation methods.

Drip irrigation systems are an entirely different concept than central pivot irrigation. A drip system uses plastic tubing buried at the plant's root level to deliver steady amounts of water to the plants. A good drip irrigation system loses practically no water due to run off, or evaporation. This system is extremely efficient in delivering water to the plants. This system can water any shape of field. However, there are problems though with costs and with dirt plugging the systems tubes. An acre of this system costs between 500 to 1200 dollars, which is well out of the price range of the average Kenyan farmer. Both the central-pivot and drip irrigation system are not very good solutions to Kenya's water problems, because they are too costly. The farmers in Kenya are most concerned with minimizing the risk of farming, and with their food security.

Several low cost methods of trickle and sprinkle irrigation systems are and have been developed. These new methods focus on the distribution of water and the application of water. The systems are made to be as efficient as possible. Systems like these are beginning to be used in several countries. These low cost methods are made for small plots and can be easily expanded upon. They are designed to be as simple as possible, and to be used on small plots of land.

One such method is the drum kit which was developed by International Development Enterprises. IDS is a company that develops products that are cheap and effective. The drum kit method involves a 200 liter drum with pipes going from the drum laterally and 26 micro tubes on each pipe. This system costs 30 US dollars and can irrigate a 125 m2 plot. This system is fairly cost-effective and easy to maintain.

The cheapest of these new methods is probably the bucket kit designed by Chaplin. This system has one bucket which is raised on a stand. Two lateral tubes feed off of the bucket and are laid on a 1m raised bed. This design supports 15 m2 of land. The bucket kit is a low costs for small land areas, but a larger bucket kit is very pricey when used on larger land areas. This product was developed for poor people in areas that are tough to raise crops, so they would work well in Kenya.

One of the main methods of irrigation used in many third-world countries is the flood system. The flood irrigation system comprises of either water being carried by a person and dumped on a field or water being pumped to cover the field. When using this type of irrigation it is best to have flat terrain to spread the water over the field as equally as possible. Also, surge flooding (which is just releasing water over a field) and reusing runoff help to make this process much more efficient. This type of irrigation has very little costs when compared to newer methods, but there is much more water that is wasted, either by water run off or evaporation. The amount of water wasted depends on the terrain of the land, what water delivery method is used (buckets, pumps, etc.), and how much water runoff is recycled.

Irrigation may be the most obvious thought that comes to mind when water scarcity is mentioned, but it may not be enough. Irrigation methods may need to be combined with other growing methods. Some methods that show promise are: crops that are meant to grow in dryer regions, genetically modified crops that can are engineered to yield better in low water environments, and even better information sources on weather, new growing techniques, or other agricultural advice can all boost yields.

Genetically Modified crops are not a new invention in the agricultural world. Genetically Modified crops have been developed for generations using cross breeding techniques, but recently scientists have been able to identify beneficial traits in plants and transfer them into other plants' DNA. These crops are producing higher yields than previously thought to be possible. So far most Genetically Modified plants have been altered to be resistant to insects, or to have more favorable qualities for cooking. Recently there has been development of crops that can survive dryer climates with good yields. This type of genetically modified crop is still under development, but could be sold to the public within a few years.

All plants have certain climates that they grow best in. This can happen because that crop isn't suited for the particular climate where it is being grown. Some crops that are suited to dry regions are the olive tree, citrus fruit, cucumbers, and grapes. Crops that are suited for areas with moderate or slightly less than moderate amounts of rainfall are corn, oats, barley, and soybeans. One of the best ways to have a crop that can grow well in a particular environment is to grow several generations of the plant, and harvest the ones that survive. Over many generations of plants, traits that help the crop to survive will become more and more dominant. This method of home grown seeds may become extremely important because of the rising amounts of genetically modified crops that are being grown instead of home grown seed. Genetically modified crops may have unforeseen effects after several generations of growth, or they just might not be able to survive in certain climates and areas.

Finally information can be a farmer's best tool for combating water scarcity. Data such as weather predictions can be used to decide whether or not to use a certain seed or fertilizer. Also, reports that specify which crops are going to grow well and be profitable are very important. This data is not making it to most farmers, even though Kenya's Ministry of Agriculture makes seasonal advisories with this information in it. Some efforts have been made to travel to farmers around grain co-ops, educating the farmers in the surrounding areas. This education can be extremely important because many farmers are not well informed. However, the co-ops don't have the resources or the man power to educate all of the farmers. If farmers can get this information their yields can jump as high as 60%.

Solutions

In Kenya water scarcity is a major problem for farmers, but as I've shown, many new and old inventions, methods, and techniques can possibly help. After looking through many of these ideas, there are a few that I believe would work well together to help Kenyan farmers to battle water scarcity. Out of the many types of irrigation systems the cheap barrel systems seem to fit the need of Kenyan farmers the most, with their efficiency and low startup costs. These barrel systems were designed specifically for poor farmers with limited resources. This form of irrigation needs to be combined with crops that are either grown in the Kenyan climate for many years or crops that thrive in dry climates such as Kenya's. Just using crops that thrive in Kenya's climate could increase yields greatly. On top of these efforts I believe funding from humanitarian groups, government agencies, and any other charitable groups need to fund co-ops. This would allow co-ops to buy better resources and hire more help to educate farmers on better farming practices. This is probably the most important of all possible solutions to Kenya's water problem. If all of these things are available or provided for the average Kenyan farmer I believe they will be able to increase their yields, reduce the effects of water scarcity, and allow them to connect their agriculture to local, national, and global trade.

Resources

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