Nate Ryan, Student Participant
Ames High School
Ames, IA

The Improvement of Food and Nutritional Security in Uganda Through Agricultural Research and the Education of Family Farmers

Introduction

The Green Revolution introduced technologies that have allowed for yield increases greater than the population growth. There is on average more food per person throughout the world. However, in the past generation most of the population growth (3 billion people) has contributed to groups of people who made less than $7,500 a year.[1] In Richard Manning's paper "Hunger Speaks", he states that at least 1.3 billion people live on less than a dollar a day. He also states "much of the increased grain production has been directed away from the poor and towards livestock to produce meat for the worlds wealthiest." He backs this idea with the fact that although the large increases in crop yields since the 1950's have allowed more than enough food to be produced to give everyone in the world a decent diet, many people still starve. If food and nutritional security are to be enhanced for everyone then a different approach must be taken. When large farms receive help towards creating greater yields from their crops, they may increase the amount of food that is exported and help the agricultural sector economically, but this input is doing little to help improve the food and nutritional security in Uganda for all people. Uganda's government has taken some steps towards helping impoverished farmers by focusing on agriculture as a means for reducing poverty. The proportion of people below the poverty line has dropped from 56 percent in 1997 to 35 percent in 2000. But Uganda's two rainfall seasons have allowed for yields that should be enough to feed the people of Uganda.[10] It would seem like the trends are very positive towards greater food and nutritional security; however, in some places as many as 65 percent of the people live below the poverty line. The approach of governmental and non-governmental agencies must be more focused on the subsistence aspect of agriculture, if impoverished farmers are have greater food and nutritional security.

Agricultural research is a prominent factor in food and nutritional security in Uganda. Most research in the past has focused on corn, wheat, and rice. These were the crops that Norman E. Borlaug worked with to improve their yields. An example of his work is the development of dwarf plants to support a fatter seed head, which in turn improved yields by up to 300%. This improvement is no doubt phenomenal; however, because of a lack of research into other species, the average percentage that cereals contribute to the daily diet of a person in developing countries is 56, while in the developed world only 33% of the diet consists of cereals.[1] The first step in agricultural development is sustainable subsistence farming. With that in mind, in the 1990's, Uganda's government decided, against many trends in developing countries, to step up its investment and research towards subsistence crops rather than cash crops. This trend is a step in the right direction, but more initiative is needed. This effort must involve the improvement of the education of family farmers. The Ugandan government is cooperating in the effort to improve food and nutritional security in Uganda and while it may be unable to do so as effectively as it needs to, this is an opportunity to make changes that will help impoverished farmers.

Background

Uganda's main food crops are plantains, cassava, sweet potatoes, millet, sorghum, corn, beans, and peanuts.[2] And while Uganda's crop yields should be enough to feed its population, hunger is still very common due to poor distribution, storage, and processing facilities. And while some areas produce high yields, most is perishable, and famine still occurs in these areas. Most farmers lack self-sustenance after they sell their crops, which leads to malnutrition.

Even though Uganda consciously decided to step up its investment in subsistence crop development, little research has been devoted to subsistence crops. An example of the lack of research on subsistence crops and how it affects impoverished farmers is well demonstrated in plantains. The lack of biotechnology research on plantains contributes partially to the lack of enough food and the lack of sufficient income, used to purchase food or dietary supplements, by not preventing loss of yields in the plantain crop. It is estimated that 90% of the world's plantains are grown on small farms or in back yards. This crop is relatively easy to grow and produce and the plantain crop is also relatively stable. Plantains also can greatly reduce subsistence families' dependence on income to purchase dietary supplements. This crop provides vitamin A and C, potassium, calcium, phosphorus, and large amounts of carbohydrates.[4] Vitamin A contributes significantly to vision, bone growth, and reproduction, as well as cell division and cell differentiation. It also might reduce the chance of HIV infection.[5] Vitamin C prevents scurvy which causes, among others, pain in the joints and muscle wasting.[6] Calcium prevents bone loss and in severe cases, rickets. Although this crop is relatively easy to grow there are major constraints to its yields, i.e., pests, diseases, and soil fertility loss. The banana weevil and parasitic nematodes make up the major pests to this crop. In fact, if a plantain were to be infected by both of these pests, yield losses could reach as high as 85%.[4] Major diseases that infect plantains include the Black Sigatoka leaf spot disease, Fungal leaf spot, Fusarium wilt (Panama disease), Banana streak virus, Banana dieback virus, and the Cucumber mosaic virus. Plants infected with the Banana streak virus can cause yield reductions up to 60%.[4] Finally, the plantain crop is highly perishable with an average market life of 1-10 days.[4]

A "typical" subsistence family in Uganda has been changed recently by the AIDS epidemic (though Uganda has been combating the epidemic well, reducing the rates of AIDS prevalence from 20% in 1991 to 6.5% in 2001).[10] For instance, 50% of Uganda's population is between the ages of 1 and 15.[14] This means that the family structure has then been altered because of this factor. Female-headed, child-headed, and widow-headed households correlate well with that household being in poverty.[12] The average consumption of the "typical" subsistence family farm only increased by a mere 0.9% in Uganda from 2000-2003. This is greatly slowed from the trends in the 1990's.[13] The high proportion of cereals in the diet and the lack of income to buy nutritional supplements creates an environment where many people suffer from malnutrition. The education of these subsistence family farmers and their children is in place, but for women especially, these institutions are not as effective as they need to be. For example, while the government of Uganda was to pay for tuition fees for all children in Primary schools, other requirements had to be picked up by the parents, which in the subsistence family farm households is rarely possible. This has caused not all of the Ugandan children to be enrolled in school and also the dropout rates for children are high, especially for girls.[14] The literacy of Ugandans was estimated at 69.9% in 2003.[15] Women are also discriminated against when it comes to the education of farmers about their farming practices. Uganda itself has a per capita income of $300.[10]

Agricultural Research and Education

The present status of agricultural research in Uganda is much better than in many developing countries due to Uganda's governmental policies concerning subsistence farming initiatives. However, the education of family farmers and specifically women, is still inadequate. Cassava and sweet potatoes are the only crops that have biotechnology research devoted to them. Crop developments in the cassava are still in the experimental phase. Research in sweet potatoes is, however, in the commercialization stage.[3] The National Agricultural Research Organization (NARO) admits to the lack of effectiveness and relevance of technologies to the poor farmers. NARO also states that even when a technology is relevant, the technology is not widely taken up by farmers. According to NARO, it and its research initiatives are not suited to take on these challenges.[9] The task of Uganda's Agricultural Knowledge and Information System (AKIS), consisting of NARO and other organizations, is to empower farmers to be able to effect

the direction of these agricultural services to better fit the farmers needs. Agricultural research may be better off in Uganda than in other developing countries, but still much greater progress needs to be achieved. Only two crops have biotechnology research devoted to them and because of the lack of integration between the extension and research, much of the other research devoted to agriculture is ineffective and irrelevant.

Agricultural research cannot be separated from the education of family farmers. Extension systems connect the agricultural research factor in food and nutrition security with the education of family farmers factor. The strategy that is most commonly employed is the bellwether strategy. The theory behind this idea is that neighbors will see the successes of the early experimenters with new crop varieties and the neighbors will follow in tow and adopt the new technologies. However, country studies in India suggest that more often the early adopter's advantage over their neighbors is used to drive the early adopter's neighbors off their land. This then contributes to the urban poor population.[1] These extensions systems also are gender-biased. Through research conducted in western Kenya, it was demonstrated that agricultural instructors tend to visit farms managed by both men and women more than farms managed solely by women.[7] In Sub-Saharan Africa women carry out most of the agricultural labor, especially in subsistence agriculture. Most agricultural scientists are, however, men. They rarely consider women as farmers and tend to not distribute information and technologies to them. In Uganda, Integrated Pest Management Collaborative Research Support Program's (IPM CRSP) research demonstrates that women have a large and important role in pest management. Women need as much extension support as men do, but because women are not viewed as important as men, vital access to information is reduced. Rarely do male extension workers (the majority) provide information to women.[8] This in turn affects the food and nutrition security situation of subsistence farmers, seeing that women are the main cultivators of the subsistence crops, yet they are not given the information they need about their crops.

Despite these problems, the trend of agricultural research and education is generally positive. NARO realizes that it needs to research technologies that are relevant to subsistence farmers. Some of this has occurred within the biotechnology sector, specifically cassava and sweet potatoes. This trend is measured by not just the technology but also the efficiency (of the distribution of these technologies). Governmental organizations as well as non-governmental organizations (NGO's) are coming to realize this. They are also coming to realize the flaws in their extension services and the lack of interface between the research and extension. This points to a positive trend in the education of family farmers. Although these changes may be slow, the NGO's and governmental organizations are revising their methods and research directions. Because of these positive trends in Uganda, it appears that the situation for family farms and the people living on them, is in general getting better and food and nutrition security is increasing.

Improving agricultural research to be relevant to subsistence family farms increases this welfare. This is achieved because technologies are developed that focus on helping the families, perhaps giving the families higher yields. This then allows the family to either consume their produce, food and nutrition benefits, or sell it to get income, which can then also be used to buy dietary supplements. Improving education to family farmers goes hand in hand with agricultural research to increase the amount of food, nutrition, and income of impoverished farmers. When technology is developed that is relevant to subsistence family farms, the only way that the developed technology is going to be widely distributed is to increase the efficiency of the extension services. A helpful, relevant technology is entirely useless unless farmers are educated. Improving agricultural research and education of family farmers will also help preserve the environment by implicating methods within family farms to replace out-dated and environmentally harmful techniques and technologies. The improvement of extension services (or the education of family farmers) will benefit women by bringing about policies of extension services that favor the distribution of information to women. By doing so, small farms will benefit because women, the primary cultivators of subsistence crops as well as providing a large amount of labor to agriculture,

will have better technologies and techniques to use. If both of these factors are increased, more people will have access to better technologies resulting in the overall benefit for developing countries and specifically Uganda.

Conclusions

To improve the situation faced by impoverished family farmers, I suggest that (a) agricultural research should be focused towards helping the impoverished farmers, not just large companies/farms that are producing cash crops and (b) that extension services should be changed to better spread new technologies when they are developed.

First of all, I recommend either using NGO's to research and develop technologies that are directed towards impoverished farmers or I recommend that farmers are in some way empowered to control the direction of agricultural research. NGO's are far more likely to be committed to pay more attention to subsistence agriculture and in general improving the poor's situation, because the existing governmental networks (e.g., NARO) are unsuited to do so.[1] A good example of technologies being developed to help impoverished farmers is given by ISU's Center for Sustainable Rural Livelihoods that is currently functioning in Uganda. They introduced to farmers in the region a cassava strain that was resistant to blight. However; this same kind of attention towards improving the life of the impoverished farmers can also be achieved by giving the farmers themselves power over the technologies that are researched and developed, thus minimizing the loss of interface between the extension and research. The farmers themselves would be able to control where research would be headed. For example, farmers themselves could help control the direction NARO takes. NARO's institutes are, however, based in and around Kampala so farmers in other areas cannot effectively participate and benefit. What is needed, then, is for NARO and organizations like them (AKIS) to spread out their institutes for research and extension services to let farmers control, participate, and benefit from the relevant research produced while the institutes still share information and cooperate in their research.

Once new technologies are developed that are relevant, they need to be distributed to the impoverished farmers who need them most. To do so the extension services need to realize two things: (1) women are a vital part in farming and (2) the common strategy used (the bellwether strategy) needs to be revised. Using ISU's Center for Sustainable Rural Livelihoods as an example again, their approach to spreading the new technology was both good and bad. First, they realized that women played a large role in agriculture. Farmers would elect a representative who would go to the center. These elected people, including women, would then receive the information as well as a packet of items (e.g., a wheelbarrow, a shovel, and other small things). Then these representatives would distribute the information to their fellow farmers. However, the center also partly relied on the ineffective bellwether strategy.[11] But the Center for Sustainable Rural Livelihoods is a good example of how these ideas could be put into place. Another example of the lack of effectiveness in the current Ugandan extension systems is demonstrated in plantains. In the past 20 years, areas highly populated with plantains has experienced a loss of soil fertility due to shortened fallow periods, thus these crops have experience major yield declines.[4] This loss of soil fertility creates both an environmental and economical issue. On the one hand the shortening of fallow periods results in environmental degradation, while on the other hand it results in yield losses that affect the economic aspect of the subsistence family. Larger yields (and more food and nutritional security) could easily be achieved by redesigning the extension model that is currently being used.

Once the extension services realize that women are vital to agriculture, then information on techniques and technologies can be passed on to those women and impoverished family farmers will be better able to grow their crops. The extension services also need to realize that the bellwether strategy does not work as well in practice as it does in theory. Instead, a new approach needs to be taken. If AKIS can effectively spread out its institutes, then many more farmers will be able to be active in controlling the research. These institutes could then, with a larger base of impoverished farmers, more easily

distribute new knowledge and technologies. The farmers would give their input into the research facilities. Then when a new technology was produced, all the farmers who had given input would easily, say, be given classes on this new technology (including women). When the number of farmers who put input into the research development process grows larger, so does the number of farmers who receive benefits from the research. In this way the research and extension interface becomes relevant and effective.

These same principles can be employed in other areas of the world. The international community needs to get rid of gender bias and in this case in agriculture. Also more effective means need to be used to distribute new technologies to the poor. Almost all of the improvements needed in Uganda can also be applied in other developing countries to help the poor. If national governments and other organizations realize that they need to focus on helping women and they also realize that the agricultural research direction needs to be focused on the impoverished farmers, then it will go a long way towards solving food and nutritional insecurity and ensuring that natural resources will be used in a sustainable way so that all people can benefit in the future. For all of the people of the world are to have food and nutritional security, approaches that recognize women as equal to their male counterparts and research processes that are focused towards helping subsistence farmers are both necessary.

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