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## **Food Security in Central Africa**

An old African proverb states “For tomorrow belongs to the people who prepare for it today.” This could not hold any more truth in it; Central Africa is a region that holds the key to Africa’s future. It is a region that is in dire need of help, in many facets, and now is the time for change. Central Africa consists of Angola, Cameroon, Central African Republic, Chad, Congo, Democratic Republic of the Congo (Zaire), Equatorial Guinea, Gabon, Sudan, and Zambia. These countries are very impoverished and most of the crops are grown by subsistence farmers. One key factor is glaringly obvious to help Africa’s situation, and that is scientific research into crop biology and agronomic technologies for improving yields, disease and drought resistance, and sustainable agricultural systems. This factor alone does not stand, but it stands by the questions that must be asked of it. This factor requires analyzing, including the current status, trends, measurements, potential, and how it can be resolved. The reason for the factor is not only to aid Central Africa, but also to act as a stepping stool for the argument of biofuels and biofoods. Africa can only fight so many fights at once, but it must realize that feeding its people and developing food security is necessary for Africa to thrive. The promises and implications for food security in this developing region of Central Africa must be called to attention. The people of Africa do not need to live in hunger or fear of starvation. Food security is a must in Central Africa, and everywhere around the world. Biofoods and biofuels pose a legitimate solution to this crisis in Africa. I will make recommendations based on research, to come up with a system or plan to help institute food security in Africa through the use of biofuels and biofoods. I will weigh the positives and negatives of biofuels and biofoods in Africa, because anything worth value is worth a little risk. I will also make suggestions for the roles of corporations, national governments, and other organizations. Africa can not climb out of its hole by itself, it will require a little help, and that help can come from many places. So the responsibility falls on Africa, and the world around them to prepare for the future.

A “typical” subsistence family farm in Central Africa is composed of a minimum of four people in the family. The average family consists of 5 to 7 children and parents. The diets of the people consist entirely on what they grow. In the country of Chad for instance, the most important crops are sorghum, millet, and berebere. These crops are responsible for around 80% to 95% of all grain production. The two other crops that are of notable cultivation are peanuts and tubers, these plants account for about 6% to 17% of the population’s diet, seeing increases in times of drought. Their diet also is dependent on fish. The majority of Africa’s diet consists of everything that is harvested by their own farms. As far as education in Africa goes, only 58% of the population receives primary schooling. Of this percentage, 4 out of 10 children don’t even finish their primary schooling. Secondary schooling numbers are even lower, and most of the students in either case are males. While females aren’t placed as high in society as the males, many males end up dropping out to help with subsistence farming. The typical family in Africa is involved in farming, as well. Roughly 80% of Central Africa’s labor force is made up of subsistence farming, herding, or fishing. The average farm size in the entire continent of Africa is only an astounding 1.6 hectares. The United States average is closer to 200 hectares on average, to provide reference point. The crops grown in Africa are not only limited to the powerhouses of sorghum, millet, berebere, peanuts, and tubers. Africa has also tried its hand at growing corn, rice, wheat, manioc (tapioca), coffee, cocoa, oilseed, bananas, sugarcane, coffee, sisal, tobacco, vegetables, plantains, root starches, palm oil, tea, quinine, gum arabic, mangos, papaya, sesame, and sunflower seeds. While this is a wide range of crops, keep in mind that the previous list of crops only accounts for 5% to 20 % of this region’s crops. The main crops are still sorghum, millet, and berebere. The agricultural practices in Central Africa are limited to what their sub par equipment enables them to do. Due to lack of income and the average land size being 1.6 hectares, there is essentially no use of machinery or modern technological

tools. The use of any pesticide or herbicide is generally all organic, coming from the immediate community. It is also not uncommon to add more soil to the ground, because the top soil is not very thick. Most of the farming is subsistence farming in which all things are done by hand, or with the help of livestock. Marketing in Central Africa consists of diverse outdoor marketing mainly because television, radio, and newspapers are scarce in the mostly rural Central Africa. There are many major barriers that are holding Africa back from success. One of these barriers is obviously financial constraints. Central African farmers can not increase productivity if they don't have the money or growing power to start with. The economy in Central Africa does not currently allow a family to change their economic status very easily. Another barrier that Africa has is their inadequate marketing and extension systems. This may be due in part to poor management, or perhaps it may be due to the scarce population in Central Africa. Either way there needs to be a better way to reach the people of Central Africa than outdoor advertisement. New media forms need to be introduced to this area. These are not the only barriers however, there is the barrier of suitable land. There are many different areas in Central Africa where the land is unsuitable for agricultural growth, or even living. These are areas such as rock outcroppings, desert conditions, and periodic flooding. Another problem is that there is not much variability in the quality of the land. Most of the good soil is already being used, and the rest of the soil is not worth the work. Another barrier is that African soils tend to be unstable, declining in productivity due to continuous cultivation. The land use has been intensified over the past 30 years, leading to declining yields and a degradation of the land base. The final barrier for Africa seems to be the lack of technology and resources. If Africa could even do more water quality checks or soil tests it would be far better off than it is now. Clearly Central Africa is missing out on bigger technological advances as well, but the economic constraints really put a damper on their capabilities.

One of the key factors in increasing agricultural productivity for biofuels production and improved food security is conducting scientific research into crop biology and agronomic technologies for improving yields, disease and drought resistance, and sustainable agricultural systems. Currently there is little scientific research being done on any of the previous titles. Central African nations are strictly relying on subsistence farming right now, only growing enough food for themselves, generating little income on any surplus crop. There is a serious problem for subsistence farmers that this factor directly appeals to, and that is drought and disease resistance. With Africa's wide climate range, from dry deserts to humid jungles, drought and disease are very common. Subsistence farmers generally use natural fertilizers, and rarely can afford herbicides and pesticides. The crop is essentially in Mother Nature's hands when it comes to crop yield in Central Africa today. The vast climate changes in Africa, as well as the many types of diseases that accompany these conditions can be under greater control if investigative research is put into place. Essentially Central Africa is doing nothing when it comes to crop biology and agronomic technologies as well. The main reason little to no research is being done in Central Africa is that family income is not allowing this research to be done, so essentially this role is currently non-existent.

The status of this factor is non-existent to very little which illustrates exactly how severe the situation is. The very little that is being done is done by groups such as the International Institute of Tropical Agriculture. This group is doing ongoing molecular biology research in over seven different crops. The situation in Africa is that the farmers have little control over yield, and even less control over income. In the country of Zambia alone, the percentage of income from the average family farm is only around 65% of the total income. Considering that subsistence farming is the main source of work for these nations, there should be a higher percentage of income generated from their work. In fact, the average household in Zambia only averages a yearly income of 57.7 U.S. dollars. With these nations only gaining around 65% of household income from their work, there is a clear problem that needs to be solved. With much of Central Africa in the highest level of poverty, (red-60% or greater) there needs to be more income generated from the subsistence farms. Another problem which clearly presents its case is the problem of environmental degradation and the diminishing of biodiversity. The reason for soil

degradation could be due to a number of things. The continent of Africa has been inhabited by humans much longer than other continents. Another reason is that African bedrock mainly consists of granite and gneiss. There is low clay, which makes the land easy to work with, but also easy to lose. In central Africa there is either serious concern for soil degradation or a large mass of non-vegetative land in Central Africa. Results from soil degradation include decreased yields and increased levels of poverty. The main type of degradation in Central Africa is physical degradation. Monoculture, deforestation, overgrazing, and overexploitation are contributing to this degradation. The deforestation has exceeded planting 30:1 in Africa over the past few years. Overgrazing however, is responsible for just about half of Africa's entire soil degradation problem. Next to this problem however, overexploitation has been a main source of this destroying of land. Since 80% of all African employment is in the subsistence farming category, the land is being overused, especially because the farmers are not being diverse in their crops, spreading nutrients around. Not only does this result in lower yields but also a decline in soil fertility, a decline in biomass, and a decline in total food production. If there is not a change in biodiversity and environmental treatment, then nearly  $\frac{1}{4}$  of African land will be useless for agricultural production. These nations need to diversify their crop and take care of the environment before it is gone.

Women in Africa are extremely disadvantaged due to legal, economic, and social constraints. Women are believed to grow 80% of all the food produced in Africa. However, very few women are actually allowed to own the land that they work everyday. Women are not viewed as equals in Africa, and this can easily be seen in the differences in pay. Women will end up working twice as long as the men, up to 18 hours a day even, yet only earn 1/10 of what the males would earn. Also, certain opportunities are limited to mostly males, such as receiving education. While many women are allowed to attend primary school, the literacy rate of women is only half of what the men's literacy rate is. The women are still expected to tend to their children's welfare. They are also expected to manage the household, providing food, water, nutrition, health, education, and family planning. They are expected to do all of this plus tend to their farm, in which long hours are required. They are largely a necessary part of the subsistence farm and family life, yet receive little credit for their efforts.

The trends for this factor are ever increasing, as African nations are now realizing what they need to do to get out of their current situation. Improvement is being made slowly, but surely. Since 1961 the number of (FTE) full-time equivalent scientists working in Central Africa has increased by 5% annually. There are now more than 10,000 FTE's working to help Africa's current situation. It is clear that improvement is happening because since 1996-1997 the total production of all major food crops in Africa has increased by 2%. This indicates that the situation is changing, but it is changing at a very slow rate. Potential change is great in Central Africa because there is so much research and technology yet to be tapped into. The situation will improve slowly overtime, unless Africa dedicates itself to being more conscious about the resources around them.

Improving or resolving this factor would greatly increase the amount of food produced in Africa, as well as raise income significantly. By conducting research for crop biology and agronomic technologies for improving yields, disease and drought resistance, and sustainable agricultural systems you could essentially have unlimited agricultural success. With this research, Central Africa could finally have some control over their crops and yields. By pinpointing what could prevent disease and drought, they could finally have a dependable crop, instead of wondering whether or not the crop will last the year or not. Also, if these nations could engineer new crops or use biomass for other uses, then not only would yields increase, but also incomes. If this research could be conducted, then Central Africa would most likely be enlightened to what they are doing to their soil. If income increases, then Africa could make a conscious effort to protect their environment. Central Africa would be able to make the right steps to diversify their crop and save their deteriorating soil. Knowledge is power, and this knowledge would definitely bring the people of Central Africa agricultural power. If this factor was resolved, it would benefit small farmers and developing countries significantly. Knowledge and technology are the

gateways to success when it comes to agriculture. If the factor was resolved, then women would be able to make more money. The question however, should be if the women would still only make 1/10 of the average male's salary. The factor being resolved would result in higher crop yields and incomes, but the discrimination against women is a social issue, in which an outcome would still be up to the people of Africa.

The production of biofuels could significantly increase the status of this factor. Biofuel is the jackpot when it comes to agriculture in Africa. Biofuels would take away from some of the crop yield, but it would boost income by a lot. Cassava and other crops could be the main source of biomass for biofuels, which would raise the price of cassava and the other biofoods. With prices increased, the livelihood of the family would be bettered. It is simple economics: aggressively grow and sell this "energy feedstock", prices will go up because the feedstock will be in demand, and then return large profits because of supply and demand. Fuel is always highly in demand, and could be a chief export from Africa. While this is one theory, there is a small chance that things could go poorly. If the selling price of the biomass does not increase, then Africans, who rely on most of their crop for their own food, will be in further trouble. The big problem that needs to be monitored is that while growing biofoods, there is enough food left over for the subsistence farmers. Africa's main concern should be to feed their people. If the Cassava and other biomass's prices increased, then food prices for the poor would increase. Keep in mind that 80% of Central African population works as part of a subsistent farm. Looking at the situation from an outside angle, if enough income is generated from these biofoods and biofuels, then the Central African people should be able to buy more food and necessities. If percentages are played, then this seems like a logical step for Central Africa. Not only would bringing the biofoods and biofuels concept to Africa be beneficial to farmers, but also to anyone looking for work. Here is where the other 20% of the population could fit in, assuming not all of the 20% is impoverished. Running an ethanol or biodiesel plant requires many workers, meaning the creation of new jobs. Not only do these new jobs help to create jobs for a few workers, but they also benefit the entire population, starting new economic growth and circulation.

My recommendations are to set up a few controlled experiments. I believe that while biofoods may be a huge cash crop, it should not be what the majority of the food is being used for. There should be two types of farm experiments, one farm group using half of its food for biofuels, and the second group using its entire crop for biofoods. The success will be relatively easy to measure, since the traditional subsistence farm growing 100% of the crop for food consumption has been used for years. The traditional subsistence farm could be the base, or the control. The half and half farm would most likely experience the most success, because it is not necessarily a do or die harvest. If prices drop in biofuels, then there will still be half of the harvest left for the family at least. If the prices are high, there is potential for good income, but nothing like the income that could be generated from the 100% biofood crop. It is likely that this could produce the most profit, but if the prices are low, that leaves the family in severe condition, with no food or funding. Most likely to succeed is the first farm group with 50% of the harvest dedicated to biofuels, and the other 50% dedicated for consumption of the family that runs the farm. With this setup there is a potential risk, but the reward exceeds the risk greatly in this instance. The main concern now will likely be the environmental treatment of the land, but if the previously stated factor is resolved, then this environmental issue should be resolved as well. This leaves a healthy win-win situation with farm group number one, where a good profit can be turned, as well as the assurance of having half of the land left for self consumption, regardless of prices. This is the food security, as well as raised incomes that farm number one brings to the table.

My suggestions for appropriate roles of corporations, national governments, and other organizations are relatively the same. Central Africa needs to first understand the importance of research in the industry of agriculture. If the national governments, as well as experienced foreign nations, could guide Central Africa into this research, the impact would be massive. If African nations can start research

in said topics in the research factor, then they would be taking a massive stride out of poverty. Any outside organizations willing to aid these nations should do so, in fact, the governments of these Central African nations should ask for help. For corporations, I believe that either Brazil or the United States should help get subsistence farms set up for producing biofoods. These are the two countries chosen because of their experience and success with biofoods and biofuels. If the organizations, national governments, and corporations worked together to aid Central Africa then progress is imminent. Outside nations, with support of organizations and the central governments, need to educate and demonstrate how to successfully run the industry of biofuels. Not only does Central Africa need to learn about this new system, but it also needs help in the economic department. Africa's main problems stem from a weak economic system and social system. The governments in these nations need to be strengthened in order to bring success to their countries. I believe this is possible through the support and guidance of nations who have figured out how to be successful in this world, but it will only work if these groups work together.

If the factor of scientific research into crop biology and agronomic technologies for improving yields, disease and drought resistance, and sustainable agricultural systems is resolved, then Central Africa's future looks very bright. By getting answers from questions about role, status, severity, trends, measurements, and potential, then a strategic plan can be formed. If Central Africa can somehow resolve this factor, or even begin research, then it has taken a large stride for food security. Africa no longer needs to live in poverty, or hunger, or fear of starvation. There is too much potential for Africans to live the way they currently are. Central Africa is just a child on a bike, waiting for someone to come and help push them for a while, and then they will learn how to ride all by themselves. In this way, we as outside nations need to help educate and demonstrate agricultural practices to the Central African people. By properly installing systems involving biofuels and biofoods, then Africa will be aiding their future people. The ensuing decisions made by Central Africa will directly affect the future generations yet to be born. It is necessary to fulfill the obligations set before Central Africa, like the obligation to better the economy, society, and agriculture in general. Most of Central Africans live in poverty, and 80% of the population relies on subsistence farming, only growing enough food for themselves. A change must be brought forth in Africa, and it needs to come from the farmers. By utilizing some of their harvest for biofoods and biofuels, then Africa will be able to finally generate some income. While the steps may seem small, Central Africans are irrevocably making the changes necessary for growth. Africa holds its own destiny now, and they are responsible for creating a secure future for generations to come.

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