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Food Security in the Republic of Gabon, Through Biofuel Production and Agricultural Education of the Subsistence Farmer

Around one billion people (or one sixth of the world's population) live in extreme or absolute poverty. This means that they cannot meet the basic needs of survival. Chronic hunger, absent health care, unsafe drinking water and sanitation, almost nonexistent education, along with perhaps the lack of shelter and basic articles of clothing define their lives. Ninety-three percent of the extreme poor can be found in East Asia, South Asia, and Sub-Saharan Africa. Sub-Saharan Africa is the only region in the world where extreme poverty continues to rise and per capita food production continues to worsen. Gabon is located in Western Sub-Saharan Africa. Almost half of Africa's population lives in extreme poverty or has an income of one U.S. dollar or less a day. Poverty and hunger makes death imminent. More than eight million people a year or more than 20,000 people a day die around the world because they are too poor to survive stated author Jeffery Sachs in *The End of Poverty*. Five sixths of the world's population lives within the three stages of poverty: extreme, moderate and relative. Unlike extreme poverty, moderate poverty means the basic needs are met but just barely. The average income is one to two U.S. dollars a day. Relative poverty is classified by a household income below a given proportion of the national income. They lack cultural goods such as entertainment, and quality healthcare.

With the rural population being a large proportion of the poor, food production must be a focus to reach food security. Jeffrey D. Sachs states the economic possibility of our time can end poverty by 2025. This will happen when Green Revolution-like advances reach Africa. Sixteen of the world's eighteen most undernourished countries in the world are in Sub-Saharan Africa according to the Rockefeller Foundation. The Green Revolution was filled with advances in seed crops and agricultural technology. Norman Borlaug and other pioneers have helped regions like Latin America and Asia. The Green Revolution stopped at Africa though. Africa is more diverse in its climate soil and range of suitable crops than Latin America and Asia. Also irrigation is less common. Fewer trained scientists are available to work on new agricultural programs. According to the Rockefeller Foundation, these are the needs of African Farmers today: "scientific development of more productive crops and fertilizers; cultivation of local talent in plant science, farming and agricultural policy, and business; strong commitment from national governments; and public-private collaboration on infrastructure, water and irrigation, the environment and building markets for the inputs and outputs of a revolutionized farm sector." To help the poverty-stricken residents of Sub-Saharan Africa agriculture must be modernized. To reach food security for the citizens of Gabon, the focus must be on current agriculture practices and the possible role biofuel may play. By first building infrastructure in the countryside, then educating family farmers about results from agricultural yield and sustainability research, next providing access to and support for implementing methods from this research, and finally creating a market for these crops, the rural subsistence farmers can bring an end to their own poverty.

Waking up early, around five, a rural Gabonese mother feeds her many children. She does the household chores and hauls water home. The mother now leaves, headed to the crops. She spends at least ten hours in the fields. On the way home, she collects firewood and brings home seasonal produce from the field. Now home, she prepares supper, feeds the family, and finishes her household chores before she goes to sleep. This daily routine varies greatly from that of her husband. Men spend an average of two to three hours working in the field during the busiest season. During the rest of the year, January through August, men are most likely fishing or hunting, along with clearing trees for crop ground. Gabonese farm families consist of many young people. They help the women in the fields or attend

school. Forty-three percent of the rural population is under 18 years of age.

There are three reasons for the unusually high proportion of children. First, there are many city dwelling parents who are sending their children to live with rural relatives. Second, families have more children to compensate for high childhood deaths. This overcompensation is in part a response to malaria-induced death rates. Worldwide, three million people are killed each year, most of whom are young children, by malaria. Ninety percent of these people live in Africa. The third reason for the high children rate is caused by HIV/AIDS. More than ten million children in Africa are orphans today because of AIDS. In the rural population men are the minority with 91 men to every 100 women, along with a high number of elderly people (aged 50 and up.) Many of the middle aged citizens (20-40 years old) have left, hoping for a better life in the city. This better life rarely occurs, with extreme poverty and unhealthy conditions common in the cities. In a study done by World Bank, some people who have migrated to Libreville, Gabon's capital city, admitted to having not returned home to their village for many years. They cannot afford the trip nor can they conceive of returning home empty handed.

The total cropland of Gabon, according to EarthTrends, is 495,000 hectares. Although 27% of the population lives in rural areas, each subsistence family only farms on about one hectare of land or less. In Gabon, high yield seeds and chemical fertilizers are very uncommon, causing harvests to be minimal. Seventy-one percent of farmers cited cost as the main reason they do not utilize chemical fertilizers. Other causes of low yield include lack of irrigation and elementary farming techniques and technology. Only 3% of total crop land was irrigated in 1999 according to EarthTrends. Rudimentary tools- machetes and axes used by men, and hoes used by women- cause field work to be extremely labor intensive. In 1997, the total number of tractors in Gabon was estimated at 1,500. Most of these tractors are property of large company productions or the government. This figure is an example of the lack of modern technology in the rural areas. Subsistence farmers practice slash and burn agriculture. This method causes high erosion rates due to the average annual rainfall between 1250mm and 2000mm. Slash and burn agriculture also causes soil degradation which contributes to the low crop yields. Plantains, cassava, and maize, which are the most common Gabonese subsistence crops, are continually planted in the same soil season after season. The soil has no time to regain the natural nutrients causing crops to not reach their full potential. Gabonese subsistence farm families generally raise free range goats, sheep, and chickens with a few local pigs and cattle. Cattle were introduced in 1980 with the development of tsetse resistant breeds. In 1981 the Food and Agriculture Organization/United Nations Development Programme began establishing small pig farms in communities. The field produce of plantains, cassava, and maize, along with manioc paste, taro leaves, yams, and occasional fruit form their diet. The rural Gabonese diet is supplemented by the livestock they raise. During important celebrations meat may be eaten, usually in the form of bush meat, cattle, or swine. This diet is severely lacking in protein and essential minerals, causing health problems left untreated due to unavailable medical care. Health care and education were cited by the rural farmers as their top unmet needs.

The Gabonese government's education spending started falling in 1986 with the collapse in oil prices and has continued to descend. Education in Gabon is compulsory until age 16 and is usually available through sixth grade. Students are required to pay for books, uniforms, and other school supplies. Cost is one cause of the high drop out and repetition rates. The repeater rate is higher than 30% at all grade levels according to World Bank's Household Archives. Sixty-five U.S. cents a day is the average income for over half of Sub-Saharan Africa's population. Most schools in the countryside are poorly constructed and lacking in equipment. Gabonese teachers are also in short supply with one teacher for many grades or no teacher at all. Net enrollment for primary school is estimated by the World Bank at 86%. Fewer than 50% of secondary school age children attend school. Only 5.6% of the population has completed their high school education. Overall, though, the U.N. has data to suggest that 64% of women and 78% of men are literate in Gabon.

Right now, in Gabon, there are many barriers to improvement. First, the government must ameliorate the rural infrastructure. Only 47% of the rural population had access to safe drinking water in 2000 according to EarthTrends. Rural villages have either poorly constructed schools or none at all. Most communities have no health care or social service available. Outside of the village there are very few roads. The roads in most places are dirt. They are difficult and at times dangerous to travel upon. Because of the isolation of most villages, marketing is basically nonexistent. There are few, if any, warehouses or buildings to store excess crops in the case of a bountiful harvest. This means the subsistence families could still starve in a few months time or next season because they cannot store their extra produce. In Gabon there is not a shortage of land; there is a shortage of rural laborers. When the farmers die or relocate to the cities, farm ground is left open and unused. Other farmers do not utilize the land because they do not have enough help to work the fields and they do not have the money to hire workers. The abandonment of land over time causes farm villages to become more spread out and secluded. This makes it difficult to create an effective, widespread course of action and dispersion of information and aid.

Currently in Gabon, the subsistence farmer's lack of modern agricultural education amplifies the cause of low food productivity. They have little or no knowledge of high yield crops or genetically engineered plants. Without new, modified seed stock, such as maize that is resistant to maize-streak virus or cassava resistant to blight, a whole season's harvest could be destroyed. As families depend on mother nature, pests, disease, drought or other contrary weather conditions can cause these rural communities to go hungry. Farmers have not realized the damage they are causing the soil when they do not rotate crops to let the soil regain its natural nutrients. The subsistence families use primitive farming techniques, such as hoes and hand planting that lead to small fields being planted. All of this, along with the lack of chemical fertilizer and irrigation, contributes to very low yields.

Nearly all rural communities lack any form of extension services. Subsistence farmers have little ability to learn about new practices. This absence of services is caused by the isolation, lack of infrastructure and distance between villages. The roads are not favorable and cause few people to venture though the countryside. Of the estimated 7,670 kilometers of roads, only 634 kilometers are paved in Gabon. Many roads are dirt and are passable only during the dry season of June to August. The severity of Gabon's deficiency of agricultural education is elevated because of the secluded villages, shortage of resources, low rural literacy rates, extremely low income levels, and inability to travel to overcome or obtain these necessary details. The slash-and-burn agriculture practiced by the men of the families is causing the environment to be degraded and biodiversity diminished. Three quarters of Gabon's land area is covered in tropical rain forest. Farmers are cutting down and removing trees, then burning the vegetation off the land. This causes high amounts of erosion and the rainforest's vast fauna and flora count to dwindle. With the men out clearing the land or hunting, the women are left to do the home and field work. These rural women are immensely disadvantaged. They are the ones that need to be informed of the current agricultural practices. Even if information was brought to these rural communities, usually women would not be the people who were taught. The women have little or no free time because their days are filled with essential chores that cannot be abandoned. The men would be free to ascertain the new information. Even though female literacy is lower than that of males, rural women may be as receptive to learn improved agricultural methods as their male counterparts. Women have more personal ownership in hands on farming. The rural subsistence families are also disadvantaged because of family composition. The communities consist of elderly men and women, and children less than 18 years of age. When the men and women die these children must continue on their own. They must work in the fields, abandoning their education. These children then grow older and most likely will follow in the footsteps of many middle aged citizens; they leave the countryside and rural lifestyle in hopes of work and all of the possibilities the cities hold.

The government of Gabon has begun to revitalize its poor sectors by rebuilding the

infrastructure. These plans will progress mainly in the large cities in Gabon, such as Libreville, Franceville and Port Gentil. Rural citizens are a largely overlooked section of Gabon's population. Over 50% of Gabon's current population exists in Libreville, 27% resides in the rural areas, leaving the remainder living in other cities or towns. On March 15, 2006, the World Bank Board of Directors approved a loan to support Gabon's local infrastructure development. The government of Gabon intends to use the U.S. \$25 million loan to aid the urban poor. They plan to upgrade the infrastructure to improve living conditions, at the same time, supporting local contractors and construction workers to transform the targeted communities. They also will fund HIV/AIDS prevention programs to coordinate with current procedures. Gabon was ranked thirteenth in the world for the number of people living with HIV/AIDS in a 2003 estimate, at 48,000 people or 8.1% of the population, according to the CIA World Factbook. In 2003, Gabon was also ranked at fifty-seventh in the world for HIV/AIDS death rate. Another strategy to elevate the urban living standards is the "Bottom-up" Community-Based Development Project also supported by World Bank. This approach will focus on the construction of roads and the use of local unskilled laborers to increase employment. In 1997, 27% of the urban population was unemployed. According to USAfrica.tripod.com, this statistic is rapidly increasing as new jobs are not being created fast enough.

With widely dispersed agricultural information and methods from new yields and sustainability research, farmers in Gabon could see impressive yield increases. They also could begin to use genetically modified crops, such as blight resistant cassava or the maize that was developed by Jennifer Thompson and Edward Rybicki of the University of Cape Town that is resistant to the common maize-streak virus. This could lead to extra produce to sell. If crop yields increase to this extent, storage bins or warehouses would be necessary in the rural villages. Next, there must be a market to sell these crops and transportation to deliver them. This will only happen when the roads are rebuilt and extension services are available throughout the county. Extra produce and a market will increase the income of subsistence families, drawing the families out of extreme poverty. With better crops and farming methods, families would not need to practice slash-and-burn agriculture preserving the rain forest, soil and biodiversity of Gabon.

Oil production now accounts for 50% of Gabon's Gross Domestic Product which is U.S. \$7,200 per capita according to the World Factbook. Biofuels are not present currently. For biofuels to help the subsistence families, infrastructure, roadways, farming technique and transportation methods must first be modernized. Gabon has the potential to create ethanol through the processing of sugar cane, palm oil, and maize. Once infrastructure is in place, Gabon will be a more attractive prospect for private companies to invest in. Biofuel plants could presently be built to utilize the produce from large commercial sugar cane and palm oil businesses. Maize is the one crop subsistence farmers grow that could be used for biofuels. Rural communities must first be able to fully provide for themselves and pull away from the continual threat of hunger and out of extreme poverty. If at some time crop yields are so high that these communities have food for today, tomorrow, and the season to come, along with surplus to sell, they can become part of the biofuel enterprise. Biofuels will most likely not be personally used by the rural citizens because they do not have tractors or other vehicles in which to use the fuel. It would be wise of Gabon's government to start in the biofuel direction because the oil supply will not last forever, and has been, in fact, declining since 1980. Gabon must first feed its people though, before it starts biofuel production. Only 10-15% of the country's food needs are being produced in Gabon. In 2001 18% of imports were foodstuffs. When Gabon is able to stop buying its food from other countries they can begin to use their crops in additional ways. To implement biofuel production many steps must be taken. In each rural village, a warehouse for maize should be erected. The road system would be renovated to make it functional in all weather conditions and it will need to be connected to each of the villages. The government could then send trucks to collect the maize crop and pay each community. The money would be split amongst the families. This income could create superior living situations and create the chance for children to proceed through their education, possibly to college or trade schools. The villages would

be able to build better schools, provide more teachers with higher pay and increase the knowledge of this population. With new roads built, the government now would be able to bring health care to these families. This could help curb the death rate by HIV/AIDS and the much more easily remedied malaria. If the rural lifestyle proceeds to these benchmarks, urban citizens might begin to repopulate the sparse countryside.

Gabon's people will one day live without the grip of poverty forever on their shoulder. Through the aid of government installed programs and world help organizations; these farmers can better their lives through education. With further monetary donations or loans from organizations like World Bank, the government could begin to overcome the problematic roadway system. This would make it possible for the extension services to reach the remote villages. Infrastructure will be renovated bringing health care and education. By means of aid from the World Health Organization, simple answers to stop the mosquito spread disease, malaria, will be instituted. These include household spraying, insecticide treated bed nets, screen doors and windows, and antimalarial medicines. Education would begin to help the farmers. Then with aid from various farming organizations such as the Food and Agricultural Organization of the United Nations, subsistence families will begin to understand the new techniques and technology. New agricultural yield and sustainability research will be implemented. Seed companies, like Pioneer, in cooperation with fertilizer companies, can introduce the modified seeds along with chemical fertilizers. Through an agency like World Bank, a non-predatory, farmer friendly credit system can begin. Loans could have very low or nonexistent interest rates. Microfinance, supported by organizations like Spandana, would be another possible approach. Very small loans or microloans, usually of U.S. \$100 or less, help finance the start or expansion of very small businesses or farms. Women are the primary focus of many microloan organizations because 70% of the world's poor are women, and women have a lower employment rate than men throughout the world. These farmers would use the start up loan to purchase the seeds to begin their climb from extreme poverty and constant hunger. A countrywide market, possibly a government or private business biofuel project, will be in place. This will be the beginning of the end of Gabon's extreme poverty and a step in the direction of Jeffrey D. Sachs goal to eradicate poverty by 2025. To start this necessary change the government of Gabon must take the first step and show their commitment by recognizing the rural and extreme poor. They must start to devise plans to raise all the Gabonese citizens to the high levels of living possible in Gabon, one of the richest countries on the continent of Africa.

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