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### **Niger: Developing a Country through Extended Food Shelf life.**

Many of us take for granted how lucky we are living in the United States of America. Given so many opportunities that we don't even realize, from twelve years of schooling at the minimum, to just getting three meals a day we have it pretty good. Niger is one of the poorest countries in the world (UNICEF). The education system only lasts six years for the 49% of males that do attend, and the 31% of females (U.S. Department of State). They are not offered much and have very little to work with. Being a hot climate that is covered 80% by the Sahara Desert, every year and every harvest could be the last one due to soil turning to sand and becoming un-farmable (What percent of Niger is covered by the Sahara Desert?). The Majority of Niger's population is involved in agriculture in one way or another, but not for a profit. One of the poorest countries in the world, Niger is ranked 174 out of 179 countries on the Human Development Index. With 66% of people living below the international poverty line (\$1.25 a day) one out of every five children dies before they reach their fifth birthday. Nearly half of the country's 14 million people are under fifteen years of age (UNICEF) The country does not grow enough food to meet the needs of its rapidly expanding population. Although the number of residents is rising rapidly the average life expectancy is 58 years (U.S. Department of State). About one in five people face food insecurity at an extreme level. In 2005, lack of rain, abnormal and market trends caused severe food shortages. The price of staple foods rocketed, sparking a major food crisis. More than 3.6 million people were in serious need of food aid, and they needed it fast. Expenditure on social services combines healthcare and education; it represents 4%-5% of total annual income for poverty stricken households and a slightly lesser proportion for middle class and above households (Human Development Reports).

Most farming in Niger is subsistence agriculture outside of the marketplace (U.S. Department of State). Subsistence agriculture is when farmers focus on growing enough food to feed themselves and their families (Waters). Some might think it sounds like a good idea to grow what you need, and you will never need to spend money or resources on nutrition from an outside source. Unfortunately, subsistence agriculture isn't enough to feed the people of Niger. The people of Niger don't farm what they need because it is easier, or more efficient, they do it for survival. With little money they can't afford to purchase the foods they need, which results in many malnutrition problems. The typical subsistence family does not have a wide variety of crops, but will have enough to hopefully get through the year. Most crops will consist of fruits, vegetables and grains with some occasional cotton for clothing. Millet, though not a very common crop in the United States, is amongst the most common crop grown in Niger and can be prepared several different ways (Food and agricultural commodity production). Subsistence farming may not be the most efficient way to farm but it is one of the oldest, it has been dated back to Native American tribes as they would settle in along a river bank. The people of Niger often don't have much land to work with, but subsistence farmland can range anywhere from one quarter acre to ten acres. Subsistence farming uses very little technology and resources that are often readily available in the environment to aid crops. If they use any form of fertilizer it is likely to be manure (Waters). By reducing spoilage and improving the quality of shelf life of food products with improved processing capacity, underdeveloped countries could sustainably provide more food to their people, and make that food last longer. Feeding more mouths with more nutritious foods would make a huge impact on such a developing country.

Improving the quality of shelf life and reducing spoilage isn't an easy task. The shelf life of food depends on four factors: formulation, processing, packaging and storage conditions. Shelf life has many attributes such as bacterial control, color stability, yeast and mold inhibition, flavor stability, textural stability and

aroma stability. The appearance of shelf-life problems can be wide ranging as well, including oxidative browning, and oxidation of flavor compounds. Food companies are continually taking steps in the forward direction to reduce bacteria that grow in foods. Such bacteria usually thrive in a moist environment. Getting rid of the bacterium means reducing water content, which leads to less spoilage and longer shelf life (Formulating for Increased Shelf Life). In return the people of Niger would benefit from having more opportunities to consume the crops produced.

A common method of extending shelf life is often to freeze dry foods. The obstacle of freeze drying food is that the process is very expensive, and is not economically feasible for a poverty stricken country such as Niger (Resources for Niger). Freeze drying is a process that consists of four steps. The first step is the pretreatment. Pretreatment will add compounds to the food to increase stability at below freezing temperatures and improve processing. The second step when freeze drying is the actual freezing, this is typically done in a laboratory, and processors will place the food source on a freeze drying flask. The processors will then rotate the flask in a bath called a shell freezer which is cooled by mechanical refrigeration, dry ice, methanol, and liquid nitrogen. Large scale, high output processing will utilize a freeze drying machine. This step of the process is important to cool the item to its triple point (usually -50 degrees Celsius). The third step would be a primary drying stage in which a vacuum is used to speed up the process. The primary drying stage is usually done around -50 degrees Celsius. Last is the secondary drying stage, the purpose of this step is to remove unfrozen water molecules from the package (Freeze Drying).

Finding a long term solution to this problem is complex and requires strategies that will be sustainable. It is no secret that Niger is a country with very little money. They are in a very severe situation, in which people are dying every day. I would deem it a crisis. This country and the people in it are at an extreme disadvantage. When Niger is in need of basic living supplies the people receive the supplies on a first come first serve basis. In this culture the women are at even more of a disadvantage because they get the last pick of what is left. As of now there is no real trend of improving shelf life. The economy is not getting better unless we have a modern day Norman Borlaug try and do something about it. Niger lacks several nutrients in their crops such as Vitamin A, Iron, and Iodine (Stevenson). Being able to apply some of those nutrients along with maintaining a decent shelf life will take a creative mindset that doesn't accept failure. Something like improving shelf life would be a big deal to Niger and the whole community. If markets could get items in bulk they could trade with the farmers and get everyone a more nutritious and balanced diet. Feeding a community would lead to more development and less poverty. With a rising economy there would be a more jobs opening up for men and women. The Nigers could then afford to produce and eat more than just millet and other common grains that increase of diversity helps them survive drought and other catastrophic events. Then any surplus of crops the country produces will be available for storage if their shelf life is improved, but would also be able to be marketed for extra income. Not all the food needs to come from their country, for example 86% of shrimp, salmon, tilapia, shellfish and other fish we eat comes from other countries. All of this due to, not money but better communication and better transportation then we used to have. Sure money is a part of it but there are ways around it such as trade (Apple Juice Made in America? Think Again).

If markets had accessibility to purchasing items in bulk and preserving them, it could be a good accommodation for population growth and have enough food to feed the existing population. Keeping a longer shelf life on bulk items that aren't in season with some items like corn millet and sorghum should be made a necessity. Crops common in Niger and can be made into high nutrient recipes, and be very beneficial. With Niger already being an extremely hot country and the climate change has temperatures on the rise, increasing shelf life and getting crops that are high in water content is essential (Niger Climate Change).

Niger has little urbanized land, and many opportunities to grow commodities. Urbanization requires more energy which is needed to keep crops cool for maximum shelf life. There are several ways to improve shelf life and food quality that will cause little to no pollution. Improving food quality will result in a longer shelf life and better taste. In return Niger would get more nutrients to its people and ensure quality food. Often I see commercials on TV, advertising food storage containers. Many claim if you buy their storage container, food will last a week longer. The way food is stored is extremely important for the quality and longevity of the crop. Especially if the food is being bought in bulk for a discounted price it does not do any good to sit there and go bad. Niger's economy can't afford to lose money. For a solution to be completely effective to the community it has to hit some benchmarks. It should maintain the same nutritional characteristics from its natural state, if not more. Without the nutrition it turns into empty calories and the food is pointless. Solutions also need to be relatively simple and economically feasible. We need to keep in mind over half the population of Niger is below the poverty line. This country doesn't have the existing capital necessary to process foods with high cost technologies. They don't have factories and laboratories that developed countries have to preserve food. Not only is spoiled food wasted, but it often causes damage when eaten, then a food that was not eaten all together (Weisberg).

There are several ways to improve shelf life and make food taste good especially on a short budget. A common way to preserve food is canning. Canning is popular for garden produce in the United States but is something that originated in France. Canned produce will last up to several years, but should be consumed within the first year for best taste and results. When the French started to can in the 1800's they found it to be a low capital and cost effective solution. Similarly canning skyrocketed in the United States during World War One. The Army was in need of high calorie foods and canning was a way of getting them without them spoiling (Canning). Canning fruits or other acidic foods can be done in boiling water. As for low acid vegetables and meats they are done in a pressure canner at about 240 degrees Fahrenheit. The first step to canning is sanitizing the can. To sanitize cans they need to be boiled for ten minutes (add an extra ten minutes for every one thousand feet in altitude). Next the food should be cleaned as good as possible. Dirt has some of the hardest bacteria to kill, so you need to make sure it is dirt free. Every food has a slightly different method on how to can so following the specific recipe accordingly is important. After these steps are taken, processors should make sure the can is closed getting all of the air bubbles out. Depending on the heat source it can be boiled, or the pressure canner can be used (We Can the Canning Process). Another highly recommended, common and reliable way to preserve food, that's the drying method. Drying foods such as fruits, vegetable, and even meats has been something commonly done throughout all of history. The ideal climate to dry foods is a warm and dry climate. This seems to fit Niger's climate the best. When food is dried it is not heated to the extent of canning, so it retains a lot of the nutrients in it, as well as requires less energy. There are several ways to dry foods out and increase the shelf life. Perhaps the easiest way to dry out foods is with a dehydrator. With a dehydrator the only thing you really need to do is make sure the food is spaced out correctly. The ideal space would be from an eighth inch to a quarter of an inch (preserve food). A good way to dry meats and preserve them is smoking. Meats are a little different when handling then fruits and vegetables are. It is important to take serious precautions to prevent the spreading of food borne illnesses. Precautions include washing the meat, washing hands, preventing cross contamination, and make sure it is cooked to the correct temperature. Safely smoking meat requires two thermometers. One thermometer will go in the meat, and the other will go in the smoker. The ideal temperature of the smoker is 225 degrees to 300 degrees Fahrenheit. Both canning and drying are good ways to preserve food and be able to store more food, longer. Because of their simple and relatively low capital, these methods are economically feasible in a developing country. With the people of Niger having accessibility to food in bulk that has been preserved properly, the country may have a bright future that would be effective immediately (preserve food). Subsistence communities in Niger do not have access to advanced technologies, so a combination of canning, and drying foods can be combined in an effort to build up a quantity of food.

There are certain situations, where canning or drying is more appropriate than others. In a community where the majority of the population is rural, the citizens need to be informed on the statistics and the benefits of canning and drying food. If the people of Niger are educated on canning and drying foods, they could realize that these preservation techniques are a necessity. If farmers in Niger bought into canning and drying foods it could mean a huge difference to their very little income, crops, and undernourished family. Preservation techniques have been in effect in European countries since the early 1800's. For example during the first years of the Napoleonic Wars, the French government offered a cash award of 12,000 francs to any inventor who could come up with a cheap and effective method of preserving large amounts of food. The larger armies of the period required increased and regular supplies of quality food. Limited food availability was among the factors limiting military campaigns to the summer and fall months. In 1809, a French confectioner and brewer, Nicolas Appert, observed that food cooked inside a jar did not spoil unless the seals leaked, and developed a method of sealing food in glass jars, otherwise known as canning. (18) Niger is very undeveloped and isn't going to stumble across canning and drying techniques without doing some research. Corporations in the country need to have a voice and let the people know what options are available. United States sends aid to several foreign countries and could send people that show how canning and drying foods can be simple and effective. Other techniques and technologies are possible, but it is not an easy task with the little money Niger has. They need something that will be cheap and effective until they can become more developed.

In order for all of the canning and drying techniques to work, the community of Niger needs to do their part along with the government and corporations. The community can all chip in to grow a different crop for families in need. If everyone in the community helps grow a needed crop and does their part to preserve essential nutrients, Niger has a lot of potential. People in Niger aren't used to non-subsistence farming, and have been doing the same thing for a long time. To be completely successful the culture of Niger needs a paradigm shift in the way they produce food. The country has been fighting a losing battle up to this point, new ideas and perceptions of agriculture are much needed. Niger has been an independent country since August 3, 1960. President Djibo Salou and other high ranking government officials, industry partners and trading countries should not leave the people of Niger to fend for themselves (Niger). The leaders will need to support solutions that enable better production and processing of agricultural commodities that are feasible for the people of Niger. The country is said to be a republic government, their government would better serve the people if the agricultural industry becomes more stable (U.S. Department of State). A common problem with receiving assistance from partnering countries is that the assistance often does not get to the people it is intended to help. Assistance programs need to be very strict and thorough to make sure that the Niger government allows the assistance to be delivered to subsistence farmers that can utilize the help the most. If the people are fed properly and have a job or way to provide for their family, it will stimulate development. It's like the old saying "sometimes you have to spend money, if you're going to make any." As for the role of corporations and other organizations, there are several working towards making Niger a more developed and sustainable country. The World Bank recently approved two credits totaling 100 million dollars to help support Niger's reform program. Niger is also a producer of oil as of 2011 and has several organizations working to bring more income to the country (U.S. Department of State).

Practicing subsistence agriculture is just not meeting the standards of Niger and what they need to survive. As population increases and climate change presents itself modern technologies and production practices are the only answer to improve the quality of life for the people of Niger. One out of five children is dying before they even get to their fifth birthday. Research shows that improving the quality of shelf life and reducing spoilage of crops is the key to getting Niger out of such poverty. One feasible method is to improve shelf life and quality at the same time, and still be affordable in a country that lives in such poverty were good at eliminating the majority of bacteria, and was cheap. Drying and canning

have been great methods of preservation throughout the years, and looks to be very beneficial to Niger. These methods are the same ones that were practiced in World War One and back to the beginning of the 1800's. The wage that determines the poverty line in Niger is only \$1.25 a day, but drying and canning produce can be practical. Techniques that have such beneficial results have extremely high potential to improve the economy. It is not just up to the community of Niger, the government and industry partners have the money, power, and the overall say of what happens. With the control in the hands of the government and larger corporations, they need to play the part to help improve the economy and try out different methods to improve the quality of shelf life and reduce spoilage of crops. It will take a group effort to make all of this happen; as we have seen from past history when vested groups work together a synergy can develop feasible solutions for large problems.



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