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## **Burkina Faso: Surviving the Protein Crisis with Tofu**

### **Introduction**

Burkina Faso. This country is a small landlocked country located in the south of the Sahara Desert in West Africa. Burkina Faso is one of the poorest countries in the world: Human Development Index (HDI) declared by the United Nations Development Program (UNDP) ranked Burkina Faso 182nd out of 189 countries (2019), near the bottom. It is true that Sustainable Development Report 2020 regarded Burkina Faso as one of the countries that particularly improved the SDGs target score from 2015 to 2020. Yet, frequent terrorist attacks targeting gold mines by Islamic extremists have deteriorated the security since 2018, and Internally Displaced Persons (IDPs) has increased sharply. Moreover, the pandemic of COVID-19 has caused a serious food crisis. In April 2020, the United Nations World Food Program (WFP) announced that approximately 3.9 million people are suffering from hunger in Burkina Faso, Mali and Niger. To make matters worse, the worst floods in the 10 years struck displaced people, while the WFP predicted that the epidemic of COVID-19 and the climate change could make the number of them increase to about 5.5 million. Obviously, the damage was very immeasurable. In fact, people suffering from hunger have been almost completely relying on external support. Nevertheless, we find it difficult to supply food because the pandemic has restricted their movement and distribution. Therefore, we find it indispensable to immediately create and supply nutritious foods that are available in Burkina Faso. Then we come up with a great idea that producing and distributing soybeans as processed foods, especially in the form of “brochettes”, will solve various problems in Burkina Faso. Additionally, that will help us to solve the approaching protein crisis worldwide. Aiming for sustainable agriculture, we reflect on the possibility that soybeans can be developed in Burkina Faso as a protein source.

### **About Burkina Faso**

Burkina Faso is a small landlocked country in West Africa. The area of Burkina Faso is approximately 274,200 km<sup>2</sup>. In Burkina Faso, the climate is tropical; the north has less rain than the south. Burkina Faso has a population of approximately 20,900,000 (2020), half of which are under the age of 18. More than 80 % of Burkina Faso’s working population is engaged in agriculture and mainly grows cotton, corn, and taro. Especially, cotton is a valuable source of foreign currency income. In addition, gold production in Burkina Faso has been increasing in recent years, and more and more people have engaged in that: Burkina Faso was the world's 19th largest gold producer in 2018. However, the development of natural resources, accompanied the population growth, has decreased water resources, and has had a negative impact on land condition and vegetation. Furthermore, more than 700,000 young people under the age of 18 work in gold mines in poor condition.

Burkinabe natural dish is “toe,” which is made by kneading millet or corn flour in hot water with sauce on it. In Burkina Faso, the sauce culture has spread extensively due to the influence of the French colonial era; therefore, it is common to put sauce in staple foods like toe. In addition, we can see many women selling boiled corn on the road. On the other hand, meat is extremely expensive in Burkina Faso because the climate is so hot that pasture grass cannot grow well. That is why, people in Burkina Faso seldom eat meat. The author proposes the solution of the issues in Burkina Faso mentioned above by “vegetables based food.” A stable supply of food will improve nutrition issues and

### **About people under the age of 18 in Burkina Faso**

People under the age of 18 in Burkina Faso have been facing various issues in terms of health care, nutrition, water, sanitation, and protection. Moreover, the mortality rate of children under the age of

five in Burkina Faso has been still high, and about 45 % of their death is thought to be caused by malnutrition. The survey in 2016 revealed that more than 1,000,000 children under the age of five in Burkina Faso are malnourished. This shows that malnutrition is one of the most serious issues in Burkina Faso.

Furthermore, the literacy rate in Burkina Faso is so low that only one out of every three Burkinabe people is literate. Additionally, there are quite a few villages where one out of every 20 people is literate. One of the main causes is its low enrollment rate. In Burkina Faso, the rate of the enrolment in elementary school is only 47 % of the whole. Compared with the average rate of countries in West Africa (60 %), that in Burkina Faso is awfully low. What is more, the enrollment rate of girls in Burkina Faso is thought to be much lower because of its social, cultural, and customary values. Although the government has developed policies to achieve gender equality and has made some improvements, many of the people still have been likely to believe that they should spend more money for their sons than for their daughters: We guess that one of the causes is their financial hardship. Either way we think that the lack of education will be a big obstacle to spread soybeans into Burkina Faso.

### **Why soybeans?**

The author has three reasons to support for the ideas.

First, soybeans include so much protein in abundance that it is superior to meat. The diet of most people in Burkina Faso is carbohydrate-centered and highly tends to lack protein because meat is extremely expensive and rarely eaten. As a result, most Burkinabe people tend to lack protein and rely on junk food for much of their diet. Though junk food is cheap and high in calories, excessive intake of it increases neutral fat and LDL cholesterol in the blood. In fact, the New York Times article dated January 27, 2018 shows that the obesity rate of Burkina Faso has risen by 1400% over the last 36 years. Moreover, the lack of protein forces people to lose immunity, which will be one of the causes of the collapse of the medical system in Burkina Faso.

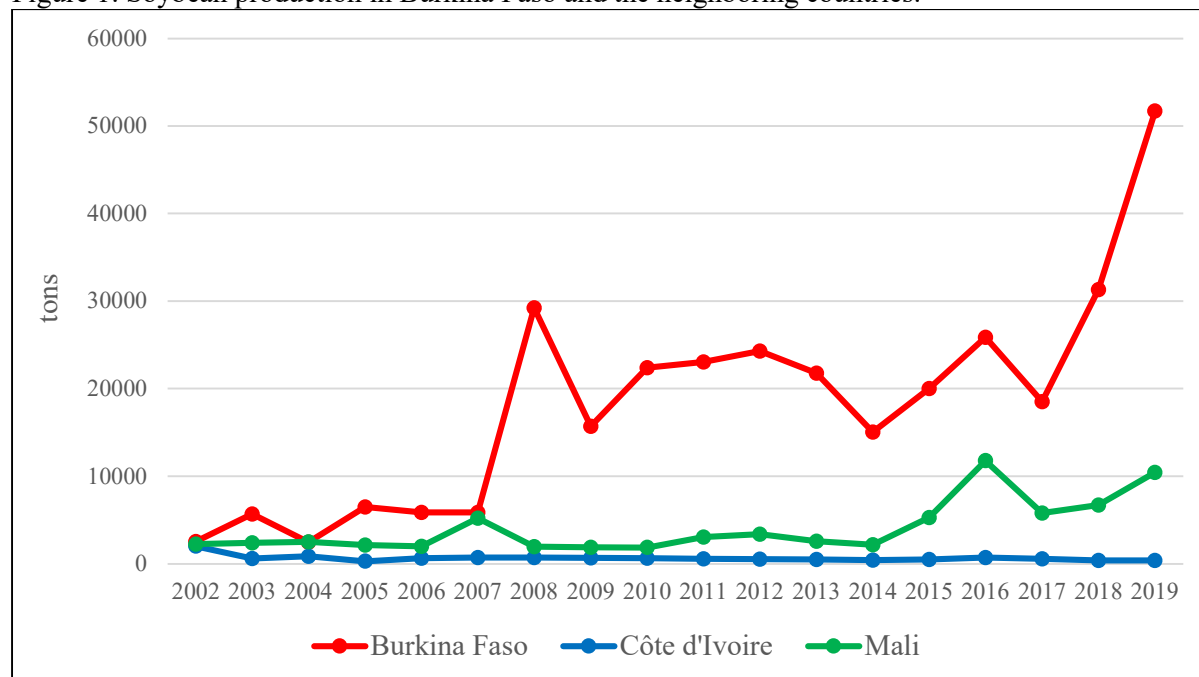
Furthermore, soybeans are expected their long-term demand in anticipation of the future food crisis. In recent years, the food crisis caused by overpopulation, especially the protein supply, has been questioned in the world. Of course, some researchers predict that the population of the world will decrease. However, the meat consumption must increase because of the decrement of the poor and the increase of the middle class. In brief, the consumption keeps on increasing as long as the economy grows. Moreover, upbringing cost is also a big problem. Livestock are living things, so they need enormous energy, such as feed, water and air-conditioned animal barns, in order to keep alive. What is more, livestock have a more negative impact on the environment compared with plants. In the actual situation, 1,500,000,000 of cows living on earth need 170,000,000,000 liters of water and 60,000,000,000 tons of feed per day. On the other hand, people on this planet consume 20,000,000,000 liters of water and 1,000,000,000 tons of provisions per day. Moreover, many experts predict that we cannot produce enough meats for future population growth despite the large consumption of resources. Taking these into consideration, processed soybeans can fill the stomach of many people: In contrast, we find it inefficiently to feed soybeans to cattle. Nevertheless, soybeans processed for food account for only 6% of the world's annual total production, so the sooner the plan is implemented, the more likely Burkina Faso is to establish a global advantage in food production. Fortunately, most people in Burkina Faso hardly be reluctant to eat soybean meals in order to take in protein since meat is not popular there.

Second, soybean cultivation has high merits for small-scale farmers. For example, legumes are easy to cultivate, and fertilize the soil (prevent deterioration). Moreover, you can earn income easily since soybeans is a cash crop. Also, processing it enables you to make more profit. This is helpful for people in Burkina Faso because more than 80% of the working-age population is engaged in agriculture, and many of the poor live in rural areas. To be sure they can earn income by selling other cash crops, such as hemp and cotton, yet the meat price will rise if many people become so wealthy that they can buy meat. Consequently, that will not be a radical solution to the lack of protein.

Third, soybean production in Burkina Faso has been increasing in recent years. In fact, from 2002 to 2012, the total annual production increased approximately 9.6 times from 2,533 tons to 24,000 tons; in 2019, it exceeded 50,000 tons. Soybean production of Burkina Faso has been increasing significantly

while that of the neighboring countries has remained at low level: For instance, Côte d'Ivoire and Mali produce less than 12,000 tons (figure 1).

Figure 1: Soybean production in Burkina Faso and the neighboring countries.



Such sharp increase of that in Burkina Faso consists of three pieces: (i) the increasing domestic consumption of soybeans as feed and processed food; (ii) the increase in exports of soybeans in lieu of cotton; (iii) the demand of neighboring countries, such as Côte d'Ivoire and Ghana. The Burkina Faso government has established soybeans as a food security crop due to its high nutritional value, and has aimed to produce 100,000 tons per year, so we find it obvious that the soybean industry in Burkina Faso will grow. Furthermore, we think that the increase of local small-scale food processors has a large impact on the rural economy since it uses local resources like agricultural products, manpower, and money. Therefore, it can generate cash income and employment for Burkinabe people.

### Comparison within other potential major sources of protein in Burkina Faso

We can expect four major sources of protein in Burkina Faso: (i) soybeans; (ii) cowpea beans, which is one of staple foods in Burkina Faso; (iii) beef round; (iv) chicken fillets. Then we compare them in row state. When compared by the protein content per 100 grams, soybeans are the richest: Soybeans contain 36.49 grams, cowpea beans contain 23.52 grams, beef round contain 21.2 grams, and chicken fillets contain 17.3 grams. Moreover, when compared by the price in Burkina Faso per 100 grams, soybeans are the second cheapest in price: Soybeans are 90 FCFA, cowpea beans are 30 FCFA, beef round are 325 FCFA, and chicken fillets are 400 FCFA.

Figure 2: Comparison between soybeans and other major source of protein in Burkina Faso

	Protein content (g)	Price (FCFA)
Soybeans	36.49	90
Cowpea beans	23.52	30
Beef Round	21.20	325
Chicken Fillets	17.30	400

1 dollar = 1,500 FCFA, 1FCFA = 0.0018 dollars

The average Burkinabe weights approximately 65.0 kilograms for males and approximately 59.0 kilograms for females, and WHO sets the minimum daily protein requirement at approximately 0.66

grams per kilogram. In short, males require at least 42.9 grams of protein per day and females require at least 38.9 grams per day. Moreover, to stay healthy, they must consume 1.0-1.5 grams of protein per kilogram per day. Taking this fact into account, we find it unrealistic that they rely on chicken or beef for protein because they are expensive in the extreme and 41.4 % of Burkinabe people live on less than 1.9 dollars (2850 FCFA) a day (World Bank data, 2018) besides raising livestock in Burkina Faso is difficult due to little pasture and lots of feed costs. Additionally, cowpea beans have a disadvantage of not being able to be preserved for a long time. Though cowpea beans are cheaper than soybeans, we believe that soybeans are superior to cowpea beans as cash crops since soybeans are the ingredients for various processed products: As you know, soybeans are often distributed as manifold forms like processed food, livestock feed and soybean oil. Moreover, if you are going to sell any crops in Burkina Faso, soybeans can provide you more profit than cowpea beans as the price of soybeans is higher. For these reasons, we find that soybeans are the most helpful in solving various issues in Burkina Faso. Then the author proposes the solution of the issues in Burkina Faso mentioned above by soybeans.

### **Tofu and brochettes in Burkina Faso**

Speaking of tofu, many people think of Japanese tofu, which has a soft and light texture; however, Burkinabe tofu is hard because of its low moisture content and is like solidified textured vegetable protein. Furthermore, there is a soybean dish called "brochette." Then we will produce this dish and a new dish of this kind in Burkina Faso.

The following is the way in which you process 5 kilograms of soybeans into Burkinabe brochette. The main ingredients are 5 kilograms of soybeans, 15 liters of water, 2.5 liters of extract from tamarind pulp, and a spoonful of vinegar. At first, you soak the soybeans in water for 5-7 hours, wash them with water, and crush them. Then, you mix this with 15 liters of water and squeeze it. You repeat this process of squeezing five times. Next, you boil resulting soy milk with 2.5 liter of extract from tamarind pulp and a spoonful of vinegar, and drain it with a weight for 2-3 hours, 5 kilograms of Burkinabe tofu are completed. You cut the tofu into 600 pieces, soak them in tomato paste, onions, chili peppers, etc. for 5-6 minutes whether you like, and fry them. Finally, you skewer three pieces together. This is how you complete Burkinabe brochettes.

In the first place, we can see Burkinabe brochettes being sold in a "meat" section of the market sponsored by the international NGO Oxfam. Hence, it follows that many people in Burkina Faso regard tofu as equivalent to meat. For this reason, the author proposes to spread tofu as an alternative meat. In addition, Burkinabe soybeans are of high quality; therefore, we expect them to be edible. What is more, Burkinabe social and cultural background as described above will favor soybean cultivation, tofu production and sales. In addition, taking current worldwide demand for meat substitutes into account, Burkina Faso must have the potential to become a remarkable nation for leading food production in the future. Despite the delay in development, Burkina Faso can easily adopt new sustainable agriculture and food culture and build a society that improves some problems facing the world today.

### **Tofu from neighboring country, Nigeria as a precedent**

In West Africa, Nigeria has already performed tofu promotion activities. International Institute of Tropical Agriculture (IITA) has executed plans of soybean cultivation and tofu promotion activities for the purpose of improving nutrition in Nigeria. Since 1989, Japanese engineers have instructed tofu making and investigated and researched coagulants that can be procured in Nigeria. Initially, IITA expected that groups and small-scale businesses in Nigeria would manufacture tofu for the purpose of improving nutrition of the people, but gradually tofu was seen as a means of cash income for women. In the process of localization, more and more women in Nigeria have regard producing tofu as a form of business and started competing for deliciousness of tofu. In Nigeria, people who recognize that tofu is one of the foods that originally has existed in Nigeria are beginning to appear. As for the sales form of tofu, we can often see unmarried women or Muslim children frying tofu and selling it fresh on the street. Married women, on the other hand, sell tofu only at their home. This is because married Muslim women do not usually go out locally. They use the income from selling tofu to cover their children's education.

Nowadays, tofu culture spread into other parts of the West Africa, not limited to Nigeria. In fact, small-scale transactions have been appearing near the Nigerian border in Niger since around 2000. Tofu was introduced as a new food from Nigeria, and the technology is now spreading even through remote towns. What is interesting is that it has become popular among the local people spontaneously. In West Africa rural areas, tofu is often made during the agricultural off-season, and sometimes it is made by a group of women throughout their own village. In the actual situation, tofu making is quite widespread in northern Benin villages and is a supplementary source of income for rural women. In addition, they sell not only tofu but also feed for livestock made from dried pomace which are produced in a production process of tofu. However, tofu is still a new food, and few people in that area have a right knowledge about nutrition and, there are few types of dishes in that area, therefore, the tofu has not been incorporated into home cooking yet.

### **Plan**

The author proposes a suggestion of incorporating soybeans into Burkinabe diet as meat substitutional food to solve their lack of protein. The experiences in other parts of West African show that small-scale processors should process and sell soybean dishes, which results in great increase of soybean consumption. Consequently, in first step of popularization of processed soybean foods, we find it better to make Burkinabe brochettes more popular than to sell new soybean dishes like imitation meat as ingredients.

Nevertheless, farmers in Burkina Faso sell soybeans without processing because the techniques of processing soybeans are not spread among them. Therefore, we find it helpful to send instructors to every rural area and distribute the materials on how to make Burkinabe tofu to literate people in Burkina Faso and eventually to post the recipe bulletin boards and books as the economy grows and education spreads. What is more, we find it effective to create “stars”, who promote the plan, and to have them advertise Burkinabe tofu.

The next step is to make minced tofu into meat sauce. We expect that introducing Burkinabe tofu to the following sauce culture leads to a solution to the protein issue in Burkina Faso. In addition to these, we expect that baby food made from soybeans utilizing the technology leads to a solution to infant mortality from malnutrition in Burkina Faso.

Furthermore, the author suggests that the farmers should sell brochettes at the markets held regularly in many regions. In this way, many farmers will get a new source of income related agriculture, which enables Burkina Faso to improve HDI. Moreover, less and less people will rely on work at a gold mine in terms of their own income thanks to that. Consequently, agricultural diversification of soybeans enables us to solve various issues in Burkina Faso, such as famine, and poverty. In addition, we can approach gender equality in Burkina Faso if Burkinabe women begin selling brochettes or tofu on the road in the same way as boiled corn.

### **Summary**

We conclude that the stable supply of soybeans and tofu will socially and economically solve two major issues in Burkina Faso: Namely, lack of protein and malnutrition. Moreover, we find it indispensable to dissemination nutritional knowledge in order to spread soybeans into Burkina Faso.

In the first stage, we should promote the local production of brochettes, and in the next stage, we should promote the marriage between Burkinabe tofu and the sauce culture and processing the tofu into baby food. In addition, we strive to spread of the tofu with guidance literate people and advertising by “stars” in Burkina Faso. Furthermore, the high quality of Burkinabe soybeans, the social and cultural background of Burkina Faso and current global need for alternative meat must favor the plan.

With these small seeds, which are rich in high-quality protein, we will be able to start the "New Green Revolution" in West Africa.

From the 1960s to the 1970s Norman Borlaug filled people's hunger with wheat breeding, but now, fifty years later, humanity has exhausted the time grace created by him. The global food crisis is imminent: Some researchers predicted that the world population would exceed 9 billion by 2050. Unlike the time when Borlaug lived, we require high nutrition and protein, not simple energy. We concern about protein

supply problems on a scale that cannot be matched by solving the food loss problem alone. Now, we need sustainable agriculture.

### **Prospects for the future**

We think that organizations in rural areas should help to manufacture processed soybean food. A lot of people in Burkina Faso have established their every mutual aid organization whose purpose is to earn cash to secure food expenses for a long time. Therefore, we found it helpful to develop the organizations into tofu manufacturing and sales cooperatives, so that people can spontaneously perform everything from tofu making to selling. Furthermore, we think it advisable to systematically use Microfinance (MF) as tofu processing funds. The Micro Finance Institution (MFI), which implements MF, is diversifying into government agencies, MF banks, credit unions, and joint venture-type NGOs / NPOs. When using MF, MFI provides loans to a group with a collective solidarity guarantee system so that the repayment rate will increase even if it is unsecured. If the mutually helpful organizations use the MF, they will be able to adequately fund the production of tofu.

Moreover, we find it indispensable to increase literate people in Burkina Faso in order to use MF well enough and operate the mutual aid organizations sustainably. People who use the MF should write down transactions and keep record of repayments in order to negotiate on the terms of use of MF, adjust the interest and repayment conditions depend on the situation, and operate MF independently; otherwise, they run the risk of falling into multiple debt.

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