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Nicaragua, Sustainable Agriculture
Nicaragua: A Kick-Start Towards Economic Prosperity

Nicaragua is a steadily growing country, home to around 6.6 million people with a long history of unrest. The country has undergone many challenges on its road to becoming a more modern state. In 1838, Nicaragua became independent from Spanish rule and began working on a more democratic government. They have had a series of dictatorships as well as undergone civil war during the Sandinista National Liberation Front in 1961. In 1972, an earthquake killed thousands in their capital city, Managua, and was one of the first of many natural disasters to devastate the country (Lambert, 2020) .

Nicaragua is regarded as one of Latin America's least developed countries and is one of the poorest counties in Central America with around 30% of its 6.6 million people in poverty and around 8% earning an equivalent of 1.25 USD per day. A majority of the poor live in the rural areas of Nicaragua, 80 percent of which depend on agriculture for employment and sustaining livelihood (IBRD/theworldbank/pg.8-9/2015). Although there have been recent decreases in poverty as a result of a few quick fixes, the country's agricultural sector still has had trouble recovering from frequent natural disasters and hardship. It is split 57.2 percent urban and 43 percent rural with all around tropical, temperate climates. An average farm in rural Nicaragua is roughly 9.22 ha, or about 22 acres. Smaller scale farmers in rural areas are not the only ones who depend on the agriculture sector, in reality, the entire country has relied heavily on agricultural production, with it taking up around 20 percent of overall Gross Domestic Product (GDP). Today, 70 percent of the Nicaraguan population still works in agriculture, and it is arguably the most valuable attribute for Nicaragua's future success in decreasing poverty as well as impacting food security on a local and national level. Nicaragua has many food insecurity challenges closely related to poverty. Poverty is linked to food insecurity problems like malnutrition, which is seen in 17% of Nicaraguan Children (Millar, 2019). The amount of undernourishment is not something to be gawked at, and is definitely one of the more pressing issues in Nicaragua. Undernourishment is a challenge throughout the country, despite this problem being notably tied to the poor in rural areas.

Typical Nicaraguan families consist of up to six to eight persons where most of their food comes from local markets and farms. Most have access to adequate health care as well as sanitary food and housing overseen by the Ministry of Health (trade.gov, 2020). In 34 percent of families, the father is typically absent, and about 70 percent of children attend school through first to twelfth grade even though there is free education (Owney, 2007). The average Nicaraguan's diet consists of local foods such as rice, beans, coffee, and peanuts, which do not contain many micronutrients, and is part of the reason why an estimated 1.5 million Nicaraguans are still undernourished (Walker-Leigh, 2011). According to the CDC network, micronutrients are the basic vitamins and minerals that contribute to healthy development, as well as disease prevention. They are not naturally made by the body, and therefore must be derived from diet. Some major barriers that typical families must overcome is structural poverty, with the largest city, Managua, having 65% of houses with only two bedrooms (Revista Envio, 2003).

Sustainable agriculture has historically been a huge problem for Nicaragua. Natural disasters such as: drought, hurricanes, and volcano eruptions have become a trend that continues to hinder the

agricultural sector of Nicaragua to this day. The agriculture sector is often mistaken to be stand-alone, but agriculture is deeply interwoven with many other sectors and influences a number of domestic economic growth areas. Sustainability in agriculture is a complex topic that encompasses the main objectives of: a healthy environment, economic profitability, and social and economic equity (Feenstra, 2019). Yields of staple crops, such as corn and beans, have stagnated due to rising temperatures, and there have been increasing crop losses due to droughts and floods. These changes in the environment are becoming more frequent, resulting in much stress on the country. Constraints such as vulnerability to weather and climate risks must be addressed in order to effectively reduce poverty and income inequality that exists throughout the different regions of Nicaragua.

At first glance, it can be hard to determine why the economy of Nicaragua has proved to be continuously unstable when compared to the circumstances of its neighboring countries, like Costa Rica. Nicaragua is a long way away from reaching the average annual income of that of Latin America and Caribbean (LAC). Unlike places like Costa Rica, which rely on culture and tourism, Nicaragua's economy relies primarily on agriculture to sustain their population and economy. The economy must grow at a higher rate to reduce poverty and improve food security (IBRD/theworldbank/2015). Unless the economy can expand to a tourism or culture based economy it is only logical to find solutions to better agricultural output. How can this be achieved given the current and past circumstances of Nicaragua's unstable agricultural sector?

Agricultural efforts must improve so that the economy can grow stable once again. Foundations like the World Bank as well as the International Monetary Fund (IMF) have made efforts in the past to put Nicaragua on their feet by encouraging foreign agricultural investments as well as increasing exports through commercial promotion. Some of these efforts have been greatly successful in recent years. Through this aid, Nicaragua's economy saw a 4.5 percent growth from 1994-1996. It was by far their best performance since the Sandinista regime (1979) with its GDP reaching a high of 1.969 billion (Owney, 2007). These results showed vast improvements, but were sadly cut short after Hurricane Mitch in 1998, which greatly damaged the country's GDP which has never fully recovered. Projects could be undertaken by multinational organizations, such as the World Bank, to provide workers with more advanced technology, (such as irrigation or drought resistance) investment from agribusiness and financial sectors, as well as catastrophe risk insurance (worldbank.org/2021). One reason why Nicaragua hasn't already taken these steps are probably financial, as funding for organizing and supporting these programs is a challenge. Assistance from international non-governmental organizations could help Nicaragua with these challenges.

First steps that can be taken to ensure Nicaragua's emergence into a sustainable economy are investment from international, and regional, non-governmental organizations that focus on the agricultural growth of the country with emphasis on poorer and rural areas. This gives the Nicaraguan government space to plan relief processes and programs aided by their own economic success. Although it is important for Nicaragua to grow out of dependence on foreign aid, it can be looked at as more of a kick-starter, to ignite the flame that the country needs to become self-sufficient. Focus on increasing agriculture production for maximum economic gain has been greatly successful in the past with the help of foreign aid, but this effort is for not unless the income from agricultural production is consistent and sustainable in order to insure long term environmental, economic, and social success.

One solution that can be proposed is the introduction, experimentation, and rotation with new crops. This could increase the biodiversity of Nicaragua, resulting in both health and economic benefits. Crop rotation is a common sustainable production technique, which strengthens agricultural yields as well as improves surrounding biodiversity (Feenstra, 2019). Expanding practices such as these would do well in increasing agricultural productivity and help local people get more nutrients that they need. Making sure that Nicaragua's agriculture is able to sustain their economic prosperity is needed to help this country grow a reliable source of consistent income, instead of relying on foreign aid. The ability to consistently sell crops could contribute greatly to community and national economic development, and should be a huge factor when looking at bettering food security in this country.

Additional steps towards improving agricultural sustainability and increasing agricultural yields without using environmentally sustainable methods of growth require involvement from outside sources. International organizations like the Global Agriculture and Food Security Program have demonstrated great influence in increasing agricultural yields by implementing agricultural innovations, nutrition training, good socio-environmental practices, as well as a series of investments. These programs have achieved a 78% increase in agricultural yields, and around 91 percent of women and children in beneficiary families improved their diet diversity index by consuming an average of seven more food groups with high nutritional value (worldbank.org/2021). It can be drawn that the people of Nicaragua have no culturally sensitive border for outside aid, and are quite cooperative and willing to use technologies such as genetically modified organisms. Since agriculture is closely interwoven into many other sectors of Nicaragua's economy, growth in agriculture would increase employment and wages of workers in all sectors of the economy as well as increase the incomes of poorer agricultural producers, which in turn contribute greatly to the country's overall income. It will also increase consumers' disposable income as food becomes less expensive (IBRD/theworldbank/2015).

A third approach to improving agricultural sustainability would be to increase biodiversity efforts in rural and poor areas of Nicaragua. Most of the larger and higher-end farms have access to modern technology as well as high-value markets, but it is not the case with the poorer, and smaller-scale agriculture. Most rural farms produce basic grains (maize beans, rice) and other products for self-consumption and to sell at local markets. These farmers make up around 81 percent of the total farms and contribute 49 percent of the agricultural GDP. (IBRD/theworldbank/pg.12-13/2015). During my time with the Florida Youth Institute, I have been exposed to many aspects of sustainable agriculture, specifically tactics that are more specific in addressing, and aiding the stress that the agriculture in Nicaragua is experiencing. An example of which is the use of hydrophobic plants. Most hydroponics can be grown indoors, without the reliance of soil. Since the soil quality in Nicaragua is unreliable due to natural disasters continuing to hinder its success, hydroponics would be a fitting substitute. If local Nicaraguan farms and communities are able to start relying on hydroponic production for their own consumption, farmers would not have to worry about the quality or state of the soil in case of an unpredicted circumstance. An effective transition towards technologies such as hydroponics on a community scale would also be beneficial in adding to the amount of micronutrients that the average Nicaraguan would consume. For those who currently rely heavily on community farming and locally field-grown crops, majorly in a rural Nicaraguan family, a transition towards hydrophobic plants such as; lettuce, tomatoes, cucumbers, strawberries, and green beans, would have a vast effect. Increasing biodiversity in all Nicaraguans diets would help to greatly reduce malnutrition.

Another example of technologies that could improve agriculture yields, without the stress of maintaining soil, is series of ongoing research featuring small particle technology, or SPT. The Particle Engineering Research Center at the University of Florida defines SPT as properties of materials that are manipulated at the nanoscale. SPT can be used in agriculture to provide plants with a large amount of vital nutrients directly. Through particle manipulation, liquid can be formed that contains the precise amount of nutrients that a crop would need, and thereafter producing plants that grow more healthily, and efficiently. This process is beneficial because it saves money for the farmer and makes it so that chemical aspects of artificial fertilizers don't have to be used heavily and end up doing damage to the environment. The potential of these areas on nanotechnology show great promise to issues present in Nicaragua. (Particle Engineering Reacherch Center. 2016)

A focus on rural farmers could also decrease income disparity, and therefore improve the food circumstances of many people. A short term, first step solution to address malnourishment among the rural population would be to import more diverse and nutritious food to rural market places.

Once Nicaragua is able to find a consistent pace and sell their crops to higher-value markets, a better foundation will be developed to build upon state-sponsored methods of relief to the poor. Once Nicaragua's economy is secured, the country can then begin to work on bettering health and social programs, improve job opportunities for their citizens and increase the variety of readily available foods. When the agriculture sector is secured, it will open many economic windows for this country and could turn it into a more developed country. A transformation to a more industry-based and private sector economy could be seen from advancements like these, and would open many job opportunities to further stimulate the economy.

In order for Nicaragua to effectively address their food security issues, they must focus on sustainable agriculture to become economically stable in hopes of decreasing the number of those in poverty. Growing the economy out of foreign dependence on financial aid is necessary to effectively insure long-term and sustainable economic prosperity, and can be achieved with increased agricultural profits obtained by sustainable farming methods and technology.

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