Shannon Rauter
Chatham High School
Chatham, New Jersey
Honduras, Factor 6: Sustainable Agriculture

Utilizing Sustainable Crop Production Practices to Improve Food Security in Rural Honduras

One of the poorest countries in Latin America and home to the highest murder rate in the world, Honduras continues to expand both demographically and economically despite a host of dilemmas it faces. Over half of the population lives in poverty, with the majority of the poor being subsistence farmers. Most homes contain three-generation families and the average fertility rate tends to be higher than three children per woman in rural areas, resulting in a majority of families with a large number of mouths to feed and care for within a single household (World Factbook, 2015). The diet of a typical rural family in Honduras consists mostly of corn, in addition to beans, cassava, plantains, rice, and coffee (Merrill, 1995). With meat an infrequent part of the diet, a lack of protein leads to a malnutrition problem that is estimated to be as high as 48.5% in some rural areas (World Food Programme, 2015). Most rural Hondurans lack access to proper healthcare, whether for geographic or financial reasons. For example, one 2006 report from the province of Intibuca, Honduras estimated that there were only three primary healthcare facilities available to service 12,000 people (Baker and Liu, 2006). Literacy rates hover around 85.4% although school attendance remains low due to the high cost of foregone labor for rural parents (Bedi and Marshall, 1999).

While food security is a complex issue, in Honduras it stems largely from a lack of agricultural production. If a typical family is chronically hungry and only produces enough maize to feed the family, they are left with no savings at the end of the season. They have nothing left over to sell at the market, leaving them no income to invest in their farm. If, during the year, a piece of equipment such as a plow is to break down, their yields decrease, leaving them with even less income than they had before and plunging them into a cycle in which they are perpetually unable to earn a living wage (Sachs, 2005, p. 54). Agricultural production has historically been limited by unsustainable management techniques, such as improper use of slash-and-burn methods and overexploitation of unsuitable land, that result in land that becomes more and more difficult for future generations to cultivate. Soil degradation and erosion, weeds, and insects also pose their own problems to production. Additionally, the social structure that includes gender inequality, along with climate and water availability compounds the food security issue in Honduras. Putting sustainable agricultural practices, such as no-till methods, intercropping, and integrated pest management into widespread use would improve crop production and rural farm family income in Honduras, and therefore assist in eradicating the food security issues in Honduras.

Years of traditional slash-and-burn agriculture techniques and recent population growth have taken a toll on the mountainous soils of Honduras. As in other areas of Central America, it is estimated that most of the natural forest cover is no longer present (Barrance et al., 2003). Removal of trees and planting of monocultures on steep hillsides has resulted in a large amount of soil degradation and erosion. The majority of Honduran farmers are poor smallholders, with landholdings in the hillsides of no more than 2 hectares (Barrance et al., 2003). With soil quality low, farmers often find it difficult to produce enough yield to generate a substantial income, forcing them to relocate to a new plot after no more than a few seasons and begin the process of slash-and-burn cultivation anew. Constant relocation creates a vicious cycle of soil degradation as farmers exploit soil for as much yield as possible before abandoning it in a nutrient poor state for someone else to find and cultivate, producing even lower yields. Long-term investments in soil quality are rare because finding a new location presents a less risky alternative to sustainable agriculture (Arellanes and Lee, 2003).

In order to improve soil quality and thus close yield gaps across rural Honduras, farmers need to take advantage of more sustainable soil practices, such as no-till methods, referred to as *labranza mínima* by locals (Arellanes and Lee, 2003). No-till methods are one way to restore soil quality because they improve soil aggregation, biological activity, and soil carbon sequestration (Dumanski et al., 2006). Since 1945, it is estimated that 17% of vegetated land has experienced soil degradation as a result of humans (Tilman, 2002). When natural vegetation is removed from land, especially on the slopes of the Honduran countryside, the lack of organic matter begins to pose problems. Whereas previously soil was being anchored to the ground by roots, now it is free to be pushed down the hills by wind or rain. Now there is less organic matter to filter rainfall and take up nutrients that are applied in the form of fertilizer, making it possible for nutrients to be carried away to bodies of water, likely resulting in eutrophication.

In Honduras, the top agricultural commodities, in order of decreasing quantity of production, are sugarcane, milk, bananas, maize, and palm oil (FAO, 2012). Of these, maize production is challenged. According to a study by Neill and Lee, maize cultivation is often hindered by the growth of weeds such as itchgrass (*Rottboellia cochinchinensis*). *Rottboellia,* a tough annual grass, is capable of producing over 2,200 seeds per plant and has been credited with decreasing maize yields by 50% to 72%. However, throughout the 1980s and 1990s, many farmers turned to an intercropping system of maize and legume velvet beans (*mucuna*) in order to combat problems generated by *Rottboellia*. *Mucuna* plants fill in the spaces between the maize crops, decreasing the amount of available land that itchgrass can take over. The maize-*mucuna* system also offered a variety of benefits for Honduran farmers, including reduction of labor, fertilizer, and pesticide inputs that led to increased production. By the late 1990s many farmers who had originally made the switch began to abandon the maize-*mucuna* system for reasons such as market access for their crops, and the necessary reseeding of *mucuna* each year (Neill and Lee, 2001).

Many Honduran farms are located far away from major roadways, making it difficult for farmers to access food markets where they can buy and sell their products. Typically, farmers who had better access to large roads abandoned the maize-*mucuna* system sooner because they could more easily profit off of cash crops, such as bananas that required less of an initial investment, at the market. The majority of Honduran farmers, however, are those that are blocked by a lack of transportation paths and may be limited in terms of income generation and access to adequate nutrition. For farmers who couldn't easily transport their products to a place where they could sell them, the maize-*mucuna* system appeared to be worth the investment, unless the farmers weren't reseeding. The process of reseeding the *mucuna* at the beginning of the wet season is crucial to the success of the maize-*mucuna* system. When left to come up on its own, the growth of *mucuna* may be limited by periods of heavy rain followed by drought, gradually creating more and more gaps for *Rottboellia* to fill in between the maize and *mucuna* crops each season. If farmers don't properly reseed which allows *Rottboellia* to take over, more labor (in the form of weeding) and herbicides are needed to diminish the negative effects of the weed on maize yields and the maize-*mucuna* system is rendered pointless (Neill and Lee, 2001).

Agricultural productivity in Honduras is also hindered by the existence of insects that feed on crops. According to Andrews and Barfield, the pests that cause the most destruction to maize crops in Honduras are the whorlworm (*Spodoptera frugiperda*), the maize-grain weevil (*Sitophilus zeamais*), and the stem-boring weevil (*Listronotus*). Since technical knowledge of plant protection is often lacking in Honduras, farmers are typically forced to suffer the yield losses incurred by these pests or spray copious amounts of insecticides (Andrews and Barfield, 2012). While insecticides may offer initial advantages to farmers, in the long run excessive pesticide use is unsustainable due to the problem of the pesticide treadmill. With each round of insecticide application, the majority of the organisms lacking resistance are wiped out, leaving a population of resistant organisms to survive and reproduce. At the time of the next application, a larger percentage of the insect population is resistant, making the pesticides less effective and prompting farmers to spray more pesticides, thus continuing the vicious cycle.

An alternative solution to the insect problem is to utilize integrated pest management (IPM) systems, a combination of biological, cultural, and chemical methods in order to keep insect populations below a level that is economically damaging. IPM is not necessarily based on strict adherence to one particular practice, but takes a more holistic approach that relies on general knowledge of agricultural systems. Rather than taking an approach that seeks to resolve existing problems, many IPM strategies are best used proactively. Rotating crops grown from year to year or every few years can decrease food sources available for pests and discourage insects from damaging crops. Intercropping, such as the previously mentioned maize-*mucuna* system can also have a similar effect. Changing planting times from year to year can also discourage pests from feasting on maize. The introduction of natural predators can reduce insect populations and save yields. In a study of Honduran farmers and their IPM practices, a variety of natural enemies for the previously mentioned whorlworm were identified. Ants, earwigs, spiders, ground beetles, and social wasps were among the most commonly found natural enemies, with farmers stating that they sprayed sugar water in order to attract the ants and social wasps (O'Neil and Wyckhuys, 2006). If a combination of these methods are not completely effective, pesticides can be applied carefully and rotated so as not to fall into the cycle of the pesticide treadmill.

The future of food security in Honduras relies largely on the production of crops such as maize. As mentioned above, slash-and-burn methods and overexploitation of unsuitable land are unsustainable. Sustainable agricultural practices, such as no-till methods, intercropping, and integrated pest management are necessary in order to improve food security in rural Honduras. While sustainable practices have been identified, many local farmers lack the knowledge and training necessary to implement these methods. In order to make an effective transition to sustainable agriculture, efforts need to be made to educate rural farm families. A project by USAID-ACCESO was implemented in Western Honduras with the goal of alleviating rural poverty. Important aspects of the program included teaching farmers about sustainable environmental and natural resource management in addition to production and postharvest skills. USAID-ACCESO project specialists initially taught a few rural communities about sustainable practices, and then slowly introduced more farmers to the concepts by bringing them to the initial farms in order to see the effect sustainable agriculture had on crop yields. After working with USAID-ACCESO, one maize farmer was able to increase his yields by 875%, earning him roughly $1600 in a year, as opposed to the $183 he earned previously ("ACCESO summary," 2014). If the approaches of the ACCESO project could be applied by the national government or nongovernmental organizations across more areas of Honduras, it would have a large impact on improving food security for the country as a whole. Rural Honduran communities need to be open to the prospects of sustainable agriculture so that they can be effectively implemented. By taking advantage of environmental knowledge, a typical Honduran family could increase their income, giving them more money for savings that they could invest in their farms, healthcare, their children's education, or other areas of need.

Although the incorporation of sustainable agricultural practices show great promise toward improving food security, social issues such as gender inequality in Honduras may prevent these food security issues from going away. As of 2013, only 21% of women were considered economically active in agriculture ("Honduras", 2012). Lack of female participation in the labor force, especially in agriculture, is the result of years of ingrained culture and traditions. Especially in rural areas, women's main roles have been those of mothers and homemakers. By the time they care for their children and the elderly, cook, clean, and perform an array of other household chores, there is little time left available for women to find work in farming or any other profession. Even if many women could find the time to generate extra income for their families, many husbands would forbid them to do so. In Latin America, the idea of *machismo*, or male dominance, implies that men will be the breadwinners of the household. It has always been the job of the husband to provide income for the family and many men would feel embarrassed to supplement that income with anything earned by their wives. Since women are not typically viewed as a substantial component of the workforce, women generally receive less education than men (Wiff, 1984). In order to

ensure that sustainable agriculture is implemented on a large scale, women need to be educated as well through projects like those of USAID-ACCESO.

If only men are trained in the field of sustainable agriculture, women may be unable to participate in the crop production process and fail to help generate income for the family. Untrained women are often unable to successfully turn a profit in the agricultural industry because they lack proper knowledge of key factors such as plant diseases, fertilizer application, and plant growth ("ACCESO summary," 2014). By learning sustainable agricultural practices, women can aid their husbands on family farms or cultivate land of their own. Either way, women will be working to produce greater crop yields with less negative environmental impacts, which can only serve to increase their income. Training women gives them the information necessary to begin to make independent business decisions and break the cycle of rural poverty that traps so many Honduran families. Only by making such programs available to men and women will it be possible to create a substantial workforce with a strong base of environmentally conscious knowledge that can be passed on to future generations.

While sustainable agriculture is still a relatively new concept to the majority of rural Hondurans, the data shows that food security trends are improving and more widespread use of sustainable agriculture will help them to keep improving in the future. USAID-ACCESO and other projects continue to teach sustainable practices, such as no-till, intercropping, and IPM, to farmers. Over 16,000 Hondurans have received USAID-ACCESO training ("ACCESO summary," 2014), and according to the FAO, the prevalence of undernourishment in Honduras continues to decrease, reaching 12.2% in 2015, compared to 14.9% measured in 2010 (FAOSTAT, 2015). The first of the Millennium Development Goals set in 2000 was to eradicate extreme poverty and hunger, which more specifically included the goal to halve the proportion of people who suffer from hunger between 1990 and 2015. According to a 2014 Millennium Development Goals report, this target has been reached or almost reached in the majority of Latin America, indicating a positive outlook for the future. However, with the prevalence of undernourished people at about 8% for Latin America as a whole, Honduras needs to make strides in order to catch up with the rest of the region. Among the suggestions cited in the report was the idea of government investment in analyzing the various factors of food security that range from sustainable production to access to nutrition (Millennium Development Goals Report, 2014).

As a developing country, Honduras is bound to continue to face challenges in the future, such as those due to climate volatility, population growth, and water scarcity. Dramatic changes in climate, such as extreme rains or droughts, threaten to hinder agricultural productivity. According to a study by Neill and Lee (2001), two growing seasons characterize the majority of Honduras—a wet season beginning in July and a dry season beginning in December or January. A shift from excessive rains in 1996 to excessive drought in 1997 that limited maize yields was just one example of the devastating effects climate volatility could have on crop growth. Sustainable agriculture, especially intercropping, is essential to food security in the face of climate change because it offers the promise of increased resilience. *Mucuna*, of the previously mentioned *maize-mucuna* intercropping system, is valued in part for its drought resistance. If properly harvested and reseeded, it is likely that the *maize-mucuna* system would be able to survive the drastic changes in water availability that occurred between 1996 and 1997 and will likely occur again in the future (Neill and Lee, 2001). As the stability of water sources becomes more and more questionable and the population of Honduras grows, it is likely that water scarcity could also pose an issue to Honduran farmers. As of 2012, only 82% of the rural Honduran population had access to improved potable water sources. In 2003, even when the majority of rural farmers didn't utilize irrigation, an estimated 71% of water usage went to irrigation ("Honduras", 2012). As farmer income increases and farmers begin to invest in more technology for their land, such as irrigation systems, water scarcity will become more marked . Teaching Hondurans sustainable practices will help available water go farther in terms of food production. For example, no-till methods have been shown to reduce runoff and leave more water in the soil for crops to take up. Other options like intercropping, such as the *maize-*

mucuna combination, and drip irrigation systems can reduce water needs and free up more water for domestic and industrial purposes as the population increases and living standards rise.

Current agricultural production methods, such as slash-and-burn cultivation, will not suffice in the long run due to the stress they place on the environment, especially when considering other challenges that Honduran food security faces. Gender inequality leaves a large portion of the population inactive and uneducated in terms of the agricultural sector. Climate volatility, water scarcity, and population growth threaten existing resources and future production of agricultural commodities. Although a variety of different solutions could have positive impacts on rural poverty in Honduras, sustainable agriculture is the only way to minimize environmental impact, increase agricultural productivity and rural farm family income, and effectively stabilize the food supply of the nation for years to come. Because knowledge of sustainable practices remains limited, it will be necessary to educate the population of rural Honduras, both male and female, about sustainable practices such as those of no-till agriculture, intercropping, and integrated pest management through various programs in order to create lasting change.

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