Derek Sherrange
Argyle Central School
Argyle NY
Honduras, Factor 6: Sustainable Agriculture

Our population is continuing to grow and it is important to put a focus on how we are going to feed the 9.6 billion people that are estimated to be living in the year 2050 ("World Population"). In impoverished countries like Honduras it is even more important to put a spotlight on how such a country will provide for itself and help provide for the world. Honduras is one the most impoverished countries in the world with one of the highest homicide rates at 169 homicides per 100,000 people (Crilly). Weather you are in Honduras's second largest city San Pedro Sula which has been deemed the murder capital of the world or one of its rural mountain villages, hunger and malnutrition is widespread (Romo and Thompson). It is going to be important now more than ever to find more sustainable forms of agriculture. Honduras has many sub-factors that are interfering with its main factor of sustainable agriculture, including education, climate change, infrastructure, corruption, and crime. We must find new forms of sustainable agriculture and in doing so look at the effects that these other factors will have on the success of new agricultural innovations. One in every four children in Honduras suffers from chronic malnutrition and malnutrition can reach 48.5 percent in rural areas, these statistics should be enough to convince anybody that Honduras is in desperate need of agricultural innovations ("Honduras").

Poverty and insufficient food security is especially prevalent in Honduran rural and subsistence farm families. In rural Honduras poverty currently affects 63 percent of people (Adreú). About 75 percent of the rural population lives in the central hillside areas in the interior highlands of Honduras in homes made of adobe or sugarcane stalks ("Poverty in Honduras"). Most of these homes have two small rooms, dirt floors and thatched roofs, these homes are known as "bahareques" (Merrill). Subsistence farmers make up 70 percent of rural families in Honduras. The average family consists of seven members. This large family size is a result of the lack of contraceptives and education on contraceptives. The average annual cost of contraceptives in Honduras is US$300, just not feasible for the average family because that would be 15 percent of their income. Most rural families do not have access to adequate healthcare for the reasons that there are insufficient Hospitals in rural areas and they do not have sufficient income to afford health care (López and Valdés). Feeding and finding employment for those large families has become a persistent problem.

The subsistence crops grown in rural Honduras are primarily maize, beans, plantain, sorghum, and rice. Raising cattle is the main livestock sector however it is uncommon to find a subsistence family raising cattle for the lack of pasture and infrastructure ("Country Profile"). The main agricultural commodities or cash crops in Honduras are bananas, coffee, and sugar, bananas being the most in demand and coffee and sugar to a lesser extent. The demand for bananas from Honduras is high but production of bananas in Honduras has been dominated by two companies from the United States since the 1990, s, Chiquita Brands International and Dole Food Company. The absence of political policies to protect small banana producers has been detrimental to rural farmers who previously grew bananas for profit. Small banana producers are almost nonexistent. However, this is not so for the coffee industry. The Honduran coffee industry almost solely relies on small producers. This is very beneficial to small farms who are looking for a profitable crop to grow and sell. The sugar industry has previously boomed as result of a Nicaraguan

sugar quota that Honduras was asked to fill in the 1980s. However large refineries and the high cost of fertilizers has made it difficult for small producers to be successful with the crop (Merrill).

Honduras's rural subsistence farm families have made detrimental mistakes in their agricultural practices in an effort to feed and provide for their families. Most rural Hondurans live on very little money throughout the year so if something were to break or their crops did not yield as much as they were expecting they have no extra money to compensate for that loss. That has led to farmers using any and all practices that will yield them enough food for their families during a given year whether it is destroying the soil for future crops or not. A major problem facing farmers, the majority of whom make their homes on hillsides, is soil degradation. It is estimated that annual soil loss on the hillsides of farms is 300 tons per year (Lockeretz). Soil erosion has been terrible to crop productivity and yields. Soil erosion has been caused largely in part by traditional slash and burn techniques. Slash and burn is used for land preparation and consists of cutting the underbrush of a patch of forest and burning it to clear space for crops while the ash acts as an initial fertilizer. Continued use of this technique results in depletion of soil nutrients and organic matter causing farmers to have to find another plot, beginning the vicious cycle all over again (Castro). Deforestation is also a major contributor to soil erosion. Instead of using more sustainable agricultural practices when crops do not yield what they need many farmers resort to simply clearing more forest to plant more crops. The lack of a forest canopy results in rain falling directly onto the soil which produces a drastic increase in runoff. The runoff accelerates erosion and land degradation.

To combat the many problems that are reducing crop yields and productivity rural Hondurans must implement sustainable agricultural practices. One of these such practices is the no till method. Unhealthy, overused soil, is a major reason for low crop yields. Organic no till methods can solve many of the problems that rural Hondurans are facing due to their unsustainable agricultural practices. The no till method is exactly what it is called, the ground is not tilled with a plow, instead planting is done right through the residue of previous plantings usually using a coulter ("No-Till Farming Pros and Cons"). Taking it one step farther by using an organic no till method will drastically increase biodiversity in the soil. The organic method uses organic mulch that gradually rots into the soil and provides a constant supply of nutrients while also attracting many beneficial microorganisms. A major benefit is that the no till method is fairly cheap compared to current unsustainable methods. The soil does not need to be tilled so farmers do not have to depend on expensive plows. This method also reduces soil erosion and rainwater runoff, a necessity in the search for more sustainable agricultural methods in the mountainous areas of Honduras where many farmers make their homes. It has been found that this method increases yields 50 to 100% and reduces labor 50 to 75% (Hargesheimer). While this method has been found to be very successful, a major setback that the people of Honduras will be forced to overcome while using this method is an increase in weed growth and the subsequent increase in herbicide application. However genetic engineering has produced crops that can withstand these heavy herbicide applications ("Pros and Cons of No-Tillage Farming.").

A major limiting factor on crop yields in Honduras is insects. The insects that are posing the most threats to Honduran crops are the bean slug (*Vaginulus plebeius*), leafhoppers (*Pseudoplusia includens*), and the bean-pod weevil (*Apion godmani*). The insects feed on many of the crops including maize. Hondurans are not educated on using nor can they often afford insecticides. If they can afford insecticides, they do not use them properly or efficiently and many of these insecticides bring problems of their own (Andrews and

Barfield). Many farmers resort to using insecticides to rid them of their insect problems, however this is often only the case for the first few times they apply the insecticide. Insects begin to grow a resistance to the insecticides making it necessary to apply a new insecticide or increase the quantity of the same insecticide. Furthermore, the elimination of insect species can allow another insect species to thrive and make the problem even worse. This results in a cycle called the pesticide treadmill and it can be detrimental to farms who now have to rely on insecticides for every agricultural cycle (Klemm).

Honduran farmers must find sustainable practices to combat the insect problem they are facing. Educating the farmers of Honduras on integrated pest management would be the best solution to the insect problem. Integrated pest management utilizes cultural, biological, and structural strategies that reduce the affects insects have on crops while refraining from using pesticides ("What Is Integrated Pest Management?"). The main goal of integrated pest management is to find economically and environmentally friendly methods to managing insects. Integrated pest management requires monitoring crops closely for pest levels. From there it utilizes many different techniques to manage insect levels. One very effective method is using natural control mechanisms including beneficial insects that are natural predators ("Integrated Pest Management"). Intercropping in which different crops are planted in alternating rows are very effective in reducing pests, and this works especially well with maize and a legume. Crop rotation is another very useful technique in integrated pest management. This consists of growing different crops in rotation in a specific area and this keeps the insects from becoming accustomed to one crop in an area. Finally, a developing area that is showing much promise in the fight against insects is biotechnology. Biotechnology has been used to develop and use insect sex pheromones that can lure insects where they can be trapped and killed, or disrupt their mating habits to keep populations to a minimum. It has also been used to develop crops that have insect and disease resistance in them ("Integrated Pest Management", 2014). This technique can reduce the need for harmful pesticides.

Intercropping has been found to be one of the most successful tools in improving agricultural productivity Intercropping is when two or more crops are planted simultaneously on the same field, often in alternating rows. The intercropping of maize and sorghum is one of the most successful intercropping practices. Intercropping of maize and sorghum produces many benefits. It has been found to more efficiently utilize space and moisture (Bello and Danfodiyo). Growing more than one crop at a time helps prevent and improve the effects of erosion and desiccation which are a major problem in the hill side farms of Honduras. It does this by providing crop cover for a longer period of time than monocultures do. A mix of species of crops makes much better use of nutrients and water in the soil so it can significantly increase yields. Intercropping provides much higher yield stability, a major advantage to small farmers of Honduras who rely on their crops for food and income (Gebru). Intercropping of sorghum and maize has been successfully used in Honduras and is called the "maiz y maicillo" system (Mila).

These solutions are very proactive and beneficial; it may seem unfathomable that in many parts of Honduras these systems have not yet been adopted. There are several limiting factors that are preventing rural Hondurans from adopting these practices. Education is a major reason why many of these practices have not yet been adopted. More than half a million Hondurans are illiterate and statistics from the United Nations have found only 32 of 100 students finishes primary school without repeating a grade and that 13.5 percent of children do not even have access to education ("Honduras Education"). It is thought provoking that these statistics drastically increase when you focus only on rural areas of Honduras. In

rural areas more than 80 percent of children are illiterate. The divide between urban and rural education opportunities is very large. Only 25 percent of rural youths are enrolled in grades seven through nine while that number jumps to 60 percent in urban areas. The reason being that in rural areas many children are forced to leave school to help provide for their families. Schools are also often very difficult to access in rural areas and do not have a sufficient amount of teachers, it is very likely to find one teacher with as many as 80 students of multiple grades ("Honduras Rural Region"). This is a major reason why rural Hondurans have a problem adopting new agricultural innovations because they are often not educated about on them or do not have sufficient literacy to learn about them.

Education is the key to getting farmers to implement these sustainable practices. These sustainable practices are out there and being used in developed countries. Organizations from those countries have a responsibility to teach Hondurans and the rest of the developing world these methods of no-till, integrated pest management, and intercropping. Education needs to start in primary school so when children leave schools they are ready and competent to get a higher level education on these innovations. Until that happens adults and current farmers need to learn these technologies to keep their farms going. There are many implementations that can be set in place to facilitate this learning process. First, governmental and non governmental agencies need to be on board. An agency from a developed country or a group like The United Nations must facilitate education of the national and local governments of Honduras and from there teach the people the skills to have a more sustainable farm. There are techniques that it would be wise to use to help implement education. It is recommended to make it evident to the national government how investing in small farms can better their economy by showing them how more sustainable agriculture will increase yields allowing subsistence farmers to bring their surplus to markets effectively increasing capital being brought to Honduras from foreign markets. This is especially relevant to the coffee industry. Honduran coffee yields compared to the amount of land used have been historically low and only half those of Costa Rica, the main reason for this is a lack of sustainable agriculture (Merrill). While this is true, demand for Honduran Coffee is still high. The national government helping coffee producers use more sustainable practices would be very beneficial to the Honduran economy.

Aside from the Honduran government's national support, the local governments support and direct education to the locals is very important in educating farmers on more sustainable agricultural practices. Local governments and communities should be educated as much as possible. Leaders of communities should be appointed to learn the technologies well so that when the organization teaching them leaves it makes a long lasting effect on the community whose leader will teach the rest of the community as time goes on. It would also be very beneficial to go to rural schools and expose the children to the new innovations so that they are exposed at an early age. For example, they could use these innovations in a school garden that all the children participated in growing and in return all the children would get to take a percent of the yield home to their families. Farmers not only need to be aware of the current sustainable agriculture that is available but also the detrimental effects their current practices are having on their soil and crop yields. Communal banks in communities can serve as a major push for sustainable agriculture. If they agree to give out credit only to farmers who are going to adopt sustainable practices they would act as a major push for farmers. The typical subsistence family needs to be ready and willing to learn but they will not be prepared to do that if they do not have a way of making money from it. For this reason, markets need to be secured for rural families. Large cash crop farms rely largely on markets in the United States to sell their goods but it would be beneficial for small farms to focus more on

cross border markets like El Salvador. After a subsistence family has grown enough food for family consumption they can make a profit by selling to these markets.

The Food and Agriculture Organization (FAO) implemented many of these strategies to get a community in Honduras to use conservation agriculture as an alternative to slash and burn farming. In their project called Quesungual Slash-and-mulch Agroforestry System (QSMAS) they went into a small rural community in Southern Honduras called Quescungual who had been using an ancient slash and burn system. Their goal was to find a way to successfully implement their system and help the farmers end their slash and burn system. They brought food security to 6,000 small scale farmers, increased productivity and resilience to strong weather events, improved environmental quality through the mitigation of land degradation, improved availability and quality of water, and brought the value of maize and beans from 1000 per hectare to 2000 per hectare. With this method crop yields increased by 100 percent. They did all this through education of the local municipal and local people on more sustainable agricultural practices, the securing of markets, working with rural banks and working with the local governments to secure policies that prohibited certain forms of unsustainable agriculture like slash and burn farming (Castro).

These are the best technologies, innovations, and approaches to tackling the obstacle of implementing sustainable agriculture in rural Honduras, however there are still obstacles rural families, farms and organizations aiding them will need to overcome. One of these obstacles is climate volatility. Climate change has had a detrimental effect on rural subsistence farm families and their crops. Climate change has caused prolonged droughts and hurricanes to occur in Honduras. These have devastated agricultural productivity(Honduras). When Hurricane Mitch hit Honduras in 1998 it destroyed 80 percent of export crops and over two-thirds of staple food crops. The president at the time, Carlos Roberto Flores said that the storm had set the country's progress back 50 years. Another storm that hit in 2008 destroyed 18,000 hectares of food crops with the severe flooding that it brought (“Country Profile”). Infrastructure is also a major problem in rural Honduras. Often to keep subsistence farmers afloat it is necessary for a family member to find employment outside of the farm. However, the country’s infrastructure makes this very difficult. In rural areas there is insufficient access to roads to more urban areas. Many of the roads in rural areas are not paved, so, especially during the rainy season they are often impassible. This denies rural families access to off farm employment, markets to sell their crops, hospitals, and education. Other infrastructural inadequacies in rural Honduras are the lack of electricity, water, and sanitation. Electricity in rural areas is only 20 percent compared to 80 percent in urban areas. This correlates with a decrease in productivity because it does not allow farmers to have machinery that would help. While 70 percent of rural families have access to water and sanitation these services are not always adequate and the upkeep on them is very low(Andréu). Crime is also a major problem in Honduras. In the years following the 2009 military coup, violence has drastically increased in Honduras. Recently there have been an unprecedented amount of killings of politicians, humans’ rights activists, labor activists, and journalists (Wilkinson). Honduras has one of the highest homicide rates in the world with 169 homicides per 100,000 inhabitants (Crilly). This is combined with the major drug trafficking that is occurring. The crime in Honduras is causing the government to take its spotlight away from the rural poor who desperately need their support.

Although the amount of undernourished people in the developing world has been halved since 1990 there is still much to do in the fight for food security ("The Millennium Development Goal Report 2015"). In Honduras it will be necessary in the coming years to go directly to where the food is being produced, in the rural farms, and help them develop more sustainable practices. Trends for food security have been found by USAID to be improving since 2003 but there is still much work to do to alleviate hunger and malnutrition in Honduras ("Honduras-Hunger and Food Security"). Adopting sustainable practices like no-till, intercropping, and integrated pest management will help to combat the effects that Honduran farmer's current practices have had on their crops and soil. Going to the rural poor and educating them on these practices will be the key to implementing them. Once Hondurans see the extent to which sustainable agriculture will improve their yields and overall quality of life it will fast track this process. The money and relief of hunger that is brought through using sustainable practices will facilitate a multitude of growth in many other areas such as education, job security, and healthcare. Sustainable agriculture is the stepping stone to improving food security and so many other areas of need in Honduras. It is important now more than ever that we all participate in the help to fight food insecurity in Honduras and the rest of the developing world.

Works Cited

Andréu, Carlos. “Rural Poverty in Honduras: Despite Progress, an Ongoing Challenge.” *Rural Poverty in Honduras: Despite Progress, an Ongoing Challenge*, vol. 3, Dec. 2012, pp. 100–109., Accessed 26 Feb. 2017.

Castro, A. “Quesungual Slash-and-Mulch Agroforestry System (QSMAS): Improving Crop Water Productivity, Food Security and Resource Quality in the Subhumid Tropics.” *Cgspace.cgiar*, CGIAR Challenge Program on Water and Food., 20 Mar. 2009, cgspace.cgiar.org/bitstream/handle/10568/33607/4.6%20%20Conservation%20agriculture.pdf?sequence=1. Accessed 27 Feb. 2017.

“Country Profile .” *New Agriculturist: Country Profile - Honduras*, New Agriculturalist , www.new-ag.info/en/country/profile.php?a=691. Accessed 27 Feb. 2017.

Crilly, Rob. “The Telegraph.” *The Telegraph*, The Telegraph, 3 Aug. 2015, www.telegraph.co.uk/sponsored/lifestyle/honduras-gangs/11701324/honduras-murder-rate.html. Accessed 26 Feb. 2017.

Danfodiyo, Usmanu, and Ahmadu Bello. “Growth, Yield and Water Use Efficiency of Maize-Sorghum Intercrop at Samaru, Northern Guinea Savannah, Nigeria .” *Growth, Yield and Water Use Efficiency of Maize-Sorghum Intercrop at Samaru, Northern Guinea Savannah, Nigeria* , 2011, pp. 253–259., www.ajol.info/index.php/njbas/article/viewFile/73888/64566. Accessed 27 Feb. 2017.

Gebru, Hailu. “A Review on the Comparative Advantages of Intercropping to Mono-Cropping System.” *A Review on the Comparative Advantages of Intercropping to Mono-Cropping System*, vol. 5, ser. 9, 2015. *9*, www.iiste.org/Journals/index.php/JBAH/article/viewFile/22307/23138. Accessed 27 Feb.

2017.

Hargesheimer, Ken. “Organic, No-till Gardening.” *No Dig Gardens; How to Grow Vegetables by Gardening without Digging or Tilling*, 2008, www.no-dig-vegetablegarden.com/organic-notill-gardening.html. Accessed 27 Feb. 2017.

“Honduras .” *Honduras | Food Security Portal*, IFPRI , www.foodsecurityportal.org/honduras/resources. Accessed 26 Feb. 2017.

“Honduras: Education | Global Exchange.” *Honduras: Education | Global Exchange*, Global Exchange , 20 June 2004, www.globalexchange.org/country/honduras/education. Accessed 27 Feb. 2017.

“Honduras Rural Region .” *Christian Child Sponsorship - Compassion - Child Charity Organization*, Compassion International , www.compassion.com/honduras/honduras-culture.htm. Accessed 27 Feb. 2017.

“IDEA Country Dashboard.” *International Data & Economic Analysis*, USAID, idea.usaid.gov/cd/honduras/hunger-and-food-security. Accessed 27 Feb. 2017.

“Integrated Pest Management.” *CropLife International*, Crop Life International , croplife.org/crop-protection/stewardship/integrated-pest-management/. Accessed 27 Feb. 2017.

“Integrated Pest Management.” *Integrated Pest Management* , 2014, doi:10.1016/c2012-0-00720-x. Accessed 27 Feb. 2017.

Klemm, Kelvin. “Pesticide Treadmill.” *Pesticide Treadmill | Sustainable Development & Environmental Awareness*, www.enviropaedia.com/topic/default.php?topic_id=187. Accessed 27 Feb. 2017.

López, Ramon, and Alberto Valdés . *Rural Poverty In Latin America* . New York , NY,

St. Martin's Press, LLC, 2000, books.google.com/books?hl=en&lr=&id=7Ct_DAAAQBAJ&oi=fnd&pg=PP1&dq=rural+poverty+in+Honduras&ots=tJr2kULvV4&sig=5J0XuHihGuDYsJiGseml. Accessed 27 Feb. 2017.

Marrigan, and Lockeretz. "Stymieing Soil Erosion on Hillsides in Honduras A New Rural Agenda ." *Stymieing Soil Erosion on Hillsides in Honduras*, Oct. 2003, Accessed 27 Feb. 2017.

Merrill, Tim. "Honduras: A Country Study." *Honduras*, Washington GPO for the Library Of Congress, 1995, countrystudies.us/honduras/. Accessed 27 Feb. 2017.

Merrill, Tim. "Honduras: A Country Study." *Honduras*, Washington GPO for the Library Of Congress, 1995, countrystudies.us/honduras/. Accessed 27 Feb. 2017.

Milla, Francisco. "Production Aspects of Maize + Sorghum Intercropping Systems in Central America." *UFDC Home - All Collection Groups*, George and Smathers Libraries , 1985, ufdc.ufl.edu/AA00025694/00001/1x. Accessed 27 Feb. 2017.

"The Millennium Development Goals Report 2015." *The Millennium Development Goals Report 2015*, 1 July 2015, Accessed 27 Feb. 2017.

"No-Till Farming Pros and Cons - Sustainable Farming." *Mother Earth News*, Ogden Publications Inc, 1 May 1984, www.motherearthnews.com/homesteading-and-livestock/no-till-farming-zmaz84zloeck?pageid=2#PageContent2. Accessed 27 Feb. 2017.

"Poverty in Honduras." *The Borgen Project*, 14 Dec. 2014, borgenproject.org/poverty-honduras-taking-extreme-toll/. Accessed 26 Feb. 2017.

"Poverty in Honduras." *The Borgen Project*, 14 Dec. 2014, borgenproject.org/poverty-

honduras-taking-extreme-toll/. Accessed 26 Feb. 2017.

"Pros and Cons of No-Tillage Farming." *Greentumble*. Greentumble, 20 Feb. 2016. Web. 28 July 2017

Romo , Rafael, and Nick Thompson . “Inside San Pedro Sula The Murder Capital Of The World .” *CNN*, Cable News Network, 28 Mar. 2013, www.cnn.com/2013/03/27/world/americas/honduras-murder-capital/. Accessed 26 Feb. 2017.

“What Is Integrated Pest Management?” *Beyond Pesticides*, Beyond Pesticides , www.beyondpesticides.org/resources/safety-source-on-pesticide-providers/what-is-integrated-pest-management. Accessed 27 Feb. 2017.

Wilkinson, Tracy. “In Post-Coup Honduras Rising Poverty and Inequality, Report Says .” *Latimes*, Los Angeles Times , 6 Nov. 2013, www.latimes.com/world/worldnow/la-fg-wn-honduras-rising-poverty-and-inequality-report-20131106-story.html#axzz2scKPZIaM. Accessed 27 Feb. 2017.

“World Population Projected to Reach 9.6 Billion by 2050 | UN DESA Department of Economic and Social Affairs.” *United Nations*, United Nations, 13 June 2013, www.un.org/en/development/desa/news/population/un-report-world-population-projected-to-reach-9-6-billion-by-2050.html. Accessed 26 Feb. 2017.