Composting Guidebook for an Organic Farm in Guaimaca, Honduras

An Interactive Qualifying Project
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This report represents the work of two WPI undergraduate students
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Abstract

Nazareth Farm, located in the small town of Guaimaca, Honduras, is an organic farm intending to improve the quality of the compost they produce. This project developed a Composting Guidebook that provides recommendations and testing procedures to improve composting methods. This Guidebook can also be used for educational purposes and is based on the Test Methods for the Examination of Composting and Compost (TMECC), published by the United States Composting Council.
Executive Summary

Honduras has historically been plagued with poverty, illiteracy, malnutrition, and very poor soil. However, in the small town of Guaimaca, Honduras, northeast of the capital city, Tegucigalpa, there is a small group of people trying to combat these obstacles. At the Saint Rose of Lima Church, progress is being made to overcome these adverse conditions through several projects, including a medical clinic, an organic farm called Nazareth Farm, and a school for girls, known as the Marie Poussepin Center for Holistic Education. The Center offers a free high school education to girls from families in the surrounding mountain villages: areas that only offer, at most, education up to the third grade.

All of these enterprises are ambitious and have great potential; however there are financial support and long-term sustainability issues. Currently, the main source of income is from charitable organizations, namely the Diocese of Fall River, Massachusetts. While the generosity of these groups is vast, dependence on their charity cannot last indefinitely; long-term sustainability and self-sufficiency would be more beneficial for these endeavors and the people who depend on them. Addressing this issue requires a more substantial and stable source of income. To that end, an organic composting project has been started, with hopes that the compost could be sold and generate revenue.

This income is not only needed for Nazareth Farm and the composting project for labor and materials, but will also help to alleviate the financial need for the other projects. There are expenses for the Marie Poussepin Center such as the payroll of the teachers, everyday educational materials, and also future plans to expand the school so that more girls can be enrolled. Resources are needed at the medical clinic to pay the workers, and for medical equipment and supplies.

This will decrease the dependence on donations, making finance planning easier for all of the projects. In turn, this will make the Marie Poussepin Center more financially stable and encourage growth in the student population. In a broader sense, these finances will be supporting education for women who will one day be the mothers and educators of the next
generation. This project is also encouraging organic agriculture by selling the organic compost around the country.

In order to aid with this endeavor, the aim of this project was to help improve the composting methods currently being used in the composting project in Guaimaca. This included optimizing time and finance management, and improving the compost recipe in such a way that it will make the compost a better additive to the soil. Creating better compost would improve the growth of the crops, and make it possible to generate more income for the farm in Guaimaca by selling the compost.

To do this, a standalone Guidebook was created to provide education and testing procedures on the composting process. The primary resource for this document was the Test Methods for the Examination of Composting and Compost (TMECC) from the United States Composting Council, which provides extensive and detailed information on the composting process. The tests, procedures, and educational material were broken up into categories depending on relevance and usefulness to the situation in Guaimaca, as well as the limited resources of the area. By using the recommended test procedures given in the Guidebook, the composting method used in Guaimaca can be monitored over the course of the decomposition process and improvements can be made. Also, the information in the Guidebook can be used as an educational resource for the students at the Marie Poussepin Center.

It is expected that the document will initially be used by Mr. Emilio Rodriguez, the manager of Nazareth Farm, and the composting project. It is written in such a way that it can be read and used by anyone in the future, no matter what their educational background may be. The document will be translated into Spanish by another Worcester Polytechnic Institute project group made up of students taking advanced Spanish courses so that those without an educational background in English may also read it. The document aims to provide education for the physical, chemical, and biological processes that occur during the decomposition. It includes detailed test procedures that can be used to monitor compost attributes, so that they will be able to accomplish quality control. By developing their knowledge on the science of
composting, the current technique can be improved upon and actions can be taken to decrease costs and increase agricultural benefit.

Beyond this project, there is a long-term goal of the design and implementation of the on-site laboratory, most likely using the abandoned ambulance that can be found on the farm. This space could become an area to carry out the tests on the compost prescribed in the Guidebook as well as to store and sanitize the materials required for them. If a laboratory can successfully be built, it will very helpful in streamlining the tests. With a conveniently located space reserved for daily testing, it is hoped that a quality assurance and control system can be created and implemented. Also, once there is a set location to perform tests, it would also be beneficial to purchase more expensive and accurate equipment to perform the more complex tests given in the Guidebook. Hopefully it will lead the people of Guaimaca to learn more ways to successfully and environmentally grow their crops, and bring wealth to the region.

The laboratory is indeed a lofty goal for Nazareth Farm. There is currently no scientific equipment of any kind available, and there is no training available for the use of complex laboratory equipment either. Such materials would be difficult to obtain and expensive, and the only way they might obtain such materials now would be through the help of a benefactor.
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Authorship Page

The two documents of this project were the Final Report and the Guidebook accompanying the report. The Final Report was authored primarily by Mary Schultz and edited by Supriya Agrawal with the exception of the background information about compost which was provided by Supriya Agrawal. The Guidebook was authored by Supriya Agrawal.
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Chapter 1: Introduction

This project is focused on the small town of Guaimaca, Honduras. Guaimaca is a rural town in Honduras where people suffer from malnutrition, and lack educational services. As of 2006, the number of poor people living in rural areas had reached approximately 2.6 million, which represents 70.4 percent of the total rural population (Statistics - Honduras, 2007). The Honduran population has historically been the poorest and least developed in Central America. In fact, a little over half of Honduras is living under the poverty line (Central Intelligence Agency; The World Factbook - Honduras, 2009). One reason why poverty is so widespread is that only nine and a half percent of the land in Honduras is arable, despite that Honduras’s main exports are agricultural (Central Intelligence Agency; The World Factbook - Honduras, 2009). Also because of the high poverty, few people can afford healthcare. This creates a high rate of malnutrition and high risk of disease. A quarter of children entering the first grade are affected by severe malnutrition and 63 percent of all Hondurans suffer from malnutrition to some degree. In fact, 77 percent of the population in rural areas simply cannot afford the food necessary to meet their minimal nutritional requirements. Additionally, even though government funded schooling is promised by the constitution, one third of Hondurans have not received education of any kind.

In 2000, the diocese of Fall River, Massachusetts took on the mission to bring aid to the small town of Guaimaca, Honduras. These improvements were made possible with their support, as well as help from various groups around the United States. The residing priest and sisters at the Santa Rosa de Lima (Saint Rose of Lima) Parish, and a few other Hondurans, have managed to find ways not only to improve their own situation, but also to help their community. Three projects were developed to address these concerns. One was a small medical clinic that serves the local community. The second project was a girls’ school, known as the “Centro Marie Poussepin para Formación Integral” or the Marie Poussepin Center for Integral Formation which enrolls girls from needy families in the surrounding area. The last
project was an organic farm, called Nazareth Farm, which provides employment, nutritious produce for the students and financial help for both the clinic and the girls’ school by selling the produce. The financial help is very small, however, and all of these endeavors are extremely dependant on the generosity of those who donate time and money to the school.

Local farmers become essential to their communities to battle malnutrition and to provide employment, which also makes it possible for children to get an education. This is where Emilio Rodriguez, the man who manages the farm, comes in. Mr. Rodriguez’s responsibilities include “planning, coordinating and implementing annual operating procedures, and coordinating agronomic studies for the students of the school” (Rodriguez, 2009). He understands the seriousness of the environmental crisis in Honduras and says that the reason he wanted to start this project was “for the need to reverse the agro-ecological conditions of our country and offer an economic alternative (to chemical fertilizers)” (Rodriguez, 2009). He has begun to use the leftover foodstuffs from Nazareth Farm to begin a comprehensive and extensive organic composting project. With the help of the Saint Rose of Lima Sisters who manage the coordination, scheduling and finances of the farm and composting project, Mr. Rodriguez has created an impressive system and is even applying for a patent for his unique method of composting (Rodriguez, 2009).

This composting project is intended to help with the education of the young women who attend the girls’ school. Mr. Rodriguez explains: “Integrating (of the girls’) curricula into everyday activities includes everything from sorting and recycling of the waste produced at the school to calculating the slope of a curve in order to level the soil for soil conservation. They also benefit greatly in eating the vegetables and fruit they produce.” These are the two current benefits of the composting project. The produce from the farm can be sold at the local market, but the compost itself cannot actually be sold unless it has an official organic certification; in Mr. Rodriguez’s words: “We produce vegetables with the compost that students eat, but we have not benefitted from selling compost that does not have the certificate” (Rodriguez, 2009). Acquiring such a certification should be possible through a company from Peru called BioLatina
(Rodriguez, 2009). This company will visit Nazareth farm once a year to re-test and re-certify the compost as organic (Ceballos, 2009).

The intent of this project was to aid Nazareth Farm in improving their compost method. To do this, the aim for this project was to develop an educational manual to guide Mr. Rodriguez in improving his current composting process. The manual was not only developed for Mr. Rodriguez’s benefit but also for the students or future workers on Nazareth Farm. Improving their composting techniques will help to generate revenue to assist with the girls’ school, the medical clinic, as well as the farm itself.

The goals of this project, in order of importance, were as follows:

1. Create a standalone, sustainable Guidebook that summarizes the useful information (textbook material and testing procedures) from the Test Methods for the Examination of Composting and Compost (TMECC) document from the United States Composting Council in layman’s terms with the priority being education.

2. Make specific recommendations for improvement of the current composting process.

With these goals, the project progressed by studying the TMECC and organizing its information, as well as other useful information from outside sources, into a comprehensive Guidebook to assist the composting project in Guaimaca. This included educational information as well as all of the test procedures from the TMECC, each accompanied with a recommendation of when and how to use the test. The tests are categorized into three sections, the first is simple tests that can be done often, the second group of tests is not possible because they require expensive equipment, and the last group of tests is not deemed useful for this composting project.

It is hoped that this Guidebook will help to direct Mr. Rodriguez in making continuous improvements on his composting process and optimize the use of the limited financial resources available. While the financial benefit is the primary desired result of this project, the
Guidebook was also written so that it could be used as an educational resource for the students at the Marie Poussepin Center.

Beyond this project, there is a long-term goal of the design and implementation of the on-site the laboratory, most likely using the abandoned ambulance that can be found on the farm. This space could become an area to carry out the tests on the compost prescribed in the Guidebook as well as to store and sanitize the materials required for them. If a laboratory can successfully be built, it will very helpful in streamlining the tests. With a conveniently located space reserved for daily testing, it is hoped that a quality assurance and control system can be created and implemented. Also, once there is a set location to perform tests, it would also be beneficial to purchase more expensive and accurate equipment to perform the more complex tests given in the Guidebook. Hopefully it will lead the people of Guaimaca to learn more ways to successfully and environmentally grow their crops, and bring wealth to the region.

The laboratory is indeed a lofty goal for Nazareth Farm. There is currently no scientific equipment of any kind available, and there is no training available for the use of complex laboratory equipment either. Such materials would be difficult to obtain and expensive, and the only way they might obtain such materials now would be through the help of a benefactor.
Chapter 2: Background

To understand the different components involved in this project, research was conducted on Honduras. Interviews were also held to gather information about the community and projects happening in Guaimaca. This section outlines the history, politics, economy, agriculture, environment, healthcare, culture, and the condition of education in Honduras. This section will also give some background on the basics of composting. Lastly, some background on the projects in Guaimaca and the mission of the Fall River diocese in Massachusetts to help them.

2.1 Honduras

In Central America, between Guatemala, El Salvador and Nicaragua, lies the country of Honduras, as shown on the map in Figure 1, below.
Tegucigalpa, the capital of Honduras, is one of the two large cities in the country. The other is San Pedro Sula, the business and industrial hub of the country. San Pedro Sula is located close to the northern border between Honduras and Guatemala. Both Tegucigalpa and San Pedro Sula can be seen in Figure 2. Also the small town of Guaimaca, the location of this project, has been labeled with an “A”.

Honduras currently has a population of roughly 7,800,000, approximately one million of which live in Tegucigalpa (Central Intelligence Agency; The World Factbook - Honduras, 2009). The unifying characteristics of the people of Honduras include language, ethnicity and religion.

Spanish is the official language, but in some areas there are Amerindian dialects and English or English Creole. The language is relatively dependent on the ethnicities of the area; almost all of the country is mestizo (part Spanish and part Amerindian), seven percent is pure Amerindian, two percent of the population is of African descent, and only one percent of Caucasian descent. Roman Catholics make up 97 percent of the population, the other three percent being Protestant. The strong sense of community prevalent in Honduras can be attributed to the unity of language, ethnicity, and religion throughout the population.
While almost the entire population has these characteristics in common, the population is also cleanly split into two groups: those who live in the cities, and the peasant people who live in rural areas and work as farmers, also called *campesinos*. Even though each group has the same cultural characteristics, this disjunction is very evident. Hondurans who have fared well in their migration from the rural fringes of the country to the city tend to have an aversion to any manual work that makes reference to their former peasant status. At the same time, the *campesinos* are not submissive and have formed militant organizations to demand land and workers’ rights (Norsworthy & Barry, 1993). Understanding this division is essential to understanding Honduran culture.

2.1.1 History and Politics

Honduras became an independent nation from the Spanish Empire in 1821. Honduras went back and forth between military rule and elected officials until a new constitution was written in 1982 and a freely elected civilian government came to power (Honduras, 2009). Since then, Honduras has been one of the more politically stable countries in Latin America until June 28, 2009 when the democratically elected president, Manuel Zelaya, was charged for attempting to unconstitutionally extend his term in power by the military. Zelaya was arrested and exiled from the country; he took refuge at the Brazilian embassy. After a few months of political turmoil, a new president was elected on November 29, 2009, President Porfirio Lobo.

Honduras’s political history has been identified by a politically influential and overly powerful military and little to no human rights policies. In the constitution, the military can refuse to follow orders from the president and are not required to report on their activities. They are treated as a separate entity meant to step in when they determine that the government’s actions are unconstitutional. However, this has led to the Honduran military having free reign to commit human rights violations. Eventually the Honduran military was the only one in Latin America ever to be convicted in a court of law for the crime of disappearance (Norsworthy & Barry, 1993). The military has had substantial influence in the government’s decisions for most of Honduras’ existence; however, there are currently efforts being made to decrease the extent of the military’s power.
Disappearances by the Honduran military were not only of political figures, but of civilians as well. International human rights organizations such as Amnesty International have expressed the need for human rights protections in Honduras since the early 1980’s; however it was a decade later before any human rights laws were passed (Norsworthy & Barry, 1993).

2.1.2 Agriculture and Economy

Agriculture generates the most export earnings and provides the most employment in the Honduran economy. Agriculture also accounts for nearly one third of the country’s GDP. However, Honduras has some of the worst soil for agriculture in the region. Unlike its neighboring countries, Guatemala and El Salvador, Honduras does not have a rich mantle of volcanic soil, which is good for agriculture. Consequently, only about ten percent of Honduras’s land is suitable for agriculture (Norsworthy & Barry, 1993).

Honduras is the second poorest country in Central America. To give a comparison of Honduras’s struggling economy to that of neighboring countries, Table 1, below, shows a summary of some statistics on their economies in 2008. The dollar amounts are in billions of 2008 U.S. dollars. As the table shows, Honduras has a lower GDP than El Salvador and Guatemala. Honduras is also further in debt.

<table>
<thead>
<tr>
<th></th>
<th>Honduras</th>
<th>El Salvador</th>
<th>Guatemala</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>$33.72</td>
<td>$43.73</td>
<td>$38.98</td>
</tr>
<tr>
<td>Account Balance</td>
<td>-$1.977</td>
<td>-$1.595</td>
<td>-$1.932</td>
</tr>
<tr>
<td>Stock of Money</td>
<td>$1.633</td>
<td>$0.2137</td>
<td>$6.106</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>11.4%</td>
<td>7.3%</td>
<td>11.4%</td>
</tr>
<tr>
<td>Budget Expenditures</td>
<td>$3.09</td>
<td>$4.242</td>
<td>$5.338</td>
</tr>
<tr>
<td>Budget Revenues</td>
<td>$2.754</td>
<td>$4.016</td>
<td>$4.693</td>
</tr>
<tr>
<td>Difference (Revenues – Expenditures)</td>
<td>-$0.336</td>
<td>-$0.226</td>
<td>-$0.645</td>
</tr>
</tbody>
</table>

Note: Dollar amounts are estimates (Central Intelligence Agency; The World Factbook - Honduras, 2009).
Bananas are Honduras’s the number one export in the national market. However it is difficult for Honduras to compete with the bigger producers in the region. Other primary agriculture products in Honduras include coffee, citrus, beef, timber, shrimp, tilapia, lobster, corn and African palm. The Honduran economy greatly relies on this narrow range of exports, which leads to poor economic stability; natural disasters and changes in commodity prices can greatly affect the entire country’s economy (Central Intelligence Agency; The World Factbook - Honduras, 2009). Fortunately, investment in non-traditional exports such as melons, cucumbers, cigars, cardamom, jam, and softballs is slowly helping to diversify the economy (Norsworthy & Barry, 1993).

In an effort to improve their GDP and economic stability, foreign investment has become a high priority of the Honduran government. Most of Honduras’ exports are currently handled by large, foreign companies. Some of the policies that have been used to attract foreign investment included: little to no import and export taxes, no minimum wages to create low labor costs, and very cheap land. Approximately 60 percent of the arable land in the country belongs to either the government or one of the two main transnational companies, Chiquita and Dole. With large companies controlling most of the arable land, rural farmers are left with the sandy, dry soil found throughout the rest of the country. Many of the rural farmers who are fortunate enough to own land inhabit plots that are either too small or have such poor soils that they are unable to meet even subsistence needs. A full 55 percent of the farming population works plots smaller than five acres, each generating a net per capita income of less than 70 dollars a year (Norsworthy & Barry, 1993).

The disproportionate distribution of land is very hindering for peasant farmers. Government policies also make it difficult for rural farmers. While large and foreign companies had many benefits available to them from the government, there were very few outlets for rural farmers to sell their products and few loan programs available. This forced the farmers take high interest loans from unreliable middlemen and to sell their products at extremely low prices (Norsworthy & Barry, 1993).
2.1.3 Environment

The terrain of Honduras is mostly mountainous and covers about 112 thousand square kilometers (27.6 million acres), approximately the size of the state of Tennessee (Central Intelligence Agency; The World Factbook - Honduras, 2009). Forests cover approximately 41.5 percent of the country, which amounts to about 11.5 million acres. As mentioned in the previous section, 2.1.2 Agriculture and Economy, the government is making efforts to diversify Honduras’s exports to increase economic stability. Timber is one of these exports. The forests in Honduras have been increasingly exploited over the past few decades for this purpose. Forests also continue to be cleared for agriculture purposes by both rural and corporate farmers. Between 1990 and 2005, 37.1 percent of Honduras’s forests have disappeared. The rate of this forest loss has also been increasing by nine percent since 2000. Every year from 2000 to 2005, an average of 386,473 acres of forest cover was destroyed (Butler, 2006).

Forests protect the soil from the elements, they provide structure, protecting it from erosion and keeping the soil moist. Deforestation has detrimentally affected the quality of the soil across the country. With fewer trees the soil has become drier, less stable, and made agriculture more difficult. Another side-effect of the deforestation is the devastation to many cities by floods and mudslides in recent years. The number of floods has not increased; it is simply that the cities are no longer protected by surrounding forests, which used to mitigate flood damage. The desertification occurring throughout Honduras may even now be irreversible in some southern areas.

In an effort to increase agricultural yield, chemical pesticides and fertilizers were used throughout the country over the past few decades. The already deficient soil became further weakened by unsafe amounts of chemicals applied by local and corporate farmers alike. Honduras imports about $22 million worth of pesticides annually, however only 15 percent of the country’s farmers receive any kind of technical instruction in the proper use of these chemicals, nor are they restricted in their use by any governmental policy. As a result, pesticides accumulate in the soil making cultivation more difficult, and farmers move on to clear more forest and start the process all over again. Increased agrochemical usage has had
another side effect; high levels of DDT and other poisons have been found not only in vegetables, but also in the fat tissue of many rural people, especially in the southern areas. (Norsworthy & Barry, 1993). Notably, environmental awareness and activism against these harmful practices began as recently as the early 1990’s.

2.1.4 Health Care and How Culture Affects It

Honduras has some of the worst health conditions in the western hemisphere. For most Hondurans health care is not a possibility, either because of their financial situation, or there is no health care in their region. There is no medical help available in most of the countryside, and the few government health clinics that are available are often lacking any kind of medical equipment or medicine.

The poor condition of public utilities has had many repercussions for the overall health of all Hondurans. Potable water is only easily accessible by one third of Hondurans, and half of the population lacks even a rudimentary system of human waste disposal. The lack of drinkable water and sanitation systems, as well as widespread malnutrition, contributes to the low life expectancy of 69.4 years. According to a Health Ministry survey, 63 percent of Hondurans suffer some degree of malnutrition. In the main public hospital in Tegucigalpa, ten to fifteen children die of malnutrition every month. A quarter of the children entering the first grade suffer severe malnutrition, and in rural areas 77 percent of the population simply cannot afford the food necessary to meet even minimal nutritional requirements (Norsworthy & Barry, 1993).

The continually rising population helps to perpetuate these health care problems. In rural areas, the average Honduran mother gives birth to seven children (Norsworthy & Barry, 1993). Sister Marina Mejía from the Dominican Sisters of the Presentation in Dighton, Massachusetts explains: “It’s the culture. When you are 15 years old you have to have a child … And when you have so little in life, you have to have something,” this thinking results in the mother having many children. “Most of these girls know no other life on the outside,” (Mejía, Gómez, Pregana, & Pregana, 2009).

Another common problem in rural areas that exacerbates overpopulation is irresponsible fatherhood. A sense of responsibility for the wellbeing of the father’s offspring is
It is common for men to leave their wives and children and start new families elsewhere. The result of a typical father’s lack of commitment to their families, half of all Honduran children are born to single mothers. Formal marriage is also uncommon in these rural areas due to the expenses and the male-dominated culture (Norsworthy & Barry, 1993). “They don’t even get married most of the time... They don’t talk about marriage, they talk about living together; it’s their culture,” explains Sister Marina (Mejía, Gómez, Pregana, & Pregana, 2009).

The male-dominated culture pervades the entire region. In modern areas of Honduras, daily newspapers feature pin-ups to increase sales, and political parties display seminude female dancers to advertise their candidates. Women in Honduras were given the right to vote in 1954, making Honduras the last country to do so in Latin America. Honduras is nearly devoid of women’s rights, and the few rights that exist are rarely enforced (Norsworthy & Barry, 1993).

### 2.1.5 Education

According to Honduras’ constitution, the government must provide mandatory education for ages seven to fourteen. However, due to a lack of schools, the low quality of public education, and the costs of educational materials, education itself remains a privilege for those who can afford private schooling.

In many rural areas education only goes up to the third grade, if there is a school at all. Even when there is a proper public school with well-trained instructors, approximately 70 percent of Honduran children who make it to the first grade will drop out before they reach the sixth grade. Only eight percent of the children that make it to secondary school will move on to postsecondary school. This means that only about two and a half percent of Honduran children make it into postsecondary school (Norsworthy & Barry, 1993).

The education crisis is sustained due to the lack of an adequate system for teacher training. Low pay for teachers, outdated teaching methods, and a lack of sufficient school buildings and teaching materials make it difficult for teachers to do their jobs. In some areas, teachers receive food instead of regular wages due to a “food-for-work” government program. Even when there is schooling available, the quality of the education is often still very poor (Norsworthy & Barry, 1993).
2.2 Organic Farming

Fertilizers, pesticides and other chemical additives were introduced into farming with the aim of increasing the yield and quality of crops. As demand for food increased all over the world so did the consumption of these inorganic compounds. Acres of land were farmed repeatedly using a single crop depleting the soil of its natural resources and resulting in barren fields unable to support future crop growth. Advances in chemistry allowed farmers to easily replenish the lost minerals in the soil. Chemical fertilizers were utilized in large quantities with minimal research. When extensive research was done, it revealed the potential ill-effects of these agricultural practices, and environmentally friendly alternatives were sought.

Organic farming refers to agricultural practices without the use of man-made chemical products such as pesticides or chemical fertilizers. Despite its importance, the exact definition of organic farming varies. The International Federation for Organic Agricultural Movements (IFOAM), an organization that has spent over 35 years “uniting the organic movement”, established a Task Force on the Definition of Organic Agriculture which spent three years to come up with the following definition:

Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved. (IFOAM)

There are two opposing opinions on organic farming. Fertilizer manufacturers and farmers that have relied on inorganic farming and its resulting increased crop production and profit margins maintain that there is nothing wrong with using inorganic farming techniques. The opposing argument insists that everything that comes from the earth is better than man-made chemicals. Both sides are partially correct. When inorganic methods are used sparingly and intelligently and organic techniques are tempered by the knowledge that not everything in nature is safe, a compromise—superior to either method used alone—can be reached.
2.2.1 Organic Farming in the International Community

Many companies are trying to find ways to market themselves as environmentally friendly in an effort to create a positive image which can lead to increased profits. If the organic market has no regulating body then companies can falsely claim that their food products are organic resulting in possible monetary and health-related harm to the consumers. To regulate organic products and to protect both the consumers and producers, international organizations such as IFOAM provide accreditation to companies all over the world. Countries can have government and corporate associations, as well as non-profit groups. The United States Department of Agriculture (USDA) created the National Organic Program (NOP) as an organic marketing service which provides organic certification. The European Union (EU) has its own regulations and guidelines. It is common for non-government programs to hold multiple certifications from other government or international agencies. Originally from Peru, a company called BioLatina has grown into possibly the largest organic certifier in South and Central America. BioLatina provides organic certifications in countries where the governments are not able to fund such programs. BioLatina is accredited by many organizations including the EU, USDA-NOP, the Canadian Conseil des Appellations Agroalimentaires du Québec (CAAQ), the Japanese Agricultural Standards (JAS) of the Ministry of Agriculture, Forestry and Fisheries of Japan (MAFF), and Bio Suisse of Switzerland (BioLatina).

2.2.2 Compost

Compost, one effective form of organic fertilizer, is a soil amendment that returns nutrients to barren ground. Composting is human harnessed decomposition, directed in a controlled fashion in order to speed up this natural process and to tailor the contents to produce a desired product. When organisms die, microbes begin feeding on them. This decomposition is a part of the natural life cycle in every biosphere. Microbes digest complex molecules such as proteins, sugars, and fatty acids into simpler, smaller molecules and ions such as potassium nitrate (KNO₃) and ammonium (NH₄⁺). Composting efforts can be as small as a simple pile in the backyard or as large as a multi-acre commercial venture with complex monitoring processes.
2.2.2.1 The Benefits of Composting

Compost benefits both the environment and the pocketbook. Whether it’s a municipally run pile at the dump or a personal heap in the backyard, compost contains waste materials that would otherwise go into incinerators and landfills. According to the EPA website, 25 percent of the municipal solid waste streams generated in the United States each year is made up of yard trimmings and food waste that can be composted (U.S. Environmental Protection Agency). The end produce, called humus, is a cheap, useful soil amendment free of hazardous chemicals.

Compost that does not meet the safety standards for growing food can be used for ornamental horticulture and to cap filled landfills. The microbes in the compost then slowly filter and recycle heavy metals and hazardous wastes. The feedstock for this kind of compost can include biosolids and sewage sludge. Compost created from safe feedstock can be applied as an amendment to soil in lieu of chemical fertilizers. This should be an attractive alternative because over time, compost applied to soil can increase the amount of essential nutrients, improve drainage and aeration, reduce soil diseases, and promote weed and erosion control, giving life to land previously thought to be barren. Nitrogen is one of these essential nutrients. In compost, nitrogen is provided by the continually active microbes in the soil, creating a slow release of nitrogen thus making a constant source. On the other hand, fertilizer only provides sources of nitrogen that are soluble in water, and are quickly washed away by irrigation and rain.

2.2.2.2 The Science of Composting

Composting is a simple environmental effort that is scientifically a very intricate process. The humus (final product) is created through the metabolic actions of microbes that exist naturally on all surfaces of the Earth. These microbes, such as bacteria, actinomycetes, and fungi, are all living organisms that require water, food, and air to live. The feedstock—the collected waste materials to be composted—provides both the microbes and their food. Compost piles can be watered and turned to keep them at the optimum levels of moisture and oxygen for the most efficient composting. If the pile is not turned or if it is overwatered, the oxygen available to the microbes in the pile will be quickly used up causing the microbes to
begin anaerobic respiration or fermentation. Though both process cause decomposition, the
process is much slower, unpleasantly more odorous, and does not kill off pathogens.

Key process variables include pile porosity, feedstock nutrient balance, pile oxygen
percent, pile moisture percent, pile temperature, and retention time (Composting Council
Research and Education Foundation (CCREF), 2001). Pile porosity is the amount of open spaces
within the compost which affects both the moisture retention of the pile and the oxygen
percentage. It depends largely on the size of the particles in the pile. For nutrient balance, the
green, nitrogen-rich, materials must be balanced with the brown, carbon-rich, materials. With
too much carbon, the compost will not reach the necessary heat, but with too much nitrogen it
will get too hot. Pile temperature indicates the work of the microbes. If the pile does not get
hot, something is interfering with the microbes’ ability to reproduce and digest the compost
aerobically. The heat caused by the thermophilic bacteria is relied upon to kill pathogens and
weed seeds. Creating the right mix and procedure for a compost pile takes some
experimentation, but the agricultural rewards are significant.

2.2.2.3 Composting in the International Community

There are very few organizations in existence that deal exclusively with compost. The
United States Composting Council (USCC) is one of the few. They work with the USDA to
provide regulations and guidelines for testing compost using the Test Methods for the
Examination of Composting and Compost (TMECC). In the United Kingdom, the Waste &
Resources Action Programme (WRAP) and the Association for Organics Recycling (AFOR) help
compost producers get certified in accordance with the British Standards Institution’s Publicly
Available Specification for composted material (BSI PAS 100). These standards are the minimum
requirements for composting and are a step in receiving the Quality Protocol for Compost
certification to sell compost as a product (Introduction to PAS 100:2005, 2005). Many organic
organizations will accredit compost as organic. However, that accreditation only asserts that
the compost is free of inorganic additives; it does not account for the safety or viability of the
compost.
2.2.2.4 Test Methods for the Examination of Composting and Compost

In an effort to provide industry wide standards for quality and safety the Composting Council Research and Education Foundation (CCREF) in a joint project with the USDA produced the Test Methods for the Examination of Composting and Compost (TMECC). The TMECC reviews relevant terminology and concepts in each section and suggests tests for examining compost’s physical, chemical and biological properties. The USCC provides the Seal of Testing Assurance (STA); a testing and monitoring program based on the guidelines and regulations of the TMECC (US Composting Council, 2009). The TMECC strives to capture all of that information in one document.

2.3 The Mission of the Diocese of Fall River, Massachusetts

In 2000, the Bishop of the Fall River Diocese in Massachusetts, Sean O’Malley, pledged the commitment of the diocese to serve the poor in another area of the world. His statement from the beginning was: "We are there to share our human, spiritual and financial resources with the Church in another part of the world that has great needs. And at the same time, they can enrich us by their faith and our solidarity with them." The diocese of Fall River partnered with the Santa Rosa de Lima Parish in Guaimaca, Honduras (Honduran Mission, 2000). Since then, Fall River has supported their endeavors to help their community by providing not only monetary donations, but their time, volunteer work, and spiritual support.

2.3.1 Introductions of the Mission Staff in Guaimaca

Residing at the Saint Rose of Lima Parish in Guaimaca is Father Craig Pregana, Sister María Ceballos, Sister Marta Toro, Sister Gloriabel Mendolza and Sister Silvia Leon. This small group works together to support the three projects. Sister María is the main coordinator of the projects. She is also a nurse practitioner and works regularly at the medical clinic. Sister Marta takes care of the finances, and can usually be found helping at the girls’ school along with Sisters Gloriabel and Silvia.

The team at the Saint Rose of Lima Parish plays an important role in the community. While they help immensely by providing food, shelter and clothing where they can, they are also a spiritual beacon for the people that may be struggling. Many Hondurans live in sub
standard conditions and it is the church family’s responsibility to spiritually uplift the people in
their community to where they can live their lives in good spirits despite their condition (Mejía,
Gómez, Pregana, & Pregana, 2009).

Another key player in the projects in Guaimaca is Mr. Emilio Rodriguez. He is the
manager of Nazareth Farm and the driving force of the composting project.

2.3.2 Medical Clinic

There are four workers at the medical clinic in Guaimaca: “We have a nursing assistant,
and a kind of pharmacist, he prepares all the medications that we give to the patients and
taking all the vital signs for the patients when they come in. And then we have one of the
Sisters is working with the Authoritive of Biomagnetism Therapy, and then the other person is
helping us in registering the patients and all that,” (Ceballos, 2009). There is currently no doctor
on staff at the medical clinic. Including Sister María there is a total of five workers at the
medical clinic. Between the five people, the medical clinic attends to around thirty patients a
day and forty on busy days. Due to these personnel constraints and the other projects in town,
the clinic is usually open from 7:30AM to 1:00PM.

The treatments at the medical clinic include: “mostly primary care for children, adults,
elderly, older chronic illness, hypertension, diabetic.” However, María states that they try not to
just “put Band-Aids” on the patients, but try to educate and use preventative care as much as
possible. Medicine is the main expense at the clinic, and the finances to cover this expense
come from the generosity of the Diocese of Fall River (Ceballos, 2009).
2.3.3 The Marie Poussepin Center for Integral Formation for Girls

The Marie Poussepin Center for Integral Formation for Girls, shown in Figure 3 above, was established in 2005 and was named after its founder. The Marie Poussepin Center began with only 14 girls, 10 of which graduated as recently as 2008, and one of which is returning to become a teacher at the school. The school now has all grades available from seventh grade up through a completed high school education. Figure 4, shown below, is a group picture of all of the students at the Marie Poussepin Center from 2008.
The girls attend school Monday through Friday and go home to their families on the weekends. The school currently enrolls a total of 61 girls, and has a capacity of 62 students. Depending on the number of beds available, the projected capacity is 70 students for 2010. Sister María Ceballos describes the vision for the school’s accommodations: “We wish we had more space, because we have the ability, I think. With the same number of teachers that we have we could have maybe 100 (students) but we do not have the space. We are praying that some of the space around the school will be for sale at some point so that we could expand a little bit,” (Ceballos, 2009). The school has also grown in educational abilities, and has been able to incorporate more subjects into its curriculum, including soccer and sewing, making for a more holistic education. Figure 5 shows the girls warming up for soccer in their new, recently donated school gym clothes.

As mentioned in section 2.1.5, education in Honduras is primarily reserved for those who can afford a private education. Those in rural areas usually have no education available to them beyond the third grade. This is why enrollment at the Marie Poussepin Center is free and only open to the poor families who need it most. “Our priority is to make education accessible to young girls from the villages, because in the village there is only primary school. ... We try to assess the families to make sure that we are reaching out to the neediest,” (Ceballos, 2009).
All ten of the girls who are graduating from the Marie Poussepin Center are currently attending a one-month seminar on agriculture at the nearby Agricultural University. They have been provided with room and board by the school and will be issued certificates at graduation. The University is also offering full scholarships for the graduates of the Marie Poussepin Center. “We are very excited about that because this shows that they really value what we are doing within the high school curriculum with organic agriculture,” (Ceballos, 2009). While most of the week is spent in the classrooms such as the one in Figure 6, the students visit the farm and composting project at least once a week.

![Figure 6: Participating in class](image)

The biggest benefit that the school provides for the students is the change in these girls’ outlooks on life. This school helps the girls break free of the region’s culture that says their only duty is to have children. For example, there are three girls at the school who are very good at math and say they want to go to college and become math teachers. The school motivates these girls to become teachers or agricultural experts, and shows the students that they can achieve things beyond what their parents or grandparents thought would have been possible. “It’s amazing how motivated they have become, because they say we come from rural areas, and we are very happy to learn about agriculture so we can teach our parents and families and value the earth, and be able to learn how to use it in a safe and ecological way,” (Ceballos,
2009). As Sister Marina put it: “They’re teaching them how to live... they’re teaching them hygiene, values, to take care of themselves... and most of all to bring these things home to their families,” (Mejía, Gómez, Pregana, & Pregana, 2009).

2.3.4 Nazareth Farm and the Composting Project

The land owned by Nazareth Farm covers approximately 250 acres, about 30 of which is cultivated land. Most of it is pinewood forest, and it is hoped that it will remain that way for the sake of environmental preservation.

As mentioned in section 2.1.2, Honduras lacks the blanket of nutrient-rich volcanic soil found in its neighboring countries. Sister María explains the difficulties: “(The soil is) very sandy in some areas, very acidic soil most of all, the pine most of all. So you really have to work the ground to get anything going. I read when I was coming here that Honduras has been cursed with the worst soil of all of Central America. ... I think that’s why poverty is so widespread, because very few people can have the means to really regenerate the soil to cultivate anything else other than corn and beans,” (Ceballos, 2009).

The organic composting project was undertaken in Guaimaca in order to regenerate this poor soil without sacrificing the surrounding forested areas, and has already had some success. “We have been using (the compost) already; it is almost the only thing we are using at this point, so we have been able to decrease a lot of the investment of buying of fertilizers... We do have to buy a few things, for example, lime because of the acidity of the soil." (Ceballos, 2009). The compost has revitalized the soil and made agriculture feasible where even the previous land owner never thought possible. “All he had was cattle; and now he cannot believe what we have been able to do with the farm. But we have had to invest quite a bit to be able to get to the point where we are, being able to plant tomatoes and bell peppers and pretty much any kind of vegetable,”(Ceballos, 2009). The food produced by the farm first goes to the school to feed the students; any excess crop is sold in town. The students greatly benefit from the farm’s nutritious produce, and the procedures at the farm are incorporated into the agricultural aspects of their education.
Currently, the nutritional and educational benefits are the only two benefits coming from the composting project. There is currently no profit, or even self-subsistence; all of the endeavors in Guaimaca are still very financially dependent on their Fall River benefactors. Ideally, they want to be able to produce a relatively steady source of income so that they can rely on their own income more than donations. “We have been investing so much, and the farm is really almost fully equipped to produce plenty, but we do not have enough money. … The income, as far as produce and all, is not much, but the farm has increased in value tremendously by all these things that we’ve been able to do … So we hope that the organic compost could really be a main source of income once we get everything straightened out with all the legalities.” (Ceballos, 2009)

The legalities that Sister María is referring to are the organic certification through BioLatina. With the organic certification, the compost can be sold to generate income for the town. The application for this certification was sent to BioLatina in 2008, and due slow management and political unrest in Honduras, BioLatina has only recently replied. Originally, in the summer of 2009, this project was meant to help achieve the organic certification through on-site testing at the Nazareth Farm. But after some research it was determined that the only way to get any official organic certification would be through an accredited organization like BioLatina. After the year of waiting for processing of the application, the certification process now will finally be coming to a conclusion. With the organic certification in sight, the goals of the project shifted focus from on-site organic testing to general improvement of the process by decreasing costs and increasing benefits for the farm.

The main contributor of the composting project is Mr. Emilio Rodriguez. Rodriguez has a technical high school degree with an orientation in agriculture and sixteen years of agriculture experience. Communication was limited for this project due to the language barrier, so most communication with Mr. Rodriguez was conducted through Sister María, who describes him as “very passionate about agriculture.” She continues on to say: “He’s very intelligent; he has very much a researcher mind, so he uses the internet a lot to look up different things and value what he’s doing trying all kinds of things. So for us it is a real blessing that we were able to find Emilio
to take on the farm because we could not do anything with it. We are really hoping that he’ll be able to get a degree, and we keep searching for possibilities that he can do, like online. ... He is really a competent, intelligent person. ... We would like to be able to support him and encourage him to keep studying.” (Ceballos).

Most of Mr. Rodriguez’s research on composting was done online, as Sister María stated. Due to the limitations in supplies and materials, his composting method was adapted for resources that are available. The resulting composting process that is being used on the farm is a unique combination of composting methods which is patent-pending. In order to get an idea of the sheer size of this project and the depth of progress achieved, as well as the limited extent of resources at Nazareth Farm, some of the pictures from the patent application by Mr. Rodriguez are provided in Appendix E.
Chapter 3: Methodology

This chapter details the means and methods used to both define and achieve the goals of this project. This includes the background research, interviews, redefining of the project goals, and how those goals were achieved. The primary goal of this project was the creation of the Composting Guidebook, which is summarized in this chapter.

3.1 Preliminary Research

In order to properly define the goals that will most effectively help the mission in Guaimaca, and to pursue those goals effectively, research was conducted on Honduras, the science of composting, and the projects in Guaimaca. For the last topic, oral and written interviews were conducted with not only Sister María and with Mr. Rodriguez, but also some contacts in Massachusetts, to better understand the project goals and vision in Guaimaca and to determine how this project can better benefit Nazareth Farm according to their needs.

When this project was first discussed in the spring of 2009, it was to take place in Guaimaca, Honduras in August and September of 2009. However, after the political unrest in July 2009 and the ensuing safety concerns, the travel plans were terminated. The project was still pursued, but via long-distance communication rather than first-hand experience. This was a difficult obstacle; however the interviews held with a few people in Massachusetts who had been to Guaimaca were very helpful in understanding the culture and needs of Guaimaca projects.

An interview was held with Sister Marina Mejía and Sister Lucia Gómez, each of who has served at the Saint Rose of Lima church in the past, along with Father Craig Pregana’s parents, Flo and Arthur Pregana. The interview was held in Dighton, Massachusetts, at the main house of the Dominican Sisters of the Presentation.

Another helpful source of information was a freshman here at Worcester Polytechnic Institute. Jean-Paul Miralda had grown up in Tegucigalpa, Honduras, and has even been to Guaimaca, so he was able to relate his experiences and background to help with the project.
3.2 Original Project Goals

Much communication took place with both Sister Maria and Mr. Rodriguez to get an idea of how this project could benefit their composting project. Their original intention for this project was for the project team to find the tests and their procedures that were required to certify the compost as organic, and to design and set up a laboratory at Nazareth Farm so that this testing could be done on-site. The proposed location for this laboratory was an abandoned, but very intact ambulance, shown below in Figure 7.

![Figure 7: The abandoned ambulance in which a laboratory is planned to someday be built](image)

After conducting research over the summer of 2009, it was determined that this particular goal could not be pursued after confirming that there is no organization that offers a self-certification option. Without this goal, other ways that this project could help the composting project had to be defined through further analysis of their Mr. Rodriguez’s current composting process.
3.3 Redefined Project Goals

As mentioned in section 2.3.4, Mr. Rodriguez gathered almost all of his information on composting from the internet. After looking over his current composting method, it was determined that the best way to help with this project would be to provide a more reliable educational document about composting. The resulting goals for this project were redefined as follows:

1. Create a standalone, sustainable Guidebook that summarizes the useful information (textbook material and testing procedures) from the Test Methods for the Examination of Composting and Compost (TMECC) document published by the United States Composting Council in layman’s terms for educational purposes.

2. Make specific recommendations for improvement of the current composting process.

It was decided that rather than providing only specific suggestions to improve Mr. Rodriguez’s composting process, it would be more beneficial to provide an educational document. Therefore, the primary focus of the Guidebook is to explain the science of composting, and to provide test procedures so that the composting process can be monitored. With this more comprehensive background, the composting procedure that is currently used can be continually improved upon for years to come. Providing specific suggestions is a secondary goal; with education and the ability to conduct tests on the compost, Mr. Rodriguez should be able to discover these potential areas of improvement on his own.

It is hoped that using the Guidebook will both decrease the costs of producing the compost and also improve the compost’s effectiveness. The TMECC provides detailed procedures of any necessary test as well as much information on the composting process including internal processes, elements and compounds and biological matter. The TMECC will be sent to Guaimaca along with the Composting Guidebook. The Guidebook will also be translated into Spanish by another Worcester Polytechnic Institute project group made up of students taking advanced Spanish courses and sent again to Guaimaca.
3.3.1 Goal #1: Creating the “Composting Guidebook”

All of the tests provided in the TMECC were included in the Guidebook. The tests were divided up into three sections:

1. Useful tests that are simple enough to be done on-site,
2. Useful tests that would require laboratory facilities,
3. Tests that have been deemed unnecessary at this time because they determine information that would not be beneficial in improving the composting design, or information that can be found through another, easier test already described, or that are not of concern to Nazareth Farm.

The following sections include a description of the educational material and descriptions of the three groups of tests in the Guidebook.

3.3.1.1 Educational Information

Preceding the descriptions of different test procedures in the Guidebook there is a section with educational information. This section includes: a glossary of terms and concepts relevant to the science of composting, descriptions of different essential elements, minerals and nutrients that are beneficial to plants and why, an in-depth description of the composting process, and also descriptions of how to detect nutrient deficiency in plants or if a plant has too much of a nutrient to the point that it has become toxic. This information was collected from a variety of textbooks and websites on the subject which can be found in the Guidebook bibliography.

3.3.1.2 Tests: Group 1

The tests in the first group have simple enough procedures to be done on-site. They require limited materials and are useful in determining compost characteristics. These procedures are described in detail. There are six procedures described, as follows:

1. Field Sampling of Compost Materials: A procedure of how samples should be collected, stored and transported to the off-site lab so that there is minimal change in the composition of the sample, improving accuracy of the data.
2. **Squeeze test**: Guidelines on how to determine if the compost has the desired moisture content by taking a handful, squeezing it together, and making observations.

3. **Field Density, Free Air Space and Water Holding Capacity**: This procedure includes collecting a sample, preparing it, weighing it, drying it, and weighing it again. The calculations to find these three properties are also included.

4. **Color and Odor**: How to use these simple observations to determine the progress of the composting process.

5. **Estimate pH with Red Cabbage**: The procedure to determining an approximate pH level of the compost by using red cabbage juice as an indicator.

6. **Indicator Ratios**: A worksheet with equations that can be used to calculate element ratios. These ratios can then be compared to the graphs included to make observations about the maturity and quality of the compost.

Also included in this section is a suggestion for a school project for the girls at the Marie Poussepin Center. This project is not from the TMECC, but it is an original idea from the authors. The project involves each student getting a small plant to care for with soils of slightly different, known soil compositions. For example, one girl may get a plant in compost that has extra lime added to it. Another girl can have a plant in compost that has extra phosphorus or potassium. A third girl may have a plant in compost that has extra sodium or chloride. There should also be control plants given where the compost or growing medium is unaltered. Each girl would then grow her plant and they would compare their plants the growing season. By making observations of the differences in the plants they may be able to draw conclusions about how their altered soils changed the way their plants grew.

This could take place every year and the girls would compile their findings in a logbook. The alterations in the soil composition could also become more complex over time. Over the course of a few of these projects, the students will collect much information, and hopefully find patterns and make conclusions, about how alterations in the soil can change plants’ growth and health.
3.3.1.3 Tests: Group 2

The tests in the second group also determine useful properties of the compost, but the procedures would require expensive laboratory equipment and more accurate results. It is recommended that these tests be requested when compost samples are sent to the lab for testing. This section also includes how to interpret the results that are returned from the lab. The lab can provide the percentages of important compounds and nutrients including organic and inorganic carbon, soluble and insoluble nitrogen, as well as twenty-five other essential nutrients.

3.3.1.4 Tests: Group 3

The tests in group three determine information that would not be beneficial to the compost design, and can be found through easier tests already described, or that are not a concern for Nazareth Farm. The following information is given for tests listed in this section: a summary of the test’s purpose, an explanation of why they were put into this section, and where to find their procedure in the TMECC. There are a total of 22 tests in this section.

3.3.2 Goal #2: Specific Observations and Recommendations

The second goal of this project refers to specific observations made about the current composting procedure. Since these recommendations are specifically for the procedure that Mr. Rodriguez is currently using, they would not be helpful to future readers of the document, so it is a secondary priority.

The purpose of the Guidebook is to demonstrate describe how the composting process works so that the current composting procedure can be improved upon. During the research to create the Guidebook, observations were made of Mr. Rodriguez’s composting method. Some of these procedures did not seem necessary, or were detrimental to the compost. For example, some of the chemical processes, additives, or ratios in the mix design were not ideal according to the TMECC. Other kinds of observations included physical attributes. For instance, aerating liquid compost with a bucket works marginally well, but the element ratios in the liquid compost showed signs of insufficient aeration. With that in mind, a few recommendations were made on different ways to aerate the liquid. There are suggestions involving most of the
current composting process, however they cannot all be included here due to the patent-pending state of Mr. Rodriguez’s procedure.
Chapter 4: Expected Benefits from the Use of the Guidebook

The Composting Guidebook was developed for Nazareth Farm to educate the reader on composting. Primarily, Mr. Rodriguez will be using the Guidebook, but it can also be used at the Marie Poussepin Center as educational material. This section goes over the benefits of these uses, as well as the long term benefits of the composting project.

4.1 Financial Benefit

The Guidebook includes descriptions of the physical, chemical, and biological processes that occur during decomposition, as well as the roles played by different elements, compounds, nutrients and minerals. This knowledge, accompanied with the test procedures also included in the Guidebook, will allow Mr. Rodriguez to monitor nutrient levels in each of the compost batches. Mr. Rodriguez can compare the guideline’s ideal conditions for creating compost with his own test results obtained by his current procedure to improve the agricultural benefits, control the quality of their compost, and find steps in the procedure where costs can be reduced without undermining the resulting compost, thus decreasing the cost of production.

The costs for production are extremely important for Nazareth Farm. In order to produce one batch of solid compost and one batch of liquid compost with the method developed by Mr. Rodriguez, it is calculated that the current equivalent of 25,500 United States dollars must be invested, and all of that money currently comes from donations (Rodriguez, 2009). Following the procedures documented in the Guidebook will help decrease the farm’s dependence on donations so that finance planning will be easier for all of their projects. As a result, the farm will be able to acquire an income by selling the compost and the agricultural products from Nazareth Farm. This income is not only needed for Nazareth Farm and the composting project for labor and materials, but will also help to alleviate the financial need for the other projects. There are expenses for the Marie Poussepin Center such as the payroll of the teachers, everyday educational materials, and also future plans to expand the school so that more girls can be enrolled. Resources are needed at the medical clinic to pay the workers, and for medical equipment and supplies.
4.2 Direct Benefit to the Students at the Marie Poussepin Center

The second projected use of the Guidebook is as an educational resource for the students at the Marie Poussepin Center. The main section that can be used for educational purposes is the first section, which is textbook material on the science of composting. Each section covers different processes that happen during decomposition, not unlike a regular textbook. This can easily be worked into the students’ normal lessons on agriculture. The second section that would be useful is the section that describes tests that can be done on-site. Understanding the tests and how they work will help the girls’ understanding of the decomposition process and how the compost will help plants when applied to the soil. The students could help with the sight and smell test or even the other lab tests. It is with hands-on testing and projects that the girls will learn the most. Therefore, the last and most appropriate section that should be used for their education is the section describing a possible student’s project, which is discussed in section 3.3.1.2 of this report. With the project, the students will be able to apply the textbook material from the Guidebook as well as apply their experience in testing procedures.

4.3 Long Term Benefits

Since these finances will be supporting the Marie Poussepin Center, they are more broadly supporting education for women, an area that is very lacking in Honduras. This school takes rural girls who had almost no chance at secondary education and breaks their family tradition of poverty by providing them with an education. Even if they do not move on to additional schooling or a career, they will still be bettering their communities with their agricultural knowledge. These young women will likely someday be mothers and head of households. They will have much influence on future generations in Honduras. The education these girls receive at the Marie Poussepin Center gives them a sense of purpose and future in their lives. It is hoped that because of their education it will be less likely that they will have as many children as other Honduran women. This will lessen the overpopulation problem in Honduras, decreasing the amount of children dying from malnutrition.
The other long-term benefit of this project is agricultural progress. Not only will organic compost be benefiting Nazareth Farm, but if the compost is sold to farms in other places in Honduras, then this compost will be helping to revitalize soil all over the country, which will not only benefit individual Hondurans, but also increase agricultural productivity and boost the economy that depends so much on agriculture.
Chapter 5: Conclusions & Recommendations

The goal of this project was to create a standalone, sustainable Guidebook that summarizes the useful information from the TMECC as well as other educational information. The Guidebook also provides useful observations and recommendations of the currently used composting procedure. The priority of this document was education. As an educational document, improvement on the current composting process can be pursued independently, and it can also be used as an educational resource for the students at the Marie Poussepin Center. The document was also intended to be sustainable. Any future generations that might use this document for unforeseen reasons should be able to do so. All of the test procedures in the TMECC were included, from those that could easily be done on-site at Nazareth Farm to those that could only be done with advanced laboratory equipment. The final sections included in the Guidebook referred to specific recommendations on the current composting method. These last sections were not so much sustainable but rather a place to begin making changes and improvements on the composting method.

Included in the recommendations sections are the following:

- **Exporting the Compost**: There will be more restrictions, limitations and testing. All additional testing will have to be done in a lab and most of the tests will be more complicated and likely more expensive. To address this, striking a deal with a lab or the nearby Agricultural University may be advisable. Perhaps instead of charging per test, they receive a certain percentage of the profits.

- **Windrows (A form of composting in which the compost is piled into long rows)**: This form of composting is very efficient but requires a large machine for aerating the compost. A windrow turning machine will likely be very expensive, but it might be something to look into to increase efficiency in the future.

- **Tailoring the Compost**: In the future, it may be possible to tailor specific compost batches to a specific customer group’s needs. For example, sea plants, such as algae, have different nutritional needs than land crops. By tailoring the compost...
batches to specific plants, it may be possible to sell the compost for more because it would increase the yield for the buyer’s crops.

Immediately following this project, the Guidebook will be sent to Guaimaca in English, along with the TMECC. The Guidebook will subsequently also be translated into Spanish by another Worcester Polytechnic Institute project group made up of students taking advanced Spanish courses, and the translated version will be sent to Guaimaca before spring of 2010. Upon receiving the Guidebook, the next step is for Mr. Rodriguez, his apprentice, and the students to learn as much as they can about composting, in detail, so that every aspect of the composting project can be streamlined and improved. This will take time, but the benefits will be tremendous.

A long-term goal at Nazareth Farm is to design and implement an on-site laboratory, most likely in the abandoned ambulance mentioned at the beginning of Chapter 3. This space is intended to become an area for carrying out the laboratory tests prescribed in the Guidebook. The ambulance will also provide a location to mix and divide the compost samples where they will not be affected by the elements. The ambulance can be used to store the equipment used for preparing the samples since they should all be kept clean so that they do not contaminate the samples. The ambulance could also be a good location to store regularly-used materials like containers for shipping and mixing, labels, tape, cooling packs, balances and scales, logbooks, color charts, nitrogen/phosphorous/potassium (NPK) kits, compost thermometers, and anything else needed for the compost. Using this convenient location for testing the compost will decrease transport time of the samples, making the results more accurate.

Since transforming the ambulance into a proper laboratory was originally intended to be the main goal of this project, it is very feasible to turn this task into another Interactive Qualifying Project in the future. The Guidebook has a section detailing recommendations for the equipment that should be in the laboratory, including recommendations of what equipment to purchase. Among these are a triple beam balance, a simple pH meter, test strips for nitrogen, phosphorous, and potassium, and other simple laboratory materials like beakers, graduated cylinders and thermometers.
If a future project group decides to modify the ambulance into a mobile laboratory, there will be many challenges. One challenge is the little space available in the ambulance; the area inside is only about two by five meters. The most beneficial materials and equipment needed for tests should be determined and made the most readily available, and less important equipment should also be accessible somewhere in the laboratory space. All of the materials and equipment must be able to fit inside, so there might be some gutting of the existing ambulance necessary to gain space. The ambulance is still in working order, and it is possible that it may need to be driven to another location at some point in the future. Therefore the storage should be designed in such a way that there will be no possibilities of equipment breaking when the vehicle is in motion.

If a laboratory can successfully be built, it will very helpful in streamlining the tests. With a conveniently located space reserved for daily testing, it is hoped that a quality assurance and control system can be created and implemented. Also, once there is a set location to perform tests, it would also be beneficial to purchase more expensive and accurate equipment to perform the more complex tests given in the Guidebook. Hopefully it will lead the people of Guaimaca to learn more ways to successfully and environmentally grow their crops, and bring wealth to the region.

The laboratory is indeed a lofty goal for Nazareth Farm. There is currently no scientific equipment of any kind available, and there is no training available for the use of complex laboratory equipment either. Such materials would be difficult to obtain and expensive, and the only way they might obtain such materials now would be through the help of a benefactor, such as the Fall River Diocese. However, for now, this particular goal remains long-term.

While the future cannot be seen, with the convictions and high ambitions of the team in Guaimaca, it is easy to predict that these projects will be vastly successful and beneficial to the community of Guaimaca and to other areas around their country.
Bibliography


Appendix A: Pamphlet of the Marie Poussepin Center for Integral Formation for Girls, Distributed by the Dominican Sisters of the Presentation
The Mission

Honduras is the third poorest country in Latin America. The Honduran people are friendly, warm and welcoming, but it is a country with great needs.

Unemployment is high, 60% of the population live in poverty, many in extreme misery without electricity, running water, or adequate food. Many children suffer from chronic malnutrition and 35 out of every 1000 children die from diarrhea each year, usually related to water borne infection.

In the case of education, 20% of the population cannot read or write. Only 21% of Honduran children finish primary school. In 1996, Hurricane Mitch wiped out whole neighborhoods killing 13,000 Hondurans and left over 2,000,000 people homeless.

In the Jubilee year 2000, the Diocese of Fall River committed to share its resources with the Church in Honduras. A team of 1 priest and 2 religious sisters have been working in two parishes and over 40 mountain villages. Besides meeting the pastoral needs of the community a medical clinic was established to help address the lack of health care for the poor.

We hope that you will become partners in serving Jesus and His poor brothers and sisters.

The Marie Poussepin Center

In 2003 the Marie Poussepin Center for the Advancement of Women was opened to foster self-reliance among the many poor and vulnerable women of the area. In 2005 the Center was expanded to house disadvantaged girls from outlying villages (aldeas) so they may be able to continue their education in a safe environment. The Center has gradually expanded and started offering comprehensive formation, including all the academic courses.

In 2008 the Center now accommodates more than 60 young girls from the poorest villages in the Guaimaca, Honduras area. Without a safe environment and dedicated team of teachers, these girls from poor rural families have no opportunity for education beyond grade six.

The Marie Poussepin Center for Comprehensive Formation is a part of the Parish of Santa Rosa de Lima, Guaimaca, Honduras which is a mission of the Diocese of Fall River, Massachusetts. Facilities of the Center were constructed primarily by Diocesan volunteers and their donations.

Scholarship Program

You have the opportunity to help by making a monetary contribution toward the $80 per month needed to pay for the basic living and education costs of a child at the Marie Poussepin Center.

The Honduran families are asked to give what they can toward their daughter’s room, board and education. However, this averages about one tenth of the $80 per month needed to cover each girl’s expenses.

Your monthly, quarterly, or annual contributions are placed in a general fund so that all residents are treated equitably.

Through your support a child is given hope and is blessed with an opportunity to break the chains of poverty through an education in a Catholic environment. The hope is that they become leaders in society and in the Church.

Learn more about the Mission and how you can help at: www.HonduranMission.org
Bank Authorization for Automatic Contributions

I authorize the Dominican Sisters of the Presentation to automatically deduct my contribution to the Scholarship Program for the Marie Poussepin Center from my checking account.

Print Name ________________________________

Address __________________________________

City, State, Zip ____________________________

Monthly Contribution Amount $ ___________

Preferred Day of Month _________________

Bank Account Number _______________________

Name of Financial Institution _______________________

Financial Institution Routing Number _______________

This authority is in effect until terminated by me in writing.

Signature __________________________________

Date ________ Phone _______________________

Please attach a voided check and mail to:

Dominican Sisters of the Presentation
CMP Scholarship Program
3012 Elm Street
Dighton, MA 02715
Appendix B: Interview with Sisters Marina and Lucia and the Preganas at the Main House of the Sisters of the Presentation in Dighton, Massachusetts, on October 19, 2009

Marina: “The money is the work of the volunteers, the people that have been helping for years and continue helping because there is for example – you see, many people have accepted one of these, and one of these is to commit themselves to give twenty, twenty-five dollars every month for the girls, because how are they going to be fed and receive their classes because they finish their high school they are in the center and it is officially accepted by the government so that’s basically, many, many people help us through this.”

Mary: “Are each of these endeavors separate financially?”

Marina: “In theory. Because the center cannot be separated from the farm because half of the food comes from the farm, and the clinic cannot be separated from anything else because the volunteers are the ones that send the medication whenever it is possible and they have helped for a long time to pay the salary of the doctor, and all this kind -- there are people that help to pay for the salary for Emilio. So you see you cannot separate them, they, you are going to look at the accounts they are separated, but in reality it’s all one.”

Flo: “It’s all funneled into one because, really, the money isn’t there. What little money they have is all into one.”

Mary: “Because it’s not really the money that gets passed between each of them, it’s just goods and services, that’s the majority of the wealth, not really money.”

Flo: “But there isn’t any extra money, they don’t have enough to do what they want to do for the farm for the medical building, for the girls, there’s just not enough”

Mary: “There’s like barely enough to just function and make it work.”

Flo: “Exactly, exactly.”

...
Flo: “Donations, I mean, without donations...”

Marina: “No, without donations it would be absolutely impossible.”

Flo: “Exactly, and with times being so tough now like they say you see the donations, little by little, they’re skimping, with the economy here. It’s a difficult situation.”

...  

Marina: “The point, to me, that is very important, it is that down there, anybody that go, knows where the money is going, there is no doubt, because things have grown so far, and have grown so much that people know what happened with the money that they had given. Because of the things like this, and they receive the notices from time to time and...”

Flo: “And they can go down and see for themselves, they can see the progress that’s been made”

...  

Arthur: “Well like the Sister mentioned, it is a team of people that are down there, particularly the Sisters, the Priest, the Dioceses, those are the important ones to say to uplift the people to get them going to whatever part of life that their going to live – their way of living is by no means poor. It’s sub-poor, I want to call it. So they know no other life, they’ve accepted that part. They’re trying now to uplift them to another plateau. And of course, Education is the primary concern for them. Without the help of the Diocese, it would be, I don’t know where they would go.

Flo: “The sisters and the priest really are the foundation down there, and then it grows from that; spiritually, of course.”

...  

Marina: “The Center is a school that is not in school, because it really they live there, and they come every week from their villages and they stay the week and go back the weekends to be with their families. At the beginning they were following the courses of the
local schools, but it didn’t work, because the local schools don’t function all the time, let’s put it that way, so they have in Honduras what is called a Teacher at Home, that is officially accepted by the government, but then you have to have the set of teachers, and that is what the school has: teachers that take care of the whole curriculum for the girls.”

Mary: “Who are the teachers?”

Marina: “The sisters help but they have also local people that they hire to teach.”

Mary: “Do they get paid in money?”

Marina: “They get paid in money from the help that comes from the donations. Now what is being very nice is that at least one of the girls that finished already and graduated is coming is getting back helping in the -- to follow with the others as a teachers, and I’m hoping it will be more and more because again, especially one of the University, two of them, after they came and spoke with the sisters and they saw the program and the whole thing at the center they had offered some scholarships to the girls.”

Mary: “Who is this?”

Marina “The Agricultural University, when they came and talk and saw what is happening. So the girls that finish, they are going to finish at the end of the month, there’s another graduation, they have been offer the scholarships to the university, full, full scholarship. Because the number is not as large as you go for school here, it just cannot be, there is more groups but the idea is to help those girls to go ahead in life, to be able to promote in their own little villages, to help there, not only with their religious education but with, they teach them to make their little gardens to be able to grow their own food,”

Flo: “In their daily life to help in their families.”

...

Marina: “You are 14, 15 years old and you have to have a child,”

Flo: “It’s the culture, there.”
Marina: “It is the culture, you have to have a child like 14, never mind that the man is going to leave you stuck with the child.”

Flo: “They don’t even get married most of the time”

Marina: “They don’t talk very often about marriage they talk about living together.”

Flo: “Yea, that’s it, but that’s their culture, you know?”

Marina: “But when you have so little in life, you have to have something.”

Flo: “You know no other life, some of these girls; most of them know no other life on the outside.”

...

Flo: “Not only the education, well the education too, but, they’re teaching them how to live. Like they have their own cubicle, their little rooms, and they teach them hygiene, stuff for themselves, so they can know once they leave there the health part of it, María is just doing a fabulous job.”

Marina: “And they’re teaching them really values.”

Flo: “Oh yes, of course, to take care of themselves.”

Mary: “And how to spread that to the other people they know?”

Flo: “Not only that but when they go home on the weekends, to their families most of all”

Marina: “And I remember one expression used by *name* He is a professional carpenter, but he’s a retired one and sometimes he had gone there two three months just to work. And he was saying one day ‘You know it’s such a big difference between the first group of girls that we came to know here and what we see now. Their behavior, their whole exterior is so different.’”
Mary: “Kind of more aware of themselves?”

Marina: “Yes and present, and understanding that life is something else.”
Appendix C: Phone Interview with Sister María on October 21, 2009

Supriya: “With the BioLatina certification, are they going to continuously test for organic?

María: “They do one site visit per year, once you have met all the requirements; they come to do another evaluation, supervision like once a year.”

Supriya: “They only do that to certify that it’s organic?”

María: “Yes”

Supriya: “So any other things you want to tell people you have to test it, such as the nitrogen carbon ratio?”

María: “The laboratory that we hope at some point to have at the farm it would be to ensure that every batch that we get out of the compost would have the same elements, to make sure that we keep the quality of compost that we have right now.”

Mary: “So you want to be able to test that regularly.”

María: “Yes, it’s like the quality assurance testing, we have been told that our compost is very good and we have so much copper and calcium, magnesium but we want to make sure that we keep that quality.”

Mary: “The document we are making will provide procedures and things you need to make sure are there and aren’t there and test for so we just want to be able to summarize it –”

María: “To help us improve, no?”

Mary: “Exactly, yes”

María: “We have the basics right now, like the magnesium copper and some other things, but it would be nice to find out what other things could be there.”
Supriya: “Once the laboratory gets built near the farm, will the people who will be running the tests will they be fluent in English or should we translate the other tests as well?”

María: “Um, yes please. *laughs* No we don’t have anyone right now. Emilio is not... he does not handle English.”

Supriya: “So will Emilio be working in the lab when it’s built?”

María: “I think so, I mean at the beginning. He is the most competent person we have right now but we will have to see how we continue, ensuring that we have somebody well trained. We certainly will need some training.”

(...)

(Discussion of translating the Guidebook)

María: “There are a couple of volunteers that come once a week; they are Americans. Maybe that could be something that they could help us with?”

Supriya: “Definitely, they could help you with the document that we’re making as well as the actual manual from the company when you’re ready to use that which probably won’t be for a while. The manual we’re making so that you can use it right away.”

María: “Oh, nice! For the sending it down, I was thinking that, I don’t know if December is too late to have that information? If not, I know somebody, volunteers that are coming back this coming week from the U.S. I could find out exactly the address and all that if you have something ready that you wanted to send down to start translating it. If not, we are going up, the sisters, for a meeting in Dighton at the end of December.”

(...)

María: “I arrive here in August of 2001, so I’ve been here a little over 8 years now. Originally I am from Columbia, and then I joined the Dominican Sisters of the Presentation. I was sent to Europe for about 10 years, and then after that I spent over 25 years working as a nurse practitioner in the U.S. with the Latino immigrant population mostly, in Washington D.C.,
and a little bit in New England as a Chaplain I work at the hospital in Fall River as a chaplain for three years and then I went back to Washington D.C to work with the Latino immigrants, and then to Honduras.

Mary: “What are your responsibilities? I know you have the medical clinic there’s also the girls’ school, and the farm, there’s lots to do, what are the things that you’re responsible for there, officially?”

María: “We have a community of Sisters; we are four, so I am now what we call the “Superior,” we call it. It is like being the coordinator of the community. And we work very much as a team, all of us, ensuring that the projects of the mission are working the way we envision as much as possible, trying to work with all the personnel that we have ensuring that the values of the mission are there and we are trying to provide holistic education as much as possible to the girls and then we try at the medical clinic: not just putting on Band-Aids as much as possible but trying to educate and do preventive care a little bit. We are integrating alternative medicine also right now; and then working with Emilio, ensuring that the farm keeps moving and that we have market for the produce and different things like that. But we try to do it as a team, we have our specific responsibilities, so I’m mostly with the clinic and then over-viewing with Sister Marta and the other sisters making sure that everything is moving. And then of the coordination for the groups that come, we get a lot of medical brigades and volunteers that come as groups, more as individuals so it’s also being available and coordinating the volunteers that come from the U.S.”

Mary: “About the church there, I was wondering what the church’s role in the community is, is it a very central role?”

María: “It is, because Honduras is at least 85% Catholic at this point, it used to be like 95% but the Evangelical groups have been very, very strong in Honduras, and I think at this point average it is about 85% is Catholic. So majority of the people here in Guaimaca for sure are members of the Catholic Church, or here in Guaimaca and in the villages. So we have leaders in the rural communities that are the main contact with the priest in town, Father Craig Pregana, and so he is the only one priest here but he has about 25 villages or more that he
cares for so he has the leaders in the different communities that will help ensure that there is all the religious education, preparations for the sacraments, first communion, baptism, marriage. So it is very, very central, very powerful entity for the Honduran people.”

Mary: “Also about the school, how many girls are enrolled there now?

María: “Right now we have 61, we have capacity for 62. For this coming year we are hoping to increase a little bit because the demand is just incredible, so we are going to increase it to 70. It’s a little bit, but we wish we had more space, because we have the ability, I think. With the same number of teachers that we have we could have maybe 100 but we do not have the space. We are praying that some of the space around the school will be for sale at some point so that we could expand a little bit.”

…

María: “This is all high school, the school is all the grades, from seventh grade up to finishing high school, so this is for village, our priority is to make education accessible to young girls from the villages, because in the village there is only primary school. Many of the girls are very far away, they have to walk 2, 3 hours before they can get here on Monday or before they are able to pick up the bus that makes the route in the mountain or the pick up a lot of them come down from the mountain in the open pick up several families get together and before that they usually have to walk 2, 3 hours to gather in one place. So village and poor, we try to assess the families to make sure that we are reaching out to the neediest.”

Mary: “When was the school founded?”

Maria: “We are in our fifth year now. We have had two little groups that graduated. Some of the girls come at different stages but we have 10 that graduated this year that are finishing this month.”

Mary: “So you started with 10 girls and now you’re at 61?”

Maria: “Well we started with 14 because it took time to build the school, the whole place has been built, so we started with 14 and now we are up to 70 or this coming year we
should be able to have 70. And then we are very excited because we are hoping and we have been promised already by the Agricultural University that they will have a full scholarship, our students will have a full scholarship to enroll in the Agricultural University. So the ones that want to study agriculture, they can at least be there for a year and a half, and take all the basics.”

Mary: “So it’s a one-year scholarship?”

María: “They could have the four year scholarship. It does not include the personnel the books and the transportation, but they have been taking at boarding in the University and that’s supposed to be covered by them. This month, all of the girls that are graduating, the 10 of them, are at the University doing an extensive workshop on agriculture, or not a workshop but a seminar, one month, and they have been covered completely by the University as far as room and board and they are going to be issued a certificate that they will be given the day of the graduation at the University. And we are very excited about that because this shows that they really value what we are doing within the high school curriculum with organic agriculture. The students go to the farm once a week, every Friday morning, and they have the class right there. And it’s amazing how motivated they have become, because they say we come from rural areas, and we are very happy to learn about agriculture so we can teach our parents and families and value the earth, and be able to learn how to use it in a safe and ecological way,”

Supriya: “Do the girls learn algebra by the time they graduate?”

María: “Yes, math is a very much a part of the curriculum. We have some of the girls are very good in math, and they want to go to college to be math teachers. So we are very happy about that, we have about three right now that are very good.”

Mary: “What is the soil like in Honduras? Is it very sandy or clay-like? What makes it difficult, what are the things that make it difficult to farm there?”

María: “Both. Clay like is like stone, and then also very sandy in some areas, very acidic soil most of all, the pine most of all. So you really have to work the ground to get anything going. I read when I was coming here that Honduras has been cursed with the worst soil of all
of Central America. That only like 13, 14 percent is cultivatable. I think that’s why poverty is so widespread, because very few people can have the means to really regenerate the soil to cultivate anything else other than corn and beans. Beans can grow in very sandy soil from what we have seen here.”

Mary: “This is why it’s so great that you have the composting project because that can revitalize the soil and make it so much more capable of growing plants that will be lush and full and produce nutritious food.”

María: “And we are already the most straight in that, some of the people in the community when they come to the farm they say, well the person that sold us the farm said like never thought that we could do any agriculture with the farm, all he had was cattle; and now he can not believe what we have been able to do with the farm. But we have had to invest quite a bit to be able to get to the point where we are, being able to plant tomatoes and bell peppers and pretty much any kind of vegetable and then corn, beans, and lots of plantains right now,”

Supriya: “How many acres is the farm?”

María: “Acres, we work here by mansanas and mansanas is like two acres, so it’s like 240 more or less. Maybe even 250 acres?”

Mary: “And that’s the entire plot of land”

María: “Yes, including the forest, the largest part of the farm is forested area.”

Mary: “So how much of that land do u cultivate?”

María: “For cultivating maybe 30 acres.”

Supriya: “So the compost has already been used to grow successful crops?”

María: “Yes, we have been using it already almost; almost the only thing we are using at this point, so we have been able to decrease a lot of the investment of buying of fertilizers and things. We do have to buy a few things, for example, lime because of the acidity of the soil. We have to use a lot of lime for the plantations.”
Mary: “I wanted to ask you about the medical clinic: How many people do you treat a day and who treats them?”

María: “We are a very small team, we had a doctor and she left a few months ago so right now we are four people and we see about 30 to 40, we are trying to work only half a day because we have so many other projects going on so we are working like a 7:30 to 1 pm, I would say mostly days will be around thirty, on a daily basis, and mostly primary care for children, adults, and elderly, older chronic illness, hypertension, diabetic, general. I am a nurse practitioner so I can manage the children and both the adults and the elderly.”

Mary: “You said there were four people who work at the clinic, is that just the four sisters or someone else?”

María: “No, we have a nursing assistant, and a kind of pharmacist, he prepares all the medications that we give to the patients and taking all the vital signs for the patients when they come in. And then we have one of the Sisters is working with the Authoritive of Biomagnetism Therapy, and then the other person is helping us in registering the patients and all that.”

... 

María: “He’s amazing because his education is at a technical level, he does not have a degree, but he has about 16 years of experience working in agriculture, but he’s very passionate about agriculture. He’s very intelligent; he has very much a researcher mind, so he uses the internet a lot to look up different things and value what he’s doing trying all kinds of things. So for us it is a real blessing that we were able to find Emilio to take on the farm because we could not do anything with it.”

... 

María: “It is a high school degree, here people usually in high school finish with a technical orientation and his orientation was agriculture, but very good training. And we are really hoping that he’ll be able to get a degree, and we keep searching for possibilities that he can do like online. We are hoping because he is really a competent, intelligent person. So we
would like to be able to support him and encourage him to keep studying, so he can really expand his knowledge more and more.”

Supriya: “So he’s building up his knowledge on compost by looking at different sites in Spanish about compost?

María: “Right. That is from Japan, from Spain, from Columbia; countries that are already using a lot of organic compost.”

Supriya: “That’s great information; I think it’s pretty clear that one of our goals would just be to get as much information to him as possible in one swoop. Because just researching for this I’ve had the experience that you get a little bit of information from each site and you have to put it all together.”

María: “Right, it would be very helpful to him not having to spend so much time comparing this comparing that. I don’t know if we have mentioned that this compost of ours, of Emilio, is very original. We presented it for a patent and we are waiting, they are still in the process of comparing with other composts that exist in different countries around the world. So, if it is not totally original, it is very special, for sure. And we should be able to get protection for a 5 year something that they get signed something that is original so we are working with the government here.

Mary: “About the expenses in all these projects, Emilio gave us a very detailed description of all of the costs in the composting project, but I’m wondering, among all of the projects going on, what is your biggest expense, what is the one thing you find yourself pressed to find money for?”

María: “Right now we would say the farm, we have been investing so much and the farm is really almost fully equipped to produce plenty, but we do not have enough money to invest in more plantations or, like right now, we would need to look for the funding to really build a laboratory that would be fully equipped. But little by little we were able to build a big wall so it will be more protected and everything. We are setting up the electricity in the farm this month, hopefully, because we have the electricity in the village already, and this Saturday
the electrician is coming to start doing the work on the electricity in the facility. The income, as far as produce and all, is not much, but the farm has increased in value tremendously by all these things that we’ve been able to do. Being able to get a little grant from here and there like the last one was from the Loyola foundation to do the wall to ensure the safety of the compost and the farm. You know, little by little. So we hope that the organic compost could really be a main source of income once we get everything straightened out with all the legalities.”
1. ¿Qué haces en un día típico?

What do you do on a typical day?

Me levanto a las seis de la mañana desayuno algo ligero, café y frutas seguidamente llevo al niño al kínder y me traslado a la finca a comenzar las actividades diarias regreso a almorzar a las 11.30 después voy al centro educativo o a realizar compras de la finca llevo a mi esposa al Centro Marie Poussepin a dar clases y por la tarde voy a la finca a coordinar las actividades del día siguiente por la noche veo noticias y reviso correos actualizo información de la finca, a las 11.00 de la noche me voy a descansar

I get up at six in the morning, breakfast a snack, coffee and fruit then take the child to kindergarten and I go to the farm to begin daily activities. Back to lunch at 11:30, and then I go to school or make purchases the farm. I take my wife to the Marie Poussepin Center to teach classes and in the afternoon go to the farm to coordinate activities for the next day. In the evening I post news updates and review information from the farm, at 11:00pm I go to bed.

2. ¿Cuáles son sus responsabilidades en la granja?

What are your responsibilities on the farm?

Planificación, coordinación y ejecución de los programas operativos anuales, coordinar prácticas agronómicas de las alumnas del centro educativo

My responsibilities include planning, coordinating and implementing annual operating procedures, and coordinating agronomic studies for the students of the school.

3. ¿Cómo se enteró acerca de compostaje?

How did you learn about composting?

El compostaje lo manejo desde mi formación profesional y me gusta hacerlo
I learned about composting operations from my training, and I like it.

4. ¿Cómo se interesó en el inicio de este abono?

How did you get interested in starting this compost?

Por la necesidad de revertir las condiciones agro ecológicas de nuestro país y ofrecer una alternativa económica.

By the need to reverse the agro-ecological conditions of our country and offer an economic alternative.

5. ¿Cómo se siente esta empresa ha afectado su vida, la vida de los afectados y la comunidad a su alrededor?

How do you feel this endeavor has affected your life, the lives of those involved and the community around them?

R//Claro que si este proyecto es el resultado de mi vida profesional y lo considero como proyecto de vida integrado con las responsabilidades familiares y comunitarias

This project is the result of my professional life and I consider this project integrated life with family and community responsibility.

6. ¿De qué manera, y cuánto, no contribuyen a las chicas y aprender de la granja?

In what way, and how much, do the girls contribute to and learn from the farm?

R//Integrando sus programas curriculares a las actividades diarias que comienzan desde la clasificación reciclaje de la basura producida en la escuela hasta cálculos matemáticos para calcular la pendiente de una curva a nivel para conservación de suelos. Y se benefician ampliamente en su alimentación de frutas hortalizas que ellas producen.

Integrating their curricula to everyday activities includes everything from sorting recycling of the waste produced at school to mathematical calculations to calculate the
slope of a curve to level for soil conservation. They also benefit greatly in eating the vegetables and fruit they produce.

7. ¿Usted tiene todos los beneficios de la explotación y el compost ir a la escuela de las niñas?

Does all the profit from the farm and the compost go to the girls' school?

Con el compost logramos producir las hortalizas que las estudiantes consumen, todavía no hemos logrado beneficios de la explotación por que no contamos con el certificado.

With the compost we produce vegetables that students consume, yet we have failed to benefit from the consumption that does not have the certificate.

8. ¿Utiliza vermi compostaje (compostaje con lombrices)?

Do you use vermi composting (composting with worms)?

R//No pero hay proyección

No, but it is a possibility.

9. ¿Qué sabe usted acerca de los diversos factores que afectan la eficiencia y el valor del abono, tales como:

What do you know about the various factors affecting the efficiency and the value of fertilizer, such as:

- Temperatura Temperature
- Efecto del volumen de pila Effect of cell volume
- El contenido de humedad Moisture content
- El flujo de oxígeno Oxygen flow
- Tamaño de las partículas Particle size
- Relaciones C: N y los porcentajes de otros elementos C: N ratio and the percentage of other elements
Son parámetros que influyen en la calidad y cantidad de abono a producir por lo que es imprescindible monitorearlo sabiendo que el compost es un proceso bioquímico que se necesita producir con estabilidad en la medida de lo posible.

These are parameters that affect the quality and quantity of fertilizer to be produced, so it is imperative to monitor them while knowing that making the compost is a biochemical process that needs to be produced with as much stability as possible.

10. ¿Estas interesado en aplicar para certificación orgánica de BioLatina?

Are you interested in applying for organic certification BioLatina?

Estamos en proceso

We are in the process.

11. ¿Por qué quiere poner a prueba su abono? ¿Qué quieres lograr?

Why do you want to test your compost? What do you get?

Poner al servicio de la comunidad una alternativa eficaz, ecológica y económica

We want to put this effort to serve the community an effective, ecological and economic alternative.

12. ¿Por qué quieres probar en el sitio en lugar de enviar las muestras a laboratorios certificados afuera del sitio?

Why you want to try on the site instead of sending samples to certified laboratories outside of the site?

Por que es muy importante monitorear todos los factores para controlar la calidad del compost el cual depende mucho su estabilidad y también por el aspecto económico

Because it is very important to monitor all the factors to control the quality of compost which is highly dependent on its stability, and the economic aspect.
13. ¿Si estás buscando certificación, que es la agencia que regula y cuales son sus requisitos específicos?

If you are seeking certification, which is the agency that regulates and what are your specific requirements?

El departamento de agricultura orgánica y servicio de sanidad agropecuaria dependencia de la secretaría de agricultura y ganadería cada certificadora tiene sus requisitos

The Department of Organic Agriculture and Agricultural Health Service Unit of the Agency of Agriculture and Livestock; each has its own certification requirements.

14. ¿Estás interesado en la optimización del proceso de compostaje basada en los resultados?

Are you interested in optimizing the composting process based on the results?

Si muy importante

Yes, it is very important

15. ¿Con qué frecuencia quieres probarlo?

How often do you test it?

Monitoreos diarias la certificación lo demanda

The certification requires daily monitoring.

16. ¿Quiénes son sus clientes potenciales?

Who are your potential customers?

La finca, proyectos de cooperación, cooperativas cafetaleras, camari cultura y tabacaleras
The property (farm and surrounding area in Guaimaca), co-op projects, coffee and tobacco cooperatives, and CAMARI culture (shrimp farmers).

17. ¿Cómo le encuentras sus clientes potenciales?

How do you find your prospects?

En nuestra zona tenemos múltiples agricultores orgánicos y nuestro comprador Wal-Mart está interesado en comercializar nuestros productos orgánicos, incluido el compost

In our area we have many organic farmers and our Wal-mart buyer is interested in marketing/commercializing our organic products, including organic compost.

18. ¿Quieres exportar su abono, o sólo quieres vender en Honduras?

Do you want to export your compost, or just want to sell in Honduras?

Sería una visión a largo plazo el poder hacerlo con su ayuda

That would be a long term vision, and we can do so with your help.

19. Somos conscientes de que hay una ambulancia vieja que estaba pensando en hacer en un laboratorio. ¿Por qué crees que esto podría ser utilizado como un laboratorio?

We realize that there is an old ambulance he was thinking done in a laboratory. Why do you think this could be used as a laboratory?

Por que cuenta con condiciones favorables para espacio controlado y además se pueden dar servicios de laboratorio a domicilio

Because has favorable conditions for controlled space and also can provide laboratory services at home, on demand.

20. ¿Cuáles son las dimensiones de la ambulancia?

What are the dimensions of the ambulance?
Mide 2x5 metros

*It measures 2x5 meters*

21. ¿Quién cree usted espera que funcione el laboratorio? ¿Tú? ¿Los otros trabajadores? ¿Tal vez los estudiantes?

*Who do you expect to run the lab? You? The other workers? Perhaps the students?*

Yo, la profesora de ciencias naturales y mi asistente un bachiller en ecología

*I, Professor of Natural Science and my assistant, a Bachelor of Ecology*

22. ¿Tiene algún equipo disponible para usted?

*Do you have any equipment available to you?*

Ninguno

*None*
Appendix E: Photographs from Mr. Rodriguez of the Composting Process

Figure 8: Straw, one of the ingredients in the compost, being broken down with a woodchipper

Figure 9: The same woodchipper is used to cut down branches to make woodchips for the composting

Figure 10: Branches, transported by a ox-drawn cart
Figure 11: Material being delivered to the composting site

Figure 12: Kitchen waste from the Marie Poussepin Center is another ingredient in the compost
Figure 13: Kitchen waste added to the solid compost pile, including egg shells and fruit rinds

Figure 14: The pit used for solid composting is about 18 meters long, 10 meters wide and three meters deep, the stable underground temperature regulates the chemical and biological processes
Figure 15: Backhoe service is rented by the hour to aerate the solid compost as well as harvest it once it’s finished

Figure 16: The compost is protected from rain and sunlight, which both affect the moisture content and temperature, with a shed. Shown is the framework for the shed
Figure 17: The roofing is made of UV protecting plastic
Figure 18: The finished solid compost
Figure 19: The liquid compost uses a kind of “teabag” method

Figure 20: The tank is filled with tightly sewn bags of composting materials, and the nutrients seep out into the liquid
Figure 21: Just a ten-gallon bucket is used in the current method for aeration by scooping and pouring the liquid compost
Appendix F: Composting Guidebook for Composting on Nazareth Farm, Guaimaca, Honduras

This document is not included here due to the confidential nature of some of the content of some of this document.