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**A PRE-FEASIBILITY STUDY FOR THE
ESTABLISHMENT OF AN
ORGANIC FERTILIZER PLANT IN HAITI**

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Prepared By

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On behalf of Chemonics International Inc. for the Haiti Feed the Future-West/Watershed Initiative for National Natural Environmental Resources project. This study is made possible by the support of the American People through the United States Agency for International Development (USAID). The contents of this report are the sole responsibility of Chemonics International Inc. and do not necessarily reflect the views of USAID or the United States Government.

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1.0 Executive Summary

TITLE: Pre-feasibility study of an organic fertilizer plant in Haiti

INDUSTRY: Agriculture, environment, local government

PRODUCT: Organic fertilizer, mulch

MARKET: Local

In fulfilling its mandate of promoting sustainability and productivity in the Haitian farming communities, the USAID Haiti Feed the Future-West/Watershed Initiative for National Natural Environmental Resources (WINNER) project sought to determine the feasibility of an organic fertilizer industry that would address the demand for affordable, environmentally friendly, soil-regenerating farming input to improve the productivity of farmers and increase crop yields. Intensive overuse of inorganic fertilizer by Haitian farmers depletes the soils of nutrients crucial to crop cultivation and limits agricultural productivity.

This study examines whether building an organic fertilizer production plant to improve supply of non-harmful fertilizer to Haitian farmers would resolve these issues, and concludes that the benefits of using organic fertilizer far outweigh the cost of establishing the plant. Organic fertilizer is more effective in increasing crop yield per acre by approximately 30% and requires approximately 90% less fertilizer per acre than inorganic fertilizer. Organic fertilizers also return valuable nutrients to the soils and improve cohesion, reducing runoff of fertilizer.

Beudet, the proposed site of the plant, boasts an established transportation network with limited congestion in the city center. It is situated in close proximity to the supply of raw material for fertilizer production. The plant size proposed is approximately 6 hectares, which would provide adequate space for storage of both raw materials and finished product. This study concludes that an indoor composting pit (approximately US\$250,000) offers the best value for investment. An indoor composting pit – a combination of the indoor windrow and pit composting system and a key driver of production – produces high levels of output and the investment in this equipment would be recouped within five years.

By the end of the second year of operation, profit of the plant is projected to be in excess of US \$1.8M. This projection is based on the assumptions that 1,800 metric tons (MT) of fertilizer are produced and are sold at a market price of US \$1,000/MT – comparable to the price of subsidized, imported inorganic fertilizer.

2.0 Rational & Contextual Overview

The Haitian economy is largely dependent on agriculture with approximately 60 percent of the rural population working in this primary industry. More than half of Haiti's population (between five and six million people) resides in rural areas and about 80 percent of the rural population is engaged in agriculture and livestock. The sector represents about 26 percent of the Haitian economy, making agriculture the largest employer in the country.¹

Haiti has a limited amount of land capable of being cultivated, and the actual use of purchased inputs, such as fertilizers and machinery, by the farming community is minimal. Farmers in Haiti employ traditional agricultural practices, using increased amounts of chemical fertilizers since the 1970s. However, only large scale farmers are able to access these inputs due to the high acquisition costs. Farming is largely subsistence in nature; it is labor-intensive, and farmers employ a mix of farming techniques. Current practices are insufficient to sustain the population, make significant contributions to gross domestic product (GDP), and maintain soil quality for future generations.

Attempts to increase the productivity of cultivable land areas have not emerged in a sustainable manner, and a formal organic fertilizer industry is nonexistent in Haiti, currently. The USAID Feed the Future-West/ WINNER project, whose aim is to improve targeted agricultural value chains in the Cul-de-Sac and Matheux corridors, seeks to help farmers acquire the resources and capacity necessary to become more productive and generate higher incomes in a sustainable manner. Development of an organic fertilizer industry would potentially offer a sustainable solution to the wider Haitian farming community, as it would protect and improve soil structure and fertility while expanding agricultural production. Furthermore, local production of organic fertilizer would increase accessibility for Haitian farmers by lowering costs and increasing availability.

This report is a preliminary assessment of the technical, economic, and environmental feasibility of an organic fertilizer plant that would use organic wastes as raw materials to create organic fertilizer. This fertilizer would be used on both small and large scales by the Haitian farming community.

3.0 Background

3.1 Organic Fertilizer Industry In Haiti

There has not been an established organic fertilizer industry in Haiti to date. Some farmers have used green manure and other forms of composting for many years. However, this has not been developed on a macro or sustainable level, and consideration has not been given to the possible income that establishing this market could generate.

Large volumes of organic waste are generated nationwide in Haiti on a daily. The Haitian landscape is marred with the ever increasing threat of environmental pollutants, and a viable and sustainable solution to this problem has not yet been found. As such, this study will examine the potential for utilizing wastes that would normally be seen as pollutants to instead advance the

¹ Food and Agriculture Organization, 2011

agricultural landscape and the lives of the Haitian people. One potential solution – transforming organic waste into environmentally safe fertilizer – has proven effective in Jamaica and is routinely implemented.

Organic fertilizer use has been widespread in Jamaica since 1985. In Jamaica, organic fertilizer is produced using the wind row composting system in Kitson Town, on the outskirts of the former capitol of Spanish Town. Raw materials are sourced in Spanish Town, processed at the plant in Kitson Town and distributed island wide. The introduction of this input to the Jamaican agricultural sector led to marked result. Crop yields increased by as much as 30 percent following the application of three metric tons of organic fertilizer per acre, and as a result, input costs decreased by 90 percent. Previously, Jamaican farmers typically applied 30 metric tons of chemical fertilizer per acre and produced lower yields. Success depends on creating a shift from the use of conventional synthetic material to the application of processed organic waste to fertilize crops. By switching to organic fertilizer, farmers are able to extend soil life, improve water quality, and eventually increase their yields.

Traditional agricultural practices in Haiti result in excessive leaching of the soil; organic fertilizer is capable of restoring lost fertility to the soil and boosting crop production. Chicken manure and organic waste – the source material required to establish the industry – is readily available from the market place and poultry farms in close proximity to the proposed plant site. The use of readily available raw materials, produced at a lower cost and accessible to both large and small farmers, is crucial to the sustainability of this industry. An organic fertilizer facility has the potential to supplement Haiti’s need for fertilizer by transforming waste into a valuable agricultural input while mitigating the negative environmental impact of traditional agricultural practices.

3.2 Waste Disposal Challenges in Haiti

The current solid waste collection system in Haiti is underutilized, and as such, waste disposal presents a significant challenge. Uncollected solid waste contributes negatively to the appearance of the landscape in both urban and rural areas. This type of waste material is not usable for the purposes of this project and so focus is given to the organic waste material.

4.0 Feasibility of an Organic Fertilizer Plant in Haiti

Technology and economics are converging to make it increasingly attractive for municipalities, companies, farms, and individuals to harness waste and transform it into usable products. Environmentalists claim that the process of transforming waste to useable products has long been a purview of the field of ecology. Historically, primary and secondary industry players disposed of their waste in ad-hoc and unsuitable ways. Today, waste is often viewed as a pollutant. Current global trends in green technology and carbon footprint reduction have placed an impetus on industries to implement sustainable environmental practices. This pressure has resulted in the transformation of waste into products that can generate income in a financially sustainable manner, namely ‘*compost organic fertilizer*’ and its by-product ‘*garden mulch.*’

4.1 Overview of Composting Systems

The Compost Process

Composting has been occurring naturally for millions of years. The major difference in nature's process and today's technology is control. Composting involves the microbial conversion of biodegradable organic materials into relatively stable humus by aerobic thermophilic microorganisms under controlled conditions. These microbes need oxygen, moisture, and food to develop and multiply. Organic material such as livestock and poultry manure, food waste, and yard waste can be composted to provide an improved product for soil application or upgraded use such as horticultural planting mixtures and hydroponics applications.

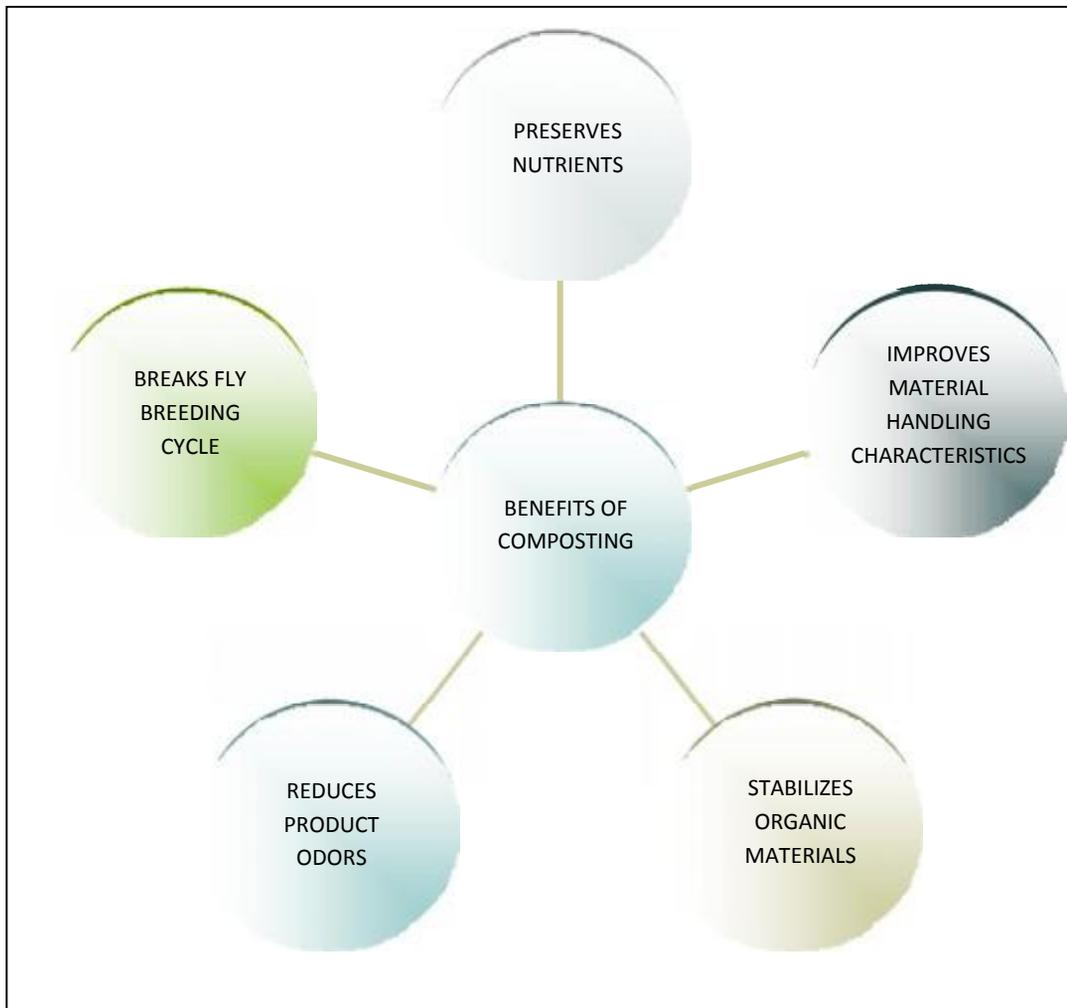


Figure 1. Benefits of Composting

The objective in composting is to provide a proper nutrient balance and environment for the reproduction of aerobic thermophilic bacteria. Factors such as temperature, moisture content, structure, and proper aeration are critical to efficient composting. Operating temperatures of 130 to 150 degrees Fahrenheit are desirable during the aerobic composting process. These temperatures kill fly larvae, pathogens, and weed seeds. Composting can be carried out in numerous ways but

this in-vessel method utilizing pits with mechanical equipment for turning are generally more efficient. In this study, bagasse (cane trash), sorghum and rice hulls supply carbon. The carbon is, in turn, combined with poultry manure, which provides plenty of nitrogen and serves as a good blend for composting. In order to employ the composting process, five key elements are required:

- (1) **Nutrient Blend.** The major sources of nutrients for composting as described in this study are chicken litter and other organic materials. However, it is almost impossible to find a single organic material with all the essential characteristics for successful composting. In order to compensate for the deficiencies, a blend of these sources with other organic materials is preferable. This blend of nutrients serves as a “composting recipe” – a mix of carbonaceous and nitrogenous material together in the proper proportions in order to form the desired carbon: nitrogen ratio (C:N).
- (2) **Moisture.** Moisture is required to facilitate the microbial activity that causes composting to occur. Moisture content for aerobic thermophilic composting should ideally be between 40 to 60 percent initially. If composting material is too dry (having a moisture content below approximately 35%), the decomposition rate will be much slower than composting materials with 40 to 60% moisture. Supplemental water may need to be added to dry material to initiate composting. The Haitian climate is ideal for composting as it naturally provides the conditions necessary, such as consistently high temperatures and moisture from the relief rainfall experienced in Haiti all year long. High moisture materials, such as manure and other organic materials, must be dried to below 60% moisture content by blending these materials with finished compost or carbonaceous bulking agents, such as bagasse, rice hulls, cane trash, banana trash, or paper.
- (3) **Oxygen.** Oxygen is a vital key in maintaining the aerobic state of the composting process. Air within or exhausted from the composting material should contain 5 to 15% oxygen. Therefore, aeration is necessary to support aerobic microbial activity as it releases moisture and removes excess heat.
- (4) **Temperature:** Activity of microorganisms in the compost materials generates heat during the composting process. A compost recipe blend that contains the correct moisture and oxygen levels will start the microorganisms’ metabolism processes. The bacteria associated with this process are known as mesophilic (moderate heat loving) and thermophilic (high heat loving). Mesophilic bacteria thrive at temperatures less than 100 degrees Fahrenheit. Thermophilic bacteria thrive within the 110 to 150-degree Fahrenheit range. A good composting temperature range is 130 to 150 degrees. Composting temperatures around 150 degrees for manure are desirable to assure destruction of pathogenic bacteria and viral organisms.
- (5) **pH Control:** The pH level of the compost may become critical at times. If the compost has a pH of 8 or higher, ammonia/odors can become a problem. PH should be in the 6.5 to 7.2 range initially for the best composting results. In the beginning stages of composting, wet manure pH may drop below 6.0, causing odor emissions. The pH of the finished compost will be in the 5.5 to 7.5 range.

In summary, the technical process of composting, which is by and large a natural process, is conducted under controlled conditions. Our research suggests that adhering to the process

described will maximize the production of high-quality compost fertilizer. This process will result in fertilizers with high nitrogen, phosphorus, potassium (N-P-K) growth enhancing properties, necessary for classification as organic fertilizer.

Types of Composters

Composting can be carried out in numerous ways. There three types of composting systems: wind-row, anaerobic and in-vessel (pit). The two most popular practices are wind-row system and the pit system.

- (1) **Wind-row composting system.** The wind-row system involves mixing the compost ingredients, preferably by a mechanical loader or front-end loader. The compost is then spread out in rows up to six feet tall. This process can be done under cover or outdoors. In either case, the compost must be turned at least every other day, if not every day. Turning can be done with a compost turner, which can be attached to a tractor. Alternatively a mechanical plow or a front-end loader could be used. The wind-row system of composting requires regular turning in order to provide aeration for the microorganisms and release heat, aiding in the decomposition process. Wind-row composting can also be done on prepared concrete platforms housing aeration tubes in the floor to provide the oxygen required to aid the composting process, requiring less turning.



Figure 2. Wind-Row Systems: Indoor and Outdoor

The outdoor wind-row practice is less expensive but offers less control and is subject to greater losses and a slower decomposition process, particularly during rainy season. The covered wind-row system is more expensive as it requires the erection of a shed-type structure at least 20 feet high. Most covered system carry a prepared concrete surface or floor and offers more control than the outdoor system.

- (2) **Aerobic composting process.** The aerobic composting process starts with the formation of the pile. In this process, aerobic microorganisms break down organic matter and produce carbon dioxide (CO₂), ammonia, water, heat, and humus, the relatively stable organic end product. Although aerobic composting may produce intermediate compounds such as organic acids, aerobic microorganisms decompose them further. The resultant compost, with its relatively

unstable form of organic matter, has little risk of phytotoxicity. The aerobic composting process destroys many microorganisms that are human or plant pathogens, as well as weed seeds, provided it is subjected to sufficiently high temperatures. However, this process causes the loss of more nutrients needed by the plants being fertilized.

- (3) **Pit composting system.** The pit composting system is best described as an in-vessel system and utilizes a shallow pit design to biologically stabilize organic material with or without forced aeration. The pit compost system provides the option of adopting “continuous flow” composting (putting material in the compost pit daily) or “batch composting” (filling the entire pit with material and turning or aerating the material until composted). The “continuous flow” option is frequently selected as the preferred method due to the simplicity of adding organic material to the composting pit on a daily basis.

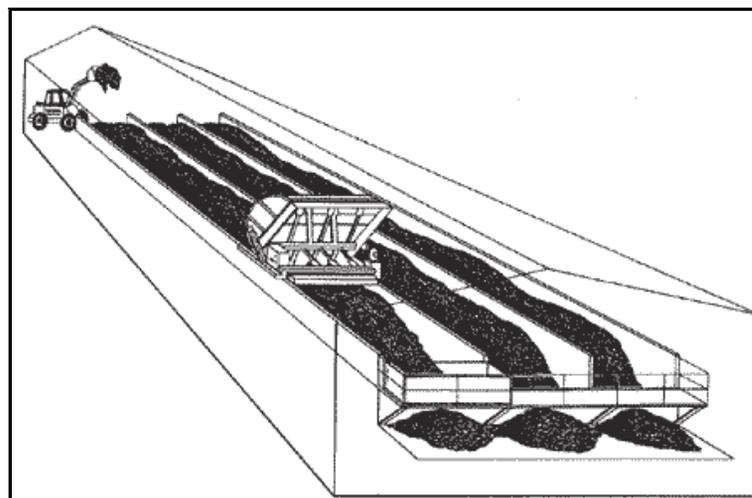


Figure 3. Pit composting system

The normal pit length in the “continuous flow and batch composting operation” is 250 feet. The pit walls are constructed of 6 inch poured reinforced concrete. Footings are usually constructed below the frost line and the floors are usually made from poured concrete, 3 to 4-inches thick and leveled.

Before selecting a composting process, the advantages and disadvantages of composting in Haiti must be considered:

ADVANTAGES	DISADVANTAGES
<ul style="list-style-type: none"> • Availability of raw material • Small groups of farmers already have knowledge of composting • Produced at a more competitive price than the subsidized inorganic fertilizer • Reduces toxins in the food chain • Produces healthier soil for future generations • Reduces dependency on imported fertilizer • Increase water retention ability of the soil 	<ul style="list-style-type: none"> • Lack of logistical support in trucking of materials • Lack of separation of garbage at origin source • Unwillingness on part of suppliers to pay for disposal of their waste

<ul style="list-style-type: none"> • Does not contaminate underground water supply • No known commercial competitors in organic fertilizer industry 	
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Table 1: Advantages and disadvantages of composting

4.2 Recommendation for Haiti

The preferred and recommended system for organic composting in Haiti is the in-door composting pit, fitted with aeration pipes and a composting machine – a combination of the in-door wind-row and the pit composting systems.

4.2.1 Proposed plant specifications

The pit would be housed in a compost house measuring 27,300 square feet (420 x 65 feet). The height would be 24 feet, measured from the floor to the highest point in the ceiling. The compost pits would be divided by reinforced concrete walls approximately 3.3-feet high. The compost machine is 22.4 feet wide, 4.75 feet tall, and weighs 6,894 pounds. The cost of this equipment is approximately US\$250,000.

COMPOSTING MACHINE and PIT CAPACITY SPECIFICATIONS	
MODEL No.	610M
Pit width	235.00”
Pit depth	39.37”
Machine width	269.50”
Machine height	57”
Machine weight	6894 lb.
Agitator motor	2@10 HP Hydrostatic
Lift/Propel Motor	2 HP Above All In One
Power required at 480VAC	27.0 FLA
Service requirement at 480VAC	60A fused
Agitate speed (inches per minute)	18”
Return speed (feet per minute)	10’
Approximate material progression per operation	7’
Cubic yards of space available per day	16 cu.yds.

Table 2: Specifications for composting machine and pit capacity for proposed plant

To fully operationalize the process, the compost machine has to be fitted onto rails installed on top of the pit walls. When turned on, the machine is propelled by hydraulic fluids in a forward and reverse motion while raising and lowering the attached composting paddles. The equipment uses proven hydraulic components coordinated in a compact package that require minimum maintenance while providing maximum performance.

The machine is regulated by a control panel featuring a solid-state programmable controller mounted in a NEMA 12 cabinet with IEC-rated motor control. Override controls also enable the

operator to manually operate the machine for maintenance. By adopting the “continuous flow” mode, the composting material moves forward approximately 7 feet per run due to the action of the machine agitator. This action discharges approximately 7 feet of finished compost daily while making room at the front of the pit for a daily addition. The daily input could range from 5 cubic yards to 16 cubic yards of material, with the possibility of maintaining up to four pits per composting machine.

An area of 6 hectares of land is required to establish this facility based on the anticipated volumes of production. Figure 4 below shows the proposed plant layout and material flow sequence.

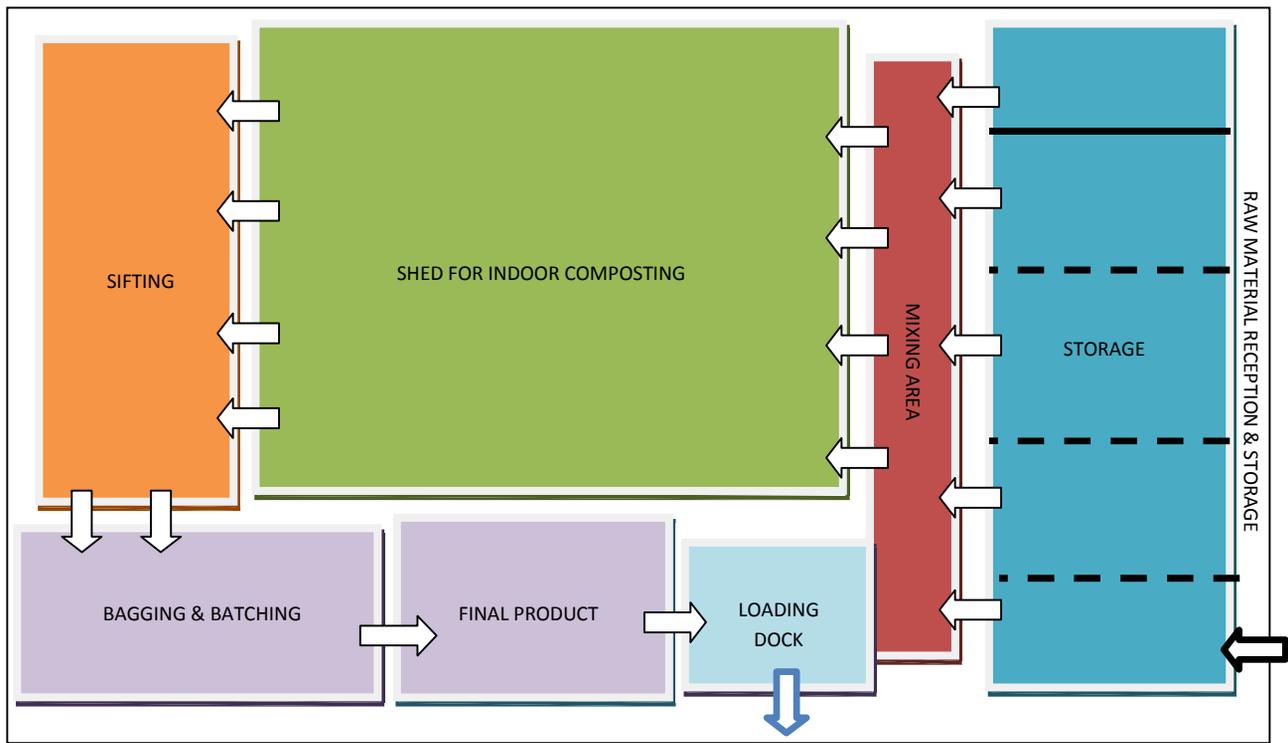


Figure 4. Proposed plant layout

4.2.2 Proposed plant location

The proposed plant should be situated in or around the Beudet area in Croix-des-Bouquets in order to reduce logistical challenges and transport cost. Suitable land was indentified in collaboration with the municipality of Croix-des-Bouquets close to the ackee farm in Beudet. The topography of this region is flat, as it lies in a wide U-shaped valley on an alluvial fan. The area is well-drained. A ready transportation network dissects the valley promoting high accessibility to the proposed plant.

Due to the organic nature of composting, the potential risk to surface water is minimal. Composting also adds cohesion to the soil which is generally lacking in alluvium type soils. Population density and industrial development are high in this region adding to the availability of raw organic material. All input sources shown in Table 3 (page 18) are found within twenty (20)

miles of the proposed plant shown on the maps below by the location spheres.

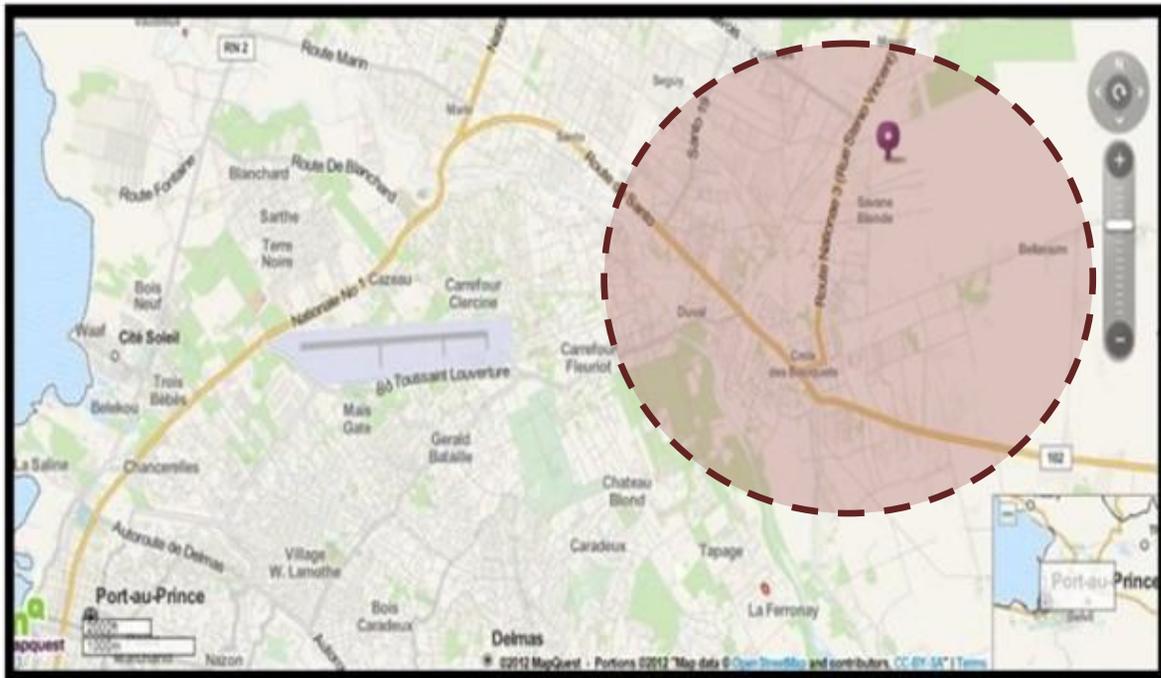


Figure 5. Proposed plant location and raw material source area

4.2.3 Production process

The production process summarized below outlines the various stages of the entire process from sourcing to distribution to the overall administration of the proposed plant.

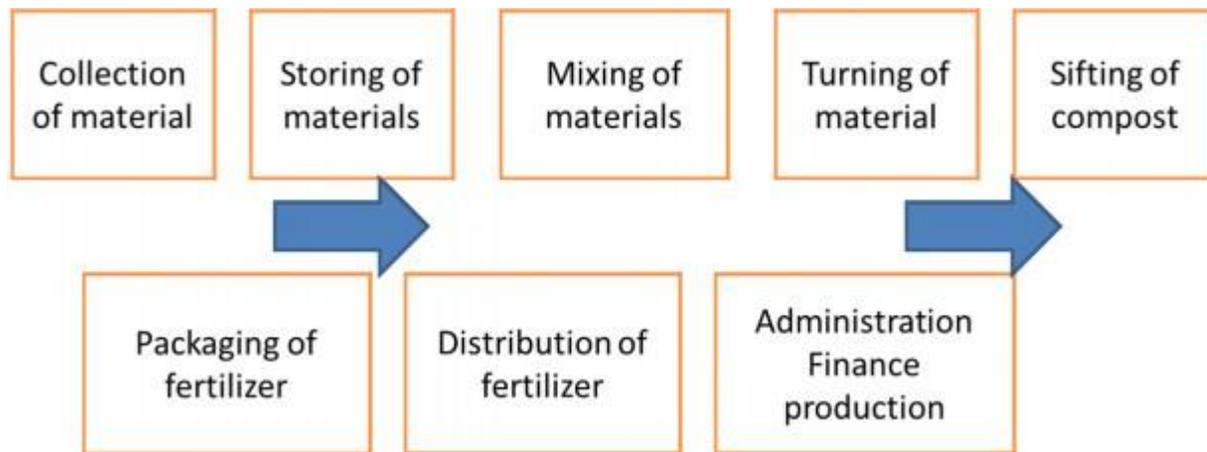


Figure 6. Production process outline

Collection of inputs: Materials must be selected to reduce the collection of integrated non-biodegradable materials. Transportation cost is a major factor in input cost, and it must be minimized by sorting material at the source to reduce excess load. Inputs for raw material are

readily available from the following sources at the indicated costs:

Material	Source	Location	Quantity/MT	USD/MT
Bagasse	Rhum Barbancourt	Damien	700	200
Chicken Litter	Haiti Broiler	Savane cheval	1500	300
Rice Trash and Sorghum	Ken Michael Group	Bas Boen	300	250
			300	250
Blood	Michel Pun Slaughterhouse	La Perriere	200	50
Market Waste	Croix des Bouquets & Cabaret Market	Croix-Des-Bouquets	500	250

Table 3. Raw Material Supply, Source and Associated Costs. These figures represent the materials in the quantities required for Year 1 and the cost/metric ton to transport materials to the proposed plant location.

Storage of inputs: Materials must be stored away from animals, waterways, contaminants, and scavengers. Proper storage conditions protect the integrity and quality of the material and ensure a high-quality finished product.

Material Mixing: This is the most crucial stage of the production process as the material must be mixed in the correct proportions. To achieve the delicate composting balance, training, expertise, and the requisite equipment are essential in the initial phases.

Material Turning: The material must be turned for aeration. Turning intervals are time and temperature sensitive. Turning should be done until material is returned to room temperature.

Sifting of Compost: The compost is sifted to maintain the consistency in the texture of the material.

Packaging of Fertilizer: The finished fertilizer must be measured, packaged, sealed and stored.

Distribution of Fertilizer: The distribution stage requires inventory control, correct invoicing, and accurate and on time delivery.

5.0 Value Proposition and Profitability

The importance of the switch to the use of organic fertilizer must be underscored. Fertilizer

consumption in 2001 was 13,930 MT per year, amounting to 15.9 kg of fertilizer per hectare, and this use has continued to increase. Crop yields increased by approximately 30% with the application and use of organic fertilizer, which comparatively requires less fertilizer per acre than inorganic fertilizers. As such, the input cost to the consumer is significantly less with the use of organic fertilizer than with the use of inorganic fertilizer.

With estimated sales of US \$1.8M by the end of Year 2 of the plan elaborated in this study and expenses for the same period amounting to US \$1.78M (which includes the capital outlay of US \$250,000 and operational costs), the viability of the project is clear. The large volume of raw material available on a yearly basis in conjunction with the existing conditions necessary to support the composting process allows for the continuous supply of materials to the plant and the sustainability of production. Converting trash to cash yields manifold benefits to the country, its people, and the bottom line.

5.1 Economic Viability

In evaluating the feasibility of an organic fertilizer facility that converts agricultural waste into useable products, we examined the reliability of the project's three major components: raw material supplies, machinery, and manpower and operational cost needed to keep the business in a state of viability for Year 1. Operation costs for Year 1 amount to US \$ 1.758M.

Operational Costs			
Year One			
Components	Items	Cost & Quantity MT	USD
RAW MATERIALS	Chicken Litter	\$300 x 1500 Metric Ton	450,000.00
	Market waste	\$250 X 500 Metric Ton	125,000.00
	Baggasse	\$200 x700 Metric Ton	140,000.00
	Blood	\$50 x 200 Metric Tons	10,000.00
	Rice Trash	\$250 x 300 Metric Tons	75,000.00
	Sorghum	\$250 x300 Metric Tons	75,000.00
EQUIPMENT	Fuel @ \$3.00/litre (30miles/gallon)	300,000miles/year	30,000.00
	Electric power @ 25c/kwh	36,000 kwh	8,400.00
	Equipment and vehicles and water usage		435,000.00
MANPOWER	Management and administration		320,000.00
	Labor	52 weeks	110,000.00
Total			1,758,400

Table 4 Operational Costs for Year 1

5.2 Job Creation

In its first year of operation, this project will directly employ twenty people on a full time basis. Manpower must be managed, and efficient operation of the waste disposal facility represents the single most important element in this project. The proper scheduling of waste collection, transportation and delivery to the waste disposal facility is crucial to production efficiency. Maintaining a clear communication channel between the producing facilities and the waste

composting facilities is critical. One employee should be dedicated to develop and maintain this system. Trucks have to be maintained and low-jacked for tracking and accountability purposes. Drivers have to be single-mindedly dedicated to their task. Radio contact with drivers has to be maintained. The staff complement that is recommended is outlined below:

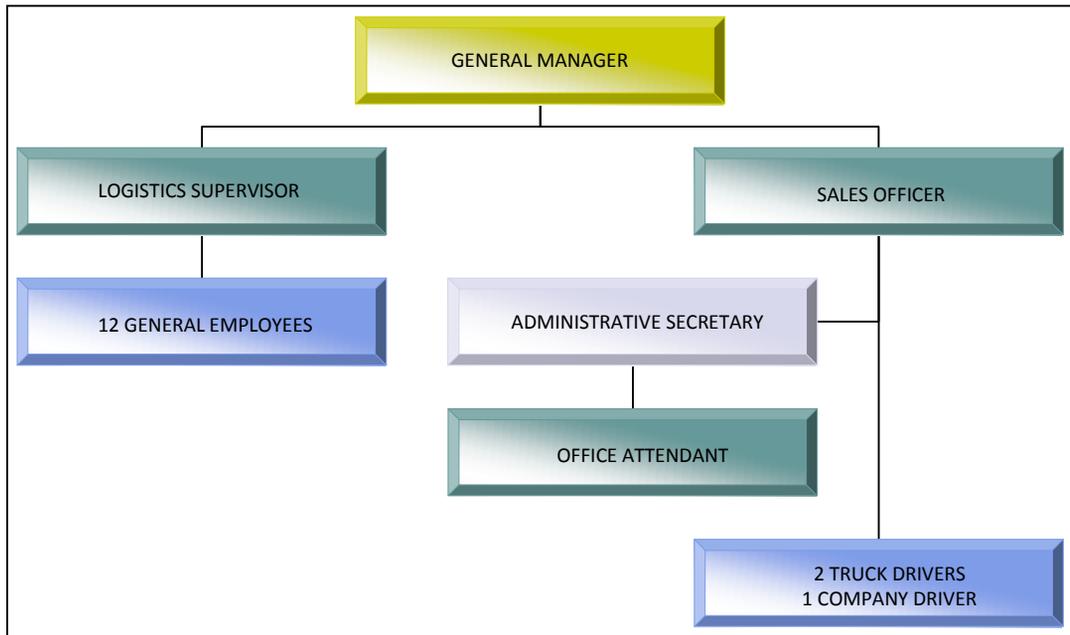


Figure 7. Organizational Chart

5.3 Agricultural Impacts

Over the last four years, the agricultural sector across the world has become acutely aware of the uncertainties and ever increasing cost associated with inorganic fertilizers and food production. Higher costs for inorganic fertilizers have translated to increased costs for agricultural and agro-industrial products. The organic fertilizer facility described in this report has the potential to supplement Haiti’s need for fertilizer by transforming waste into fertilizer and supporting environmental restoration. Equally important are the capabilities of organic fertilizers to restore lost soil fertility due to excessive leaching and poor agricultural practices and to boost plant growth.

5.4 Environmental Impacts

Issues associated with the preservation of the environment as well as environmentally safe production practices are increasingly gaining popularity and are being incorporated in the market place as companies seek to gain market share in an increasingly environmentally conscious globalized world.

6.0 Marketing

The marketing of the fertilizer is critical to penetrate and gain traction in the Haitian market.

Fertilizer use is widely accepted and necessary. However, the push to transform usage to organic fertilizers from inorganics is the main challenge. Employing the right marketing strategy will lead to conversion as training and clear and direct messaging of the benefits, value, and increased yields is essential to obtaining profitability. The marketing message for organic fertilizers should one of affordability and high performance.

6.1 Objectives

- To obtain 50% sales within 1 year
- To obtain and maintain a strong local presence
- To develop partnerships to further the conversion of use from inorganic to organic fertilizer

6.2 Target Market Segment Strategy

The large number of subsistence farmers across Haiti is the primary target for organic fertilizer marketing. The agricultural sector, composed of mainly small-scale subsistence farming vulnerable to frequent natural disasters, is the main source of income for two-thirds of Haitians. As such, a population in excess of 5 million people rely on the agricultural sector and will be targeted as the primary consumers of the organic fertilizer produced.

6.3 Distribution Patterns

A robust distribution network is necessary to facilitate the marketing push to penetrate the Haitian market and psyche. It must be available in the usual locations more prominently, if not, along-side the fertilizers already on the market. Utilizing established distribution companies to leverage and piggyback on their established network can be pursued and undertaken through sub-contracts. The distribution network should include hardware stores, farming supply stores, greenhouses, and micro shops in rural areas to serve the market, delivering to the organizations monthly or bi-monthly depending on demand and usage patterns.

6.4 Market Needs

The nature of farm lands across Haiti dictate of the need for fertilizers to obtain any substantial yield from the mostly hilly, deforested land available for farming. It is important for farmers to understand the ability of organic fertilizers to repair and replenish the land's depleted soils and to apply these fertilizers to their respective farms instead of inorganics, which further the barren state of Haiti's soils.

6.5 Market trends

Global trends in the fertilizer industry point toward organic, environmentally safe alternatives that maximize crop yields and minimize lasting negative impacts on the environment and water supplies. In Haiti, fertilizer consumption has been increasing since the 1980s, especially as the country is systematically impacted by natural disasters that cripple the agricultural sector. Furthermore, increasing demands for high agricultural productivity and yields are prompted through the profuse use of fertilizers.

6.6 Strategies

Successful and systematic use of organic fertilizers relies on employing a number of recommended marketing strategies:

- Direct targeting of consumer population through strategic training seminars to educate the farmers at the community level is necessary to gain penetration and traction in the market.
- Discounted sales tactics over a short-term period to induce farmers to try the fertilizer in tandem with promotional tours and booth displays at farming events and environmental awareness programs are necessary.
- Advertising campaigns reliant on visual aids, radio broadcasts with testimonials, and promotional documentaries and pictorials showcasing the use, application techniques, and most importantly, increased yields resulting from the use of organic fertilizers.
- Attendance at community meetings and distribution of educational brochures, flyers, and other promotional materials showcasing products and possibilities. This promotion will highlight the benefits of organic fertilizers compared to its alternatives. Additionally, providing information to the targeted institutions, such as the Ministry of Agriculture, and larger farm owners will further the penetration of organics.
- Strong branding leading to recognition and reinforcement of the brand promise, such as higher yields, value packaging, environmentally friendly, and sustainability.

7.0 Implementation Timeline

Introduction of organic fertilizers into the Haitian agricultural sector can be implemented based on a 15-month timeline.

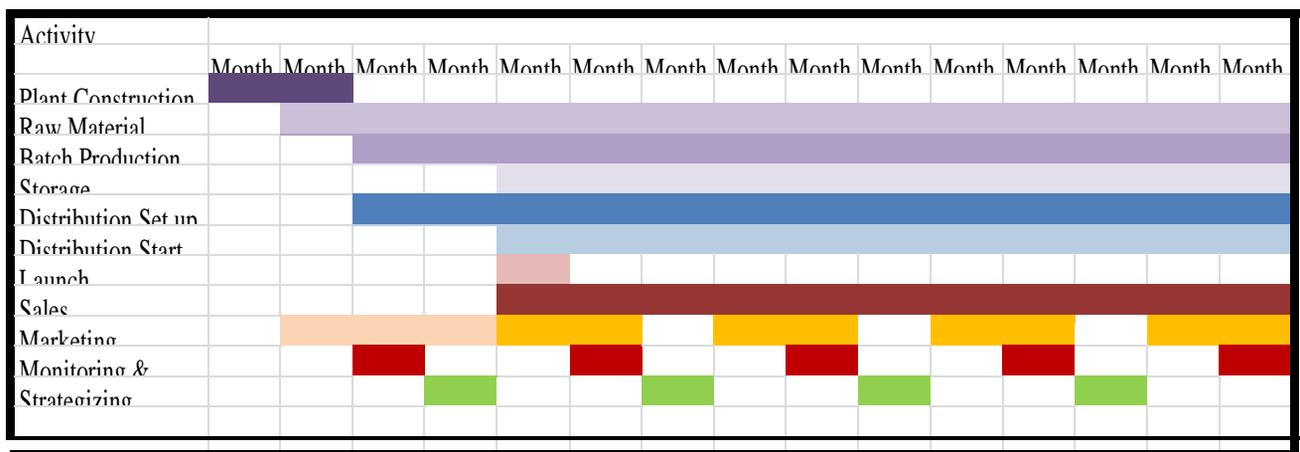


Figure 8. Implementation Timeline

8.0 Post Project Sustainability

Solid implementation and management of the fertilizer plant in its infancy is the benchmark of sustainability. Quality standards of operations (SOPS) must be built into the construct of plant protocol. Building relationships within and across the value chain from suppliers of raw material through to the distribution networks and onto the end-users (farmers) is critical to success and will aid in the project's continuity after investment from WINNER has ceased.

Continued marketing and promotions will also lead to sustainability as the benefits of organic fertilizer are seen and valued above alternatives on the market. Using the plant as a pilot project or model to build or utilize waste in other strategic locations will also ensure its sustainability.

However, the largest and best determining factor of sustainability is self-sufficiency, obtained through profitability and efficiency in operations. Pre-emptive maintenance, monitoring and evaluation of plant assets (such as equipment and vehicles), and the implementation of shared best practices are also critical.

9.0 Conclusion

This organic fertilizer project is estimated to generate income exceeding all expenses, including start-up capital. The anticipated outcome is predicated on the cost of inputs against the price of outputs. Sale of organic fertilizer is expected to generate income of US \$1,800,000.00, with a sale price of US \$1,000.00/MT. This revenue can be compared to expenses amounting to US \$1,758,400.00 by the end of Year 2. Based on this analysis, it can be determined that this project is economically and financially feasible.