

# Composting in the Philippines

## Case-Study Report Composting

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## Preface

This study has been done in the framework of UWEP, the Urban Waste Expertise Programme, a six-year programme - 1995-2001 - of research and project execution in the field of urban waste management in the south. UWEP aims at:

- \* generating knowledge on community and small and micro enterprise involvement in waste management
- \* developing and mobilizing south expertise on urban waste issues

The Urban Waste Expertise Programme covers a range of topics related to waste management in the context of the urban environment in the south - solid waste collection and transfer, waste minimization, recycling of various waste fractions, resource recovery and liquid waste treatment.

Waste management and its various stakeholders now form a rapidly growing area of interest. The role played by small and microenterprises and communities, however, is still much neglected. UWEP aims to generate, analyse, document and customize the information that is gathered during research and pilot projects, in order to enhance the expertise of the UWEP target groups, ultimately aiming at an improved integrated sustainable waste management system. This will in the long run lead to an improved environment, create more employment and offer improved urban services for everyone.

One of the UWEP research topics was composting. This report, "*Composting in the Philippines*", reflects the results of a case-study research done by Danilo G. Lapid, Christopher C. Ancheta and Theresa J. Villareal, commissioned by WASTE, the executing agency of the UWEP programme. Similar researches on the topic of composting were undertaken in Egypt, Nepal and India. By publishing these case-study reports, we explicitly aim at divulging the data gathered during the researches. UWEP sees this report as one of the ways of focusing attention on small and microenterprises, community involvement and their invaluable role in urban waste management.

Hopefully this publication helps you to form a picture of the role the various stakeholders play in urban waste management. More information and an overview of the other UWEP reports and books can be obtained from WASTE.

The *UWEP Case-study Report* series are published informally by WASTE. In order that the information contained in them can be presented with the least possible delay, the typescript has not been prepared in accordance with the procedures normally adhered to. WASTE accepts no responsibility for errors.

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## LIST OF ABBREVIATIONS

AWARE	Assorted Waste Administration and Recycling Enterprise
BARANGAY	Smallest political unit governed by elected officials
CFA	Compost Fungus Activator or Thricoderma
DA	Department of Agriculture
DENR	Department of Environment and Natural Resources
DOST	Department of Science and Technology
FPA	Fertilizer and Pesticide Authority
GPEP	Grain Production Enhancement Program
KALIKASAN	AWARE's compost brand which means "nature"
LGU	Local Government Unit
MEIP	Metropolitan Environmental Improvement Program
MMDA	Metropolitan Manila Development Authority
MOA	Memorandum of Agreement
MSW	Municipal Solid Waste
MT	Metric Ton
NPK	Nitrogen Potassium Phosphorous
OFERMANA	Organic Fertilizer Manufacturers Association of the Philippines
Pxx.xx	Peso (Philippine currency)
PTFWM	Presidential Task Force on Waste Management
SWM	Solid Waste Management
UWEP	Urban Waste Expertise Programme

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## **1.0 INTRODUCTION**

### **1.1 BACKGROUND OF THE STUDY**

This case study is about composting. It deals specifically with technical (i.e., process of composting, scale of technology, quality of compost) and financial-economic (i.e., marketing of compost and financial feasibility) aspects of an existing composting enterprise in Sta. Maria, Bulacan, an urbanizing municipality just north of Metro Manila.

This study is part of the Urban Waste Expertise Programme (UWEP) initiated by WASTE and funded by the Netherlands Directorate General of International Cooperation.

UWEP is a six-year programme (1995-2001) with the purpose of generating employment in waste handling through small and micro-enterprises, and improving the environmental conditions of low income communities. Through its course, the programme wants to develop local expertise by means of research and pilot projects, and to disseminate documented knowledge and technology as far as waste management is concerned. Furthermore, the programme aims to promote waste policies which aim at integration of SME's in the existing waste management systems through regional meetings and policy conferences with local authorities and development organizations. UWEP is implemented mainly in three regions, namely, Latin America, West Africa and South West Asia.

### **1.2 PURPOSE OF THE STUDY**

The objective is to examine, analysis and document an existing composting enterprise whose main source of organic raw material comes from the urban market center of the municipality. The results of this research should ultimately contribute to improve composting of (urban) organic waste and should ultimately lead to policy adjustments to facilitate the establishment of composting enterprises.

The general research questions are:

- How does the composting enterprise function (with particular reference to technical and financial/economic aspects)?
- What are the key factors that determine the efficiency and effectiveness of the enterprise?
- What are the obstacles they face and what are the opportunities for improvement?
- What are the key factors that determine the replicability of the enterprise?

The specific research questions are:

- What is the appropriate scale for composting enterprise?
- What are possible markets for compost?

### **1.3 METHODOLOGY AND LIMITATIONS**

Gathering data for this case study involved actual site visits to the composting site and other concerned private and government entities. Two research consultants, a sanitary engineer and an economist, were hired and supervised by a principal researcher to gather primary data by interviewing key informants. Interviews were both formal and informal using open-ended guide questions followed by relevant probing queries. Part of the documentation process was the taking of slide photographs.

In terms of secondary data, the research team obtained relevant documents from the key informants from the composting enterprise, the municipal government and Department of Science and Technology (DOST), the Department of Agriculture (DA), the Fertilizer and Pesticide Authority (FPA) and other concerned agencies. Documents included newsletters, magazine articles, memorandum of agreements (MOA), a feasibility study and other printed materials.

As far as limitations of the study are concerned, the main issue is lack of availability of time as far as the key informants (the composting proprietor and his staff) were concerned. In addition, official company records on cost, expenditures and other

financial matters were not made available to the research team. As such, the team made use of estimates given verbally by the respondents. These estimates were subjected to field verifications and information coming from other sources like the municipal waste collectors that deliver organic raw materials for the enterprise, the municipal mayor herself and the DOST. Also, the researchers compared the estimates to the next best source of financial information, that is the very recent feasibility study done by the proprietor for a municipality which has a similar socio-demographic and economic characteristics. Composite financial and marketing figures were derived through this process of verification and comparison.

## **2.0 WASTE MANAGEMENT SITUATION**

### **2.1 GOVERNMENT LAWS AND POLICIES**

The Local Government Code of 1991 mandates the Local Government Units (LGU) which include the provincial, city, municipal and barangay governments, to be primarily responsible for delivering basic services and facilities within their respective jurisdiction.

Basic services, of course, include solid waste management. The Code provides that waste collection is a function of the barangay government and disposal is under the responsibility of either the municipal, city or provincial governments. However, this delineation of responsibility is flexible to the extent that lower government units, like the barangay, can expect assistance from (and should be given by) higher government units, like municipal, provincial or national, in cases when the lower units are not capable of delivering such basic services.

In Sta. Maria, Bulacan, the barangays are not capable of collecting garbage so the municipal government collects and disposes municipal waste. The collection and disposal of organic waste used for composting purposes fall under this arrangement. In Metro Manila, a regional body called the Manila Metropolitan Development Authority (MMDA) takes care of the transfer stations and disposal sites while the 17 municipalities and cities within the region are responsible for collection.

Solid waste management (SWM) problems have become a national concern. Major urban centers, like Metro Manila, Cebu, Baguio and Davao, are experiencing rapid rates of solid waste generation beyond the capacity level of the government to improve waste collection and disposal facilities (Tomboc, 1995). In 1987, a Presidential Task Force on Waste Management (PTFWM) was created to address this problem. In July of 1993, President Ramos issued a directive to the PTFWM to formulate a National Integrated SWM Program (see Appendix 1.) particularly for urban areas. Among the policy objectives of this program related to this study are 1) waste reduction at source and 2) the provision of safe, environment-friendly and acceptable ways of disposing or handling of waste including waste reuse, recycling and composting (PTFWM).

Along side these initiatives of the executive branch of government, the legislative bodies,

the Senate and the House of Representatives, have introduced various bills in SWM. Recently, the committees of both Houses in charge of this issue made the painstaking effort of consolidating the different bills (see Appendix 2.) and put them together into a single bill (Passe, 1994).

## 2.2 COMPOSTING SITUATIONER

Organic compost and processed organic fertilizers have been in the Philippine market for more than twenty (20) years. However, the market remains small and sporadic due to the following reasons:

- Lack of acceptance from big and small farmers due to the lack of information dissemination on the values of using organic fertilizers.
- High prices of organic fertilizer vis-à-vis the chemical fertilizers;
- Lack of cooperation of some organic fertilizer producers to produce quality products.

The existing market for compost and organic fertilizer are mainly agricultural producers and farmers who slowly but increasingly use this as an alternative to inorganic fertilizers.

The total national demand for organic fertilizer is defined in terms of sales and based on the actual sales reported by the Organic Fertilizer Manufacturers Association of the Philippines (OFERMANA), the latest being 1992. The actual sales was registered to be 58,750 metric tons. The actual (1985-92) and projected (1993-95) production and sales of organic fertilizers are shown below:

Production and Sales of Organic Fertilizers in the Philippines., 1985-1995			
Year	Production (MT) <sup>1/</sup>	Sales (MT) <sup>1/</sup>	
Surplus/(Deficit)			
1985	6,917	3,091	3,826
1986	4,154	3,967	187
1987	5,478	4,922	556
1988	5,300	4,867	433
1989	8,990	6,430	2,560
1990	25,120	24,420	700
1991	40,819	41,630	(811)

1992	62,210	58,750	3,460
		<u>Projected</u>	
1993	97,981	91,533	6,448
1994	154,320	142,608	11,712
1995	243,053	222,183	20,870

1/ The 1993-1995 figures were estimated using 1991-1992 average growth rates of 57.5% and 55.8 % for the production and sales, respectively.

*Source: Organic Fertilizer Manufacturers' Association*  
See Appendix 3 for list of registered organic fertilizer producers

Considering the above figures, there is a growing market for compost during the past ten years. However, there is no data to support that production and sales of organic fertilizer for 93-95 were achieved. The former president of OFERMANA prior to 1993 has monitored the sales performance of its members but after his term, the new president no longer monitors this. Nevertheless, as per interview with the current president, the potential market for organic fertilizer is 750,000 MT to 1 million MT, mainly equivalent to the market of chemical fertilizers. It is noted that organic fertilizer is still in its infancy stage and comprise only 1 to 2 % of the total fertilizer market.

Based on fertilizer consumption figures, the fertilizer market as a whole has expanded from 1.2 million MT in 1988 to 1.5 million MT in 1994 making an average annual growth rate of 3 percent. Urea and ammonium sulfate dominated the fertilizer market supplying 42 and 16 percent, respectively of the total fertilizer sales in 1994.

These are indications that the DA is now oriented towards a more holistic view of farm situations in the Philippines. It has identified specific opportunity areas in the various regions of the country within which to anchor promotional programs for organic fertilizer.

In 1991, the DA started promoting the use of this type of fertilizer under. The farmers were informed of the benefits of organic fertilizer and encouraged them to reduce dependence on imported chemical fertilizer. Hence, farmers of horticulture crops such as fruits and vegetables and rice in most farming areas of the country were provided with organic fertilizers by the DA for their agricultural production.

For the past four years, the National Program on Rapid Composting of the DOST and Use of Compost as Fertilizer Program of the DA have given impetus to the production and sale of organic fertilizers. These said programs is being coordinated by the Los Banos based Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD). The DA is also pursuing, together with DOST, research and development orientation towards cropping pattern-based technology options instead of commodity focus.

Other relevant information about the composting situationer in the country are mentioned in the succeeding sections as they fit the subject being discussed. For example, market competition and pricing are discussed in the section on market analysis.

### **2.3 WASTE FLOW IN STA. MARIA**

Sta. Maria is a semi-rural, semi-urban municipality located about 25 kilometers north of Metro Manila (see Figure 2-1). Majority of the land use is agricultural where various types of farms (rice and corn predominantly with a number of livestock and orchards) are located. It has a very dense town center where all the residential, commercial and institutional establishments are located (see Figure 2-2). Many have observed that Sta. Maria is fast becoming urbanized due to its proximity to Metro Manila. It has a population of about 110,000 residents.

#### **Agricultural Waste**

This kind of dual economy spells the type of waste it generates. As a municipality, most of the waste generated are agricultural and are mostly left to decay out in the fields. Animal manure from poultry and hog farms are either washed to the river system or are collected by compost producers like AWARE (Assorted Waste Administration and Recycling Enterprise), the focus of this case study.

#### **Municipal Solid Waste**

The so-called municipal solid wastes (MSW) that the local government collects are

largely coming from the town center. The waste generators are the commercial and institutional offices, both government and private, schools, restaurants, shopping stores, service establishments including clinics, beauty parlors, movie houses, and many others.

Given the two dump trucks which average four trips a day to the dump site, MSW is estimated to be around 10-12 tons a day. Solid waste characterization has not been done in the Sta. Maria so there is no data on its waste composition. Moreover, the total solid waste generated in the municipality cannot be quantified since the garbage collection is only done in the poblacion or town center of the municipality. The rural areas of the municipality, including some residential areas manage their own solid waste disposal such as burning and backyard dumping or just leave to compost in pits which are later covered when filled. However, using the average per capita of solid waste generation in rural areas at 0.40 kg/day, the estimated solid waste generated by the whole municipality is 44,000kg/day or 44 tons/day. Of these, only 10 tons are collected daily or 23 % of the total waste generated goes to the dumpsite.

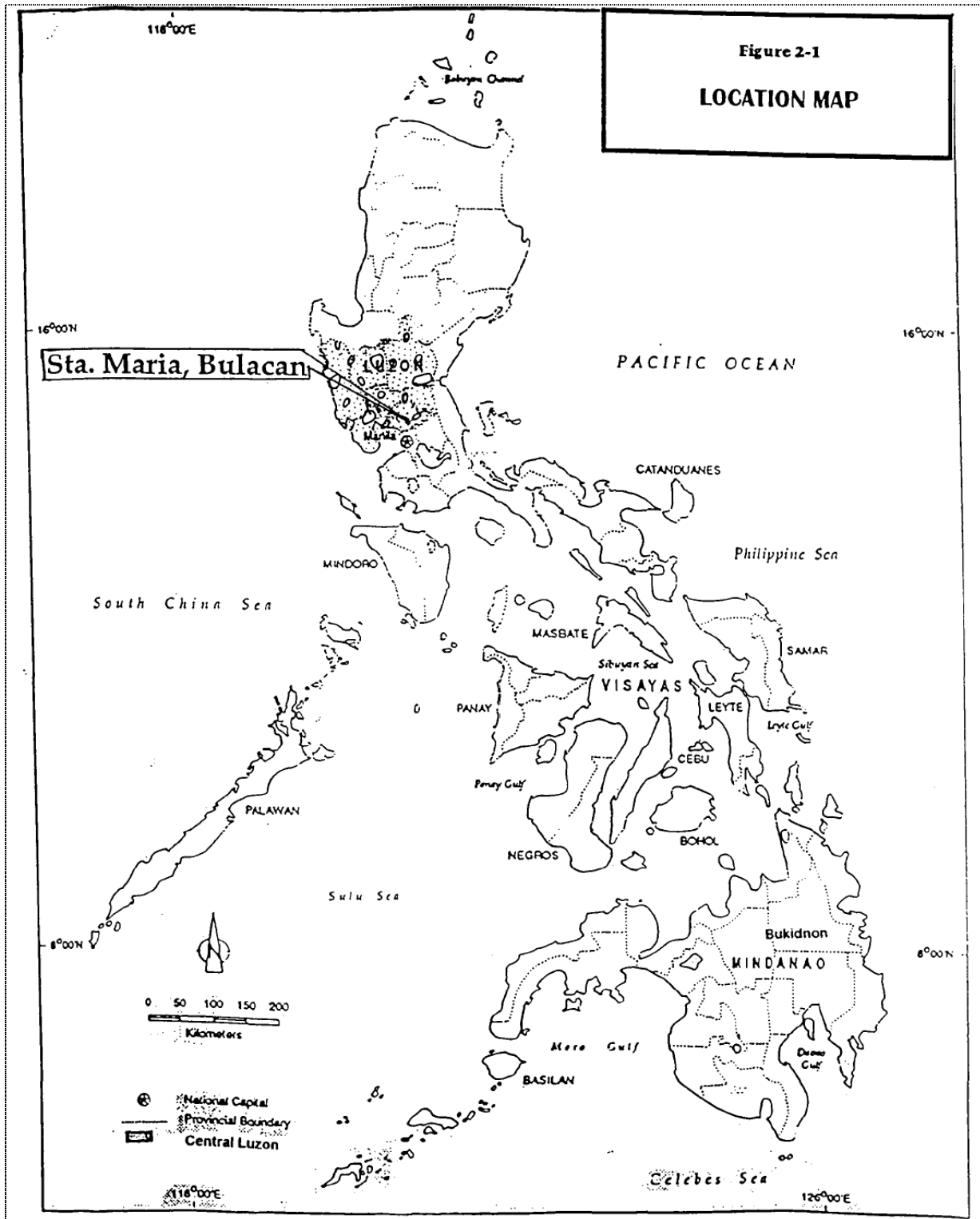
According to AWARE, almost fifty percent of the MSW is biodegradable waste. Only the biodegradable waste from the public market is segregated. This is where AWARE gets its basic raw material input. Household organic wastes are not segregated and end up in the dumpsite.

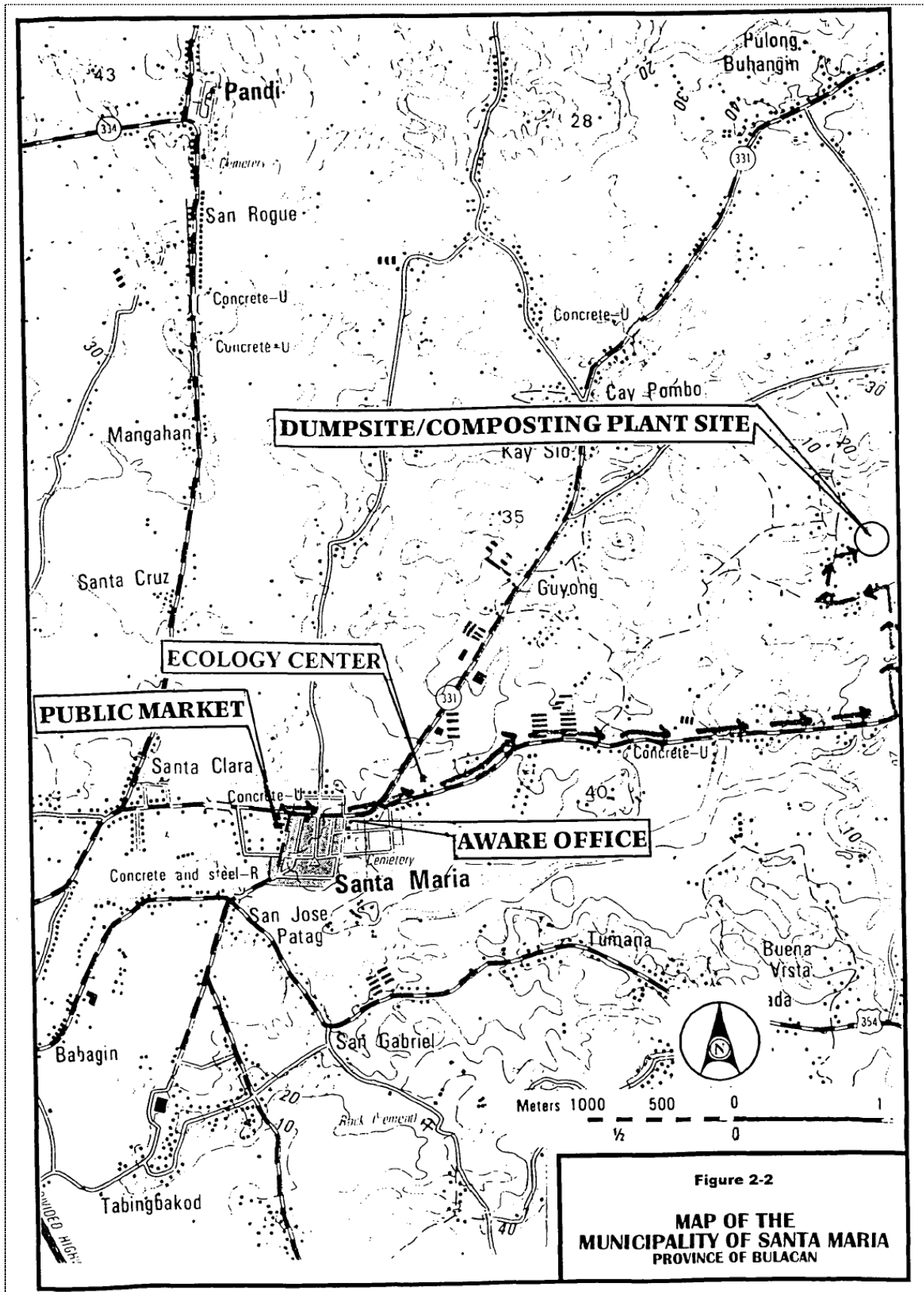
The non-biodegradable wastes are the usual type, like, paper, broken glass and glass bottles, plastics of different types, tin cans, ferrous and non-ferrous metals, and other disposables.

Some of these non-biodegradables are recyclables. Old newspapers are either used as wrappers in the market and small stores or are sold to small pushcart waste buyers that go from house-to-house. The junkshops are at the receiving end of these buyers. Similarly, glass bottles and cullets, tin cans, some kinds of plastics, most metals, like aluminum, bronze, copper, steel bars and pipes and stainless steel scraps end up in junkshops who in turn sell to consolidators or big junkshops before the recyclables are brought and sold to recyclers. Most if not all consolidators and recyclers are from outside Sta. Maria.

### Industrial waste

There are few small to medium industries operating in Sta. Maria. Many of these are cottages industries, metal fabricators; food processors and construction firms. The unrecyclable scraps or wastes of these light industries are either burned or thrown in public areas. Some degree of pollution is observed in the major river crossing the municipality.





**Figure 2-3**  
**WASTE FLOW**  
**Sta. Maria, Bulacan**

<u>Generators</u>	<u>Collector</u>	<u>Disposal</u>
<b>URBAN AREAS</b>		
• Residential	-----> Government Dumptruck	-----> Dumpsite
	-----> Pushcart Collectors Junk Dealers	-----> Recycling
• Commercial	-----> Pushcart Collectors/ Junk Dealers	-----> Recycling
• Institutional	-----> Pushcart Collectors/ Junk Dealers	-----> Recycling
• Industrial	-----> Pushcart Collectors/ Junk Dealers	-----> Recycling
	-----> Government Dumptrucks	-----> Dumpsite -----> Composting (AWARE)
• Public Market	-----> Government Dumptrucks	-----> Dumpsite -----> Composting (AWARE)
<b>RURAL AREAS</b>		
• Residential	----->	Public Area/Burning
• Agricultural	----->	Composting (AWARE)
	----->	Public Area/Burning
• Institutional	----->	Public Area/Burning
• Industrial	----->	Public Area/Burning

### **3.0 CASE STUDY - STA. MARIA COMPOSTING PROJECT**

#### **3.1 ORGANIZATION OF THE ENTERPRISE**

##### **3.1.1 Background**

Sta. Maria's Waste Processing and Recycling Plant started in early 1994. It is a joint-effort of the municipality, AWARE, Incorporated headed by Mr. Luis R. Vargas and the Sta. Maria Economic Foundation, headed by Dr. Roman Cuncio. The supporters of the project did not wait until each resident of Sta. Maria Poblacion became die-hard garbage activists. There was no time to lose and the project just had to begin with the hope that people would cooperate and become garbage conscious. Meetings hastened the awareness process even as structures and systems were set up to make the operation work.

##### **3.1.2 The Enterprise**

AWARE (acronym for Assorted Waste Administration and Recycling Enterprise) is a corporation duly organized and existing under and by virtue of the laws of the Philippines. It was created and joined the program of the municipal government on Solid Waste Management by initially providing technical assistance in addressing the garbage problem. The company was tasked to operate the composting plant which aims to convert solid waste into fertilizers.

While there is a demand for organic fertilizer, AWARE admits that its business was for the proper waste management.

Although AWARE can make money by immediately selling recyclable materials to junk shops or manufacturers, its thrust was to solve the wet biodegradable garbage that are simply thrown to the dumpsite. In so doing, the solid wastes in the Poblacion (town center), which is estimated to be about 300 tons per month (using 10 tons per day which is collected by the collector truck), be further reduced, in as much as roughly 50 per cent of the volume is wet and compostable. Thus, the production of organic fertilizer through composting was conceptualized and its profitability became an incentive to get people involve and be aware of its economic benefits.

Today, the composting activities of the enterprise has gone further. It has been providing

trainings and duplicating its masterpiece in other cities and municipalities. It has made some improvements through innovation for new technologies to enhance the process.

### 3.1.3 Organizational Structure

AWARE, is headed by Mr. Luis R. Vargas. Under a MOA, AWARE tied up with the municipality of Sta. Maria for the operation of its composting plant which forms part of the Sta. Maria's Waste Processing and Recycling Project. The town council had approved the use of the 2,000 square meters public land for the plant site within the 2.5 ha. garbage dumpsite of the municipality and a ₱500,000 budget for equipment, and building expenses.

AWARE has 15 employees comprising of: an Administrative Officer, who runs the office in Sta. Maria; an Institutional Specialist, who provides briefings/training/seminars; an Accountant, who is in charge in bookkeeping, and accounting and sales; an Engineer, who provides technical lectures, feasibility studies and innovation of machineries/equipment; and Laborers, five of which are now working at the Sta. Maria processing plant. Two female employee are assigned full time in the culture and propagation of CFA at the Ecology Learning Center. Other laborers, who were involved and trained with the Sta. Maria's processing plant during its initial operation are now assigned to other municipalities/cities who sought assistance from AWARE to duplicate the same project in their locality. Additional incentives are given to those employees who are involved in the duplication work. The demographic profile of the personnel are as follows:

Personnel	Gender	Age	Religion	Status	Origin/ Ethnicity
General Manager	Male	above 50	Catholic	Married	Sta. Maria, Bulacan
Administrative Officer	Female	late 30s	Catholic	Married	-do-
Institutional Specialist	Female	early 30s	Catholic	Single	Metro Manila
Accountant	Female	early 30s	Catholic	Married	Bulacan
Engineer	Male	early 30s	Catholic	Married	Bulacan
Laborers	Male	20 - late 30s	Catholic	Single/ Married	Bulacan

\* It should be noted that the salaries were not provided to the team for confidentiality reasons.

However, the salaries of the laborers were based on the minimum wage under the Philippine Labor Laws at P 145.00/day. Key staff receives higher salaries

The operation of Sta. Maria's composting plant and that of the other cities/municipalities are being administered by Mr. Vargas. He directs and supervises the over-all operation of the organization. Likewise, he performs decision-making and assigns or delegates responsibilities to the personnel. The organizational structure of the enterprise is shown in Figure 3-1.

#### **3.1.4 Initiation of the Enterprise**

The garbage problem in Sta. Maria actually motivated the initiation of the enterprise, when Marilao, a neighboring town and the former solid waste dumpsite stopped accepting garbage from outside its jurisdiction. The solution to such problem challenged everyone. With lots of guts, basic science and technology and management, Mr. Vargas, a returnee from the U.S., concerned townfolk and officials organized themselves and turned an environmental headache into a model project.

### **3.2 ENVIRONMENTAL SETTING OF THE ENTERPRISE**

#### **3.2.1 Location**

In Sta. Maria, Bulacan, AWARE established its office at the central business district, near the source of the solid waste - the Public Market. It is accessible by land to the dumpsite, about 7 km, where the composting plant described in this report was established (Figure 2-2).

The site is characterized as a generally flat terrain, surrounded by ricefields and it is naturally drained by nearby creeks.

### 3.2.2 Site Selection

In 1994, the existing dumpsite was commissioned after the closure of the open dumpsite at a neighboring town of Marilao, about 15 km from Sta. Maria. With the “not in my backyard (NIMBY)” syndrome, solid wastes are no longer accepted by other municipalities and had to locate its own disposal site within its jurisdiction. The selection of the dumpsite was based on the availability (being a property of the municipality) of the area, and it has in time when the municipality was in dire need of a site for their accumulating municipal solid waste. The site is surrounded by ricefields and there are no inhabitants which are directly affected by the dumpsite.

During the commissioning of the dumpsite and when the compost plant was established, some oppositors were against the use of the area as garbage dumpsite due to socio-political reasons and again, the NIMBY syndrome. It came also into a point when the oppositors picketed at the entry of the dumpsite, until the solid waste management of Sta. Maria became a model and familiarly known, nationwide, and was contrary to some of the oppositor’s negative perceptions on the project. To date, many municipal officials visit the composting operations, including the ecological waste management being implemented in the municipality for duplication.

The local government decided to built the composting facilities within the dumpsite to avoid the NIMBY effect if located elsewhere. Likewise, AWARE will be free to use the land availed of by the municipality, thus, cutting down the initial capitalization which should have been used to purchase/lease the land. It provides also AWARE the advantage of reducing its operational expenses since the municipal collector trucks delivers the sorted garbage into the site free of charge.

In other municipalities where composting is duplicated, the same criteria is being used since the cost/lease of land, the environmental impact of spreading the garbage to other areas (away from the dumpsite) , and the cost/rental of collection truck to bring in the solid waste will greatly affect the selling price of the compost fertilizer. Thus, AWARE believed that the dumpsite is the most appropriate site for the composting operations.

### **3.3 TECHNOLOGY AND COMPOSTING PROCESS**

Solid waste management is under the jurisdiction of the local government units. With the financial constraints of operating an effective collection and proper disposal of the increasing municipal solid waste, the local government is seeking ways and means of developing and implementing environmentally-acceptable solid waste management schemes that are economically feasible and sustainable. As such, the ecological waste management concept was thought as a means to minimize the domestic refuse to a manageable volume.

#### **3.3.1 Ecological Waste Management Concept**

Ecological waste management offers communities the opportunity to unite environment and economics in a low-technology, people-oriented solution to manage solid waste. It embarks in waste reduction through waste recycling and reuse, where biodegradable and non-biodegradable materials are separated at source. The concept through massive information campaign, is now gaining popularity and has encouraged communities to reduce volume of waste and saves money that would otherwise have gone to the payment for the proper disposal of a larger amount of waste.

Non-biodegradable (non-compostable) but recyclable materials are sold to junk shops and manufacturing plants where they are remanufactured or reused. Biodegradable materials are composted or made into useful materials such as bricks for fuel, among others. (Appendix 4)

#### **3.3.2 Composting**

Composting technology employed is basic and simple, requiring minimum skill and capital. With the joint effort of the government and AWARE Inc., the process was further enhanced.

Biodegradable wastes can be composted and turned into organic fertilizer, in a process that essentially returns to the earth what is of the Earth. Food wastes, such as peelings, leftover, veggie trims, fish fowl, seeds, entrails, innards, soft shells; garden wastes such as

manure and carcasses are compostable and become organic fertilizer through a controlled process of biological decomposition in about 35 to 45 days. It is a messy and tedious process, but not so, if we realize that it is good for the earth and its profitability.

### **3.3.3 The Process**

#### SEGREGATION AT SOURCE

The composting process begins with the proper segregation of solid waste. The Sta. Maria pilot project starts in the public market (Slide No. 1), and its surroundings as the source of compostable materials. Under the supervision of the market master, solid wastes are segregated by the vendors and market employees which are then collected through the reuse of sacks with properly labeled classification of wastes, as shown in Figure 3-2 and Slide No. 2. One representative from AWARE assists the market master and market sweepers to see to it that the various types of garbage go into the right container (Slide No. 3). The assistance is temporary and it is one way of educating and disseminating the drive. The sorting process at source is actually part of the ecological waste management concept, where wastes are classified into three types and implemented in color-coded containers - brown for metal (M), green for compostable (C) and yellow for disposable (D). The compostable waste is what eventually becomes the compost fertilizer.

#### COMPOSTING PROCESS

The biodegradable wastes are shredded in order to reduce their sizes, hasten the composting process, and make materials compact and easier to haul.

Under the composting project of AWARE, a shredder (Slide No. 4) was installed in the public market premises where it is accessible to the public. The shredded waste materials are placed in sacks which are tied and hauled (Slide No. 5). A compactor truck which was donated by a Rotary Club in Japan is used to transport the waste materials to the composting plant, located within the municipal garbage dumpsite, 7 kms. away from the market. Another truck brings in rice hull and animal manure from nearby farms.

At the dumpsite (Slide Nos. 6-7), the wastes are laid out in open compost heaps with a

base of about 5 sacks burned “ipa” (rice hull) or sawdust per layer of wastes to help absorb moisture content and reduce odor (Slide Nos. 8-10).

About 10 to 12.5 kilos of compost fungus activator (CFA) or trichoderma (Slide No. 11) are mixed per layer of wastes to help accelerate the decomposition process. The DOST and the University of the Philippines (UP) introduced to them the technology and provided AWARE with the initial supply of trichoderma. Thus, the four month period of decomposition was shortened to 30 days.

Convinced with the result and to ensure the abundant supply of trichoderma, AWARE has gone into CFA production by using coconut water and “gulaman” (agar) as medium which are placed inside “lapad” or flat bottles. After 4 days, the fungi are harvested and placed in a sterilized sawdust which are packed in plastic bags, each containing 1 kilo. It should be noted that trichoderma grows further in sterilized sawdust when added to compost heaps (Slide Nos. 12 - 15).

To mitigate the smell, a layer of about 10 kilos of rock phosphate are spread all over the wastes to be composted. In cases where garden and vegetable wastes are being decomposed, rock phosphate may not be necessary because such wastes do not really emit foul odor.

For the final product to attain the proper balance of nutrients and designed qualities for organic fertilizer, animal manure is added to the wastes being composted before they are covered with burned or carbonized “ipa” (rice hull) and sawdust.

The layers are then covered with plastic sheet to protect the compost heap from rain and to keep the heat that hastens composting. Likewise, each compost heap should be well drained and runoff should be kept away from the compost heaps to prevent excessive generation of leachate (Slide No. 16).

Bamboo poles are pierced into the compost heaps through the plastic cover to sufficiently provide aeration. The bamboo poles are prepared with through holes and perforations on its walls. Actually, it is an indigenous substitute for perforated conduit pipes. Besides aeration induced through the bamboo, which is integral to the rapid decomposition

process, limited amount of methane that may be produced, in the composting process are emitted through it. The process does not emit foul odor since most of the garbage are vegetable and garden wastes.

The wastes are left to decompose and on the fifteenth day, the layers are turned over manually using shovel and then covered again. The process is done until the compost is ready for harvest, usually on the thirtieth day (Slide No. 17).

### REFINING PROCESS

The decomposed wastes are transported manually using pails or wheel barrow from the compost heaps to the mechanical sifter, where the finer materials are separated by vibration from the larger ones (Slides Nos. 18-20). The larger materials are picked out and broken down manually or mechanically through the hammer mill (Slide Nos. 21-22) in order to turn them into finer materials. The larger compost are fed into the grinder.

The uniformly sieved compost are then collected and stored in open bins for four days to allow further aeration and reduce moisture content by mixing or turning over regularly (Slide No. 24). At this stage, it should have the smell of the earth.

The last stage is bagging and storing before the compost are packaged in 50 kilos sack (Slide No. 25) and marketed under the brand name “Kalikasan” which means “nature” in English.

Complementary to the processing plant is the ecology center (Slide No. 12) where small experiments on waste management are done, including the various applications of compost and other waste products. This is where the trichoderma are produced. It also serves as a showcase for products made from recycled materials. Here, the Kalikasan fertilizer are actually tested on plants to observe its effects, specifically on horticulture and ornamental plants.

The composting and refining processes are illustrated in Figure 3-3.

### 3.3.4 Production and the Quality of Compost

One plot or heap can contain around five tons of fresh garbage and animal waste. At the composting plant are 35 heaps with chronological maturation dates. This means that one heap at least can be harvested per day for the entire month. The total volume is composed of 2 parts solid waste and 2 part additives, such as CFA, rock phosphate, animal manure and carbonized rice hull/ipa or sawdust.

To date, AWARE is harvesting about 2 to 3 tons of compost per day or about 40 to 60 sacks of fertilizer. The organic fertilizer is sold at ₱155.00 per sack.

A well-produced, mature compost is free from odor and easy to handle, store and transport. A raw compost (one that has not matured) does not have this qualities, but will acquire them with time if it is allowed to mature. Some of the differences of raw and mature compost are as follows:

<b>Mature compost</b>	<b>Raw compost</b>
Nitrogen as nitrate ion	Nitrogen as ammonium ion
Sulfur as sulfate ion	Sulfur still in part as sulfide ion
Lower oxygen demand	Higher oxygen demand
No danger of putrefaction	Danger of putrefaction
Nutrient elements are in part available to plants	Lower concentrations of vitamins and antibiotics
Higher concentrations of vitamins and antibiotics	Lower concentration of bacteria and fungi, which decompose organic materials
Higher concentrations of soil bacteria, fungi, which are decomposed, easily degradable substances	Higher concentration of bacteria and fungi, which decompose organic materials
Mineralization is about 50 percent	High proportion of organic substance mineralized
Higher water retention ability	Lower water retention ability
Clay-humus complexes are build	No clay-humus complexes generated
Compatible with plants	Not compatible with plants

Mature compost contains trace and essential elements, of which the most important are nitrogen, phosphorous, potassium, and become available during the composting process. The compost can therefore be used in somewhat the same way as an inorganic fertilizer, except that in many cases the concentrations of these elements are so low that excessive large application rates would be required. As a result, compost is often considered a low analysis fertilizer or soil conditioner. Unlike in organic fertilizers, compost has a humus

like quality that makes it even more useful (by replacing lost humus) especially in areas of the world where the humus content of the soil is rapidly depleted as a result of excessive cultivation and land erosion. Kalikasan fertilizer has been tested by the Bureau of Soils and Water Management and has been certified by Fertilizer and Pesticide Authority (FPA) who checks the quality of the compost every year. It was found out that the product contains the necessary nutrients to qualify as compost fertilizer which means that at least 7% comprise of Nitrogen, Potassium and Phosphorous (NPK) contents. Compost having a total NPK of less than 7% may be used as solid conditioners. Either of the product has very important nutrients good for the soil.

During the CAPS team field visit to plant site, a grab or representative sample of composted waste was taken from the compost bin for laboratory analysis. Although the sample has not gone through reprocessing to further increase NPK and reduce the moisture content, it has already the qualities for soil conditioning. The product, however, failed to meet the nutrients to qualify as compost fertilizer and among the reasons why the quality of the product has deteriorated is the segregation and collection of waste with rich nutrients by hog growers. The result of the laboratory analysis taken in 25 June 1996 is shown in Appendix 5. No analysis was carried out on heavy metals since this was not available in the local soil laboratory.

### **3.3.5 Equipment / Material Used**

Except for the collector truck which was donated to the municipality, the basic equipment used in the composting process were locally fabricated through design innovations of AWARE. The cost of the building structure for the composting process and equipment were provided by the municipal government. The provision of the building and equipment are not considered as a loan. They still belong to the municipality after the 10-year contract agreement expires. No repayment is required but a rental/lease is imposed beginning on the 2nd year of operation.

The equipment/materials used are subdivided into the following sub-processing activities:

#### SORTING

- Waste Sack Holders - A simple wooden structure with nails where the sack are fixed to keep it open. Each sack are provided with labels indicating the classification of the solid wastes, as shown in Figure 3-2.
- Sanitary Waste Collector Truck - The compactor truck was donated by a Rotary Club in Japan for the Municipality of Sta. Maria, Bulacan. In coordination with the local government unit, the sorted biodegradable and non-biodegradable are transported by the truck from the public market to the garbage dumpsite, where the composting plant is also located.

### COMPOSTING PROCESS

- Shredder - The shredding machine was fabricated by AWARE. The prototype shredder has the capability of being set at various places.
- Tools - wheel burrow, shovel, pail, plastic cover
- Miscellaneous materials - used sacks, plastic cover, sawdust or burned “ipa” (rice hull), bamboo poles, thread or rope, and additive materials used in the process.

## REFINING PROCESS

- Shifter (conveyor - oscillator) - The shifter was locally - fabricated. It is equipped with a sieve to separate the fine component from the larger ones through its vibratory motion. The finer compost are collected at the bottom in sacks while the larger remains on top of the sieve where they are collected for reprocessing.
- Hammer mill - The hammer mill was locally-fabricated. It is used to break larger and harder compost.
- Grinder - The grinder is also locally - fabricated. It is equipped with a fabricated funnel where the broken compost are further refined to its desired size.
- Bin - The concrete compost bin is made of masonry blocks with an opening in front to facilitate ease in turning over and harvesting. It is used as storage of sieved compost for further aeration.
- Hand sewer - The hand sewer was purchased locally. It is used to close filled-up sacks during packaging.
- Miscellaneous materials - sacks and thread.

The composting process are done outdoor while the refining process are done indoor. The support facilities are the drainage system of the compost heaps or plots, the water supply system, and the refinery plant where all the plant equipment are installed and materials are stored.

With the enterprise expansion to other cities and municipalities, AWARE has prepared some new ideas and technology to impart. Among others are the design of support facilities and equipment for the municipality of Dinalupihan in Bataan Province, as shown in Figure 3-4 to 3-15.

### **3.3.6 Production Problems and Limitations**

The Kalikasan Organic Fertilizers has gone places and AWARE has enough orders to keep its 15 or so employees busy. It is proven that with the great demand for organic fertilizers, AWARE faces problem on the volume of compostable wastes, especially those with rich nutrients such as fish spoils, vegetable and carcasses, since most of these are collected by hog growers. The laboratory result shown in Appendix 5 shows that the

nutrients required are not always satisfactory.

While AWARE has undergone innovations to further increase their production, future marketability of the compost may fail if the quality is not safeguarded. Thus, research and development should form part of the continuing search of improving the quality of the compost as fertilizers.

To bring back the necessary nutrients to qualify as compost fertilizer and not only soil conditioner, AWARE has been recently deploying its personnel to public market early in the morning to make sure that the large amount of nutrient-rich wastes are collected for the composting plant. Besides, AWARE has been looking into other options to enhance the nutrients of the compost.

#### Improving the nutrients by Co-composting garbage with other compostable materials

The animal manure added to organic waste is seasonal and sometimes not enough, especially during rainy season when limited amount of animal manure are provided from farms because large quantity are washed to drain.

One of the recommendations were based on the report of Obeng and Wright. The following were taken from the report which may guide AWARE in the collection of wastes. Carbon and nitrogen are two elements required for microbial growth. The carbon-to-nitrogen (C/N) ratio provide a useful indication of the rate of decomposition of organic matter. Micro-organisms generally require 30 parts of carbon to each part of nitrogen for their metabolism. This ratio is therefore commonly used in the composting process; the most frequently used is between 25 and 30. Sewage sludge and night soil are both relatively high in nitrogenous compounds, and the C/N ratio is normally less than 15 for these wastes. The addition of bulking agents that have a high C/N ratio compared with that of sewage sludge or night soil can be used to adjust the final ratio to one within the optional range. If the C/N ratio is too high, however, the decomposition process slows down as nitrogen becomes growth limiting; if the ratio is too low, the large amount of nitrogen present is rapidly lost by volatilization as molecular ammonia. Since nitrogen is a valuable plant nutrient, its levels in mature compost need to be kept

reasonably high; thus, maintaining an optimum C/N ratio is advantageous to the process.

As a guide an approximate nitrogen content and C/N ratio for some compostable materials are as follows:

<b>Materials</b>	<b>Nitrogen % dry weight</b>	<b>C/N ratio</b>
Urine	15-18	0.8
Mixed slaughterhouse waste	7-10	2
Night Soil	5.5 - 6.5	6-10
Digested sewage sludge	1.9	16
Activated sludge	5.6-6.0	6
Young grass clippings	4.0	12
Cabbage	3.6	12
Weeds	2.0	19
Grass clippings (ave. mixed)	2.4	19
Farmyard Manure (average)	2.15	14
Seaweed	1.9	19
Potato haulms	1.5	25
Oat straw	1.05	48
Wheat straw	0.3	128
Fresh sawdust	0.11	511
Newspaper	nil	---
Food wastes	2.0-3.0	15
Fruit waste	1.5	35
Refuse	0.5-1.4	30-80
Wood	0.07	700
Paper	0.2	170

Source: World Bank Technical Paper, 1987 by Obeng and Wright

Co-composting of garbage with human waste has been proven in other countries. This kind of composting is advantageous because the two waste materials complement each other well. The human waste is high in nitrogen content and moisture and the garbage is high in organic (carbon) content and has good bulking quality.

On the other hand, the NPK values (and other mineral content) of compost can be fortified with chemicals to enhance its fertilizing capacity.

On the production capacity, AWARE could no longer expand extensively within Sta. Maria since collection of garbage are only done in the central business district where the

public market which is the major source of compostible materials are located. The expansion of AWARE is, therefore, focused on the urban center of the municipalities, including the public market. Likewise, AWARE is also taking advantage of the collection system being offered by the municipalities at no cost.

### **3.4 OCCUPATIONAL HEALTH AND ENVIRONMENT**

The project is generally considered environmental enhancement since the composting activity reduces the solid wastes that are collected and disposed into the open garbage dumpsite while enriching the earth and other biological matters. The composting project is actually one of the solutions to further reduce the biodegradable wastes since a large quantity of the non-biodegradable materials are either recycled or sold for remanufacturing. The improved environment of the municipality has reduced the harmful effects of the garbage and its pollutive by-products.

Exposed to the garbage are the personnel involved in composting. The continued exposure of the personnel may be harmful, most especially when they get in contact with carelessly dumped hazardous or toxic wastes.

#### **3.4.1 Environmental Impact**

There are few impact of the project to the environment. However, these impacts are temporary and mitigating measures are attainable.

##### AT SOURCE

- Wastes that are segregated at source are exposed to astray animals, rodents and vermins. While the impact is temporary, the liters which may be left uncollected could be a breeding place of rodents and vermins.
- Leachate generated during the process emits foul odor, if the area is not cleaned.

##### DURING COMPOSTING

- Wastes that are laid in compost heaps or plots produces leachate which may contaminate the groundwater or surface water.
- Gasses and odor may be emitted.

- Compost attracts vermin and rodents.

#### DURING REFINING PROCESS

- Injury that may be caused in the operation of the equipment.

Of the environmental effects, AWARE is applying mitigating measures to minimize the impact of the process to the environment. The following measures are being undertaken:

- Sweeping and flushing the segregation area. The activity is being undertaken by the municipal government.
- Burned rice hull used as waste bedding minimizes the production of leachate and when mixed or used to cover the garbage, it repels flies and other insects.
- Phosphate is mixed with the wastes to eliminate or if not, minimize odor generated.
- Clay or concrete liners attenuates the leachate generated by the wastes. Efficiency of the drainage system should, however, be monitored in order to divert runoff away from the leachate generated and compost plots. The compost plots should be properly drained.
- Plastic cover is provided to avoid increase of moisture content which may result to the increase in leachate generation. Likewise, the plastic cover minimizes the emission of odor and prevents flies and other insects from harboring.
- The bamboo poles with window opening provides also a ventilation for the compost which avoids the accumulation of gas.
- First aid or emergency kits are made available at site.

### **3.4.2 Occupational Health**

Aside from the temporary environmental effects, the frequent exposure of the employees to wastes could be a problem. Of the people engaged in the process, the garbage collectors and composting personnel working at the dumpsite face numerous health and

other hazards. Among these are: (a) lack of sanitary eating and bathroom facilities, (b) threats of diseases due to mosquito, flies and rat infestation, and polluted air.

The municipal government has provided, boots, masks and gloves to solid waste collectors but most of the employees preferred to do the job with their bare hands, slippers and without protective masks. The same findings were observed at the plant site, which is within the town's garbage dumpsite, where AWARE management has provided its employees with protective gadgets. However, the employees simply refuse to wear them and do not realize the effects of the regular exposure of the garbage to their health. According to them, they are uneasy working with the protective gadgets. Although the effects may not be felt at this time, the long-term effects on the employee's health should be looked into.

As already noted, the risk of infection in healthy individuals is low. Certain measures can be taken, however, to improve the general health standards at a composting plant and thus reduce the risk of the secondary infections even further:

1. Workers should be encouraged to maintain high standards of hygiene.
2. During periods of dry weather, the composting area should be sprinkled periodically with water to reduce dust dispersal.
3. Workers should be encouraged to wear masks or respirators, or some other covering to reduce dust inhalation and other protective gadgets, such as boots, and gloves.
4. The composting plant should be located at "discreet" distances from hospitals and residential areas.

### **3.5 MARKET ANALYSIS**

#### **3.5.1 Market Segment**

##### **Market Behavior and Demand**

Under the Department of Agriculture's National Program on the Use of Compost Fertilizer which started in 1991, DA buys organic fertilizers from various organic fertilizer producers including AWARE.

In 1995, the DA introduced the Grains Production Enhancement Program (GPEP) covering the provinces of Pangasinan (Region 1), Isabela (Region 2) and Nueva Ecija (Region 3). This program is a joint undertaking of the three provinces and the DA. It calls for the use of eight bags of organic fertilizers per hectare of rice land as soil conditioner in an attempt to counter the decreasing yield due to increased soil acidity. Funding for the program was allocated from the DA annual budget. The DA and the LGUs are to provide the farmer free of charge eight bags of organic fertilizers for every hectare (4 from DA and 4 from the LGU). This program created an artificial demand for organic fertilizers. The program however was terminated after only one cropping season because the LGUs failed to provide the four bags as stipulated. For the duration of the program the DA bought most of AWARE's organic fertilizer production.

With the termination of the program in early 1996, farmers are no longer subsidized and each manufacturer now promotes their respective products individually. Unfortunately, DA has not conducted any assessment of the program to determine the effect on production as well as the acceptability of organic fertilizers.

AWARE's organic fertilizer, with the brand name of Kalikasan, is produced mainly out of biodegradable materials from market wastes combined with other compostable products such as animal manure, etc. The other organic fertilizer producers use animal manure, bagasse (crushed sugarcane refuse from sugarcane making) and other biodegradable materials. The agricultural sector is the market for compost or organic fertilizer but still utilize inorganic or chemical fertilizer in agricultural production.

Aside from the DA, AWARE also sell direct to farmer's cooperatives and even individual farmers within the province of Bulacan and nearby areas. The potential target groups are still the various farmers' cooperatives in the different provinces not only in Central Luzon but to as far as Bukidnon in Mindanao. Refer to Location (Philippine) Map in Figure 2-1. ( The Philippines is composed of three main island groups, namely; Luzon, Visayas and Mindanao. There are a total of fourteen (14) administrative regions including Metro Manila. Regions 1-5 are mostly in Luzon island, Regions 6-8 are in the

Visayas islands and Regions 9-13 are in Mindanao. Metro Manila is the National Capital Region situated in Luzon and adjacent to the south of Region 3). There are distributors and dealers for chemical fertilizers which can be utilized as marketing channel of organic fertilizers. However, some companies impose exclusivity arrangement with the distributor, i.e., a distributor should not carry the same fertilizer type and grade(s) from another company.

At present, AWARE has been facing the problem of a small production capacity due to the limited space and raw materials available in the municipality of Sta. Maria. The strategy therefore, is to develop more of the production capacity since there is already a large market for compost and they cannot meet the existing demand requirements of the potential customers.

Hence, AWARE has been encouraging the local governments of other municipalities in Bulacan and Nueva Ecija to as far as Naga in Bicol (Region 5) and Bukidnon in Mindanao (Region 10) to at least look at ways of increasing the supply of compost by encouraging them to have proper waste management system that will incorporate composting as part of the system. This is undertaken thru the DENR's (Department of Environment and Natural Resources) solid waste management program which showcases composting as part of an integrated system that will address the solid waste problem of LGUs nationwide, in both urbanized and rural municipalities.

### **Bottlenecks Encountered in Penetrating Market Segments**

There are bottlenecks encountered in penetrating the market segment for the fertilizer market such as resistance to using organic fertilizer due to lack of awareness of its benefits in terms of the increase in yields vis-a-vis the use of inorganic fertilizer. With the support of the Department of Agriculture for the program of promoting the use of organic fertilizer, farmers nationwide are becoming more willing to use organic fertilizer.

AWARE has no problem of competition since it caters only to farmers' cooperatives,

orchard growers and gardens that are in Bulacan, Nueva Ecija and Pampanga and the production capacity of various organic fertilizer producers is still not sufficient to supply the needs of the market. There may be problems on maintaining the quality of compost products but these are on a case-to-case-basis. Also, there is an apparent lack of raw materials for composting due to the inability to secure sufficient quantity of market wastes and even animal manure for compost production.

It is necessary to mention that with regards to the overall organic fertilizer market, constraints were encountered in the utilization of organic materials in the past and despite conclusive evidence showing the merits of organic fertilizer, farmers still limit their use in crop production. Following are some of the constraints in the use of organic materials that are relevant to promoting the use of organic fertilizer among farmer groups:

- (1) on a per unit basis, organic fertilizer sources had been more expensive than inorganic fertilizer. But with the use of indigenous materials and improvement of composting technology compost has become competitive. Composting of organic residues is seen as a labor-intensive process because it involves collection of bulky materials. With the help of local government units (LGUs) this process has formed part of the overall solid waste management and disposal scheme of some LGUs. If the value of indirect benefits of organic fertilizers such as the improvement of the physico-chemical properties of the soil, then organic fertilizer is potentially more cost-effective in the long run.
- (2) social barriers exists which include the natural aversion to handling waste materials. But this is overcome by AWARE by inculcating professionalism in the production of compost among its labor force.
- (3) organic residues are utilized as fuel as in the case of sugarcane bagasse or as feed in the case of rice straw. Recycling systems at present taking cognizance of these competing uses would promote the practice. AWARE has already taken note of the sugarcane bagasse as input to composting and DA has been promoting this

among the sugarcane farmers in Mindanao.

### **Major Competitors**

The major competitors of AWARE are the other member-producers of compost/organic fertilizer of OFERMANA, mostly using animal manure, rice straw and other raw materials except market wastes which AWARE is using. There are already larger producers such as Sagana 100 which has been in the organic fertilizer market since 1974 and whose products have been accepted on a nationwide scale.

There is a threat however on the stability of the market because of the existence of some “fly-by-night” producers who can sell at very low prices and at substandard quality. This is a result of the government’s policy, in particular the Department of Agriculture to award to a bidder who can sell organic fertilizer at the lowest price possible sometimes without due consideration to the quality of the organic product. This is a contributory factor to why a large majority of farmers still do not want to use organic fertilizer.

AWARE in fact is trying to develop and expand its production capacity by developing new production sites of compost in various municipalities, provinces and regions. Although there is some logic for AWARE to expand production within Sta. Maria rather than open new production sites elsewhere, it cannot do so because Sta. Maria is a very small municipality with only a small volume of MSW in its lone dumpsite. Further, there are no landowners willing to sell land to be used for the purpose and nobody wants a dumpsite in his respective neighborhood.

So far AWARE has negotiated with the local government units(LGUs) of Naga City (Camarines Sur), Gapan (Nueva Ecija), Hagonoy (Bulacan) and other towns in Bulacan on the possibility of producing compost from market wastes. AWARE promotes the technology of making compost in order to help LGUs to properly manage disposal of market and municipal wastes.

AWARE’s direct competitors include the other organic fertilizer producers as well as

producers of chemical fertilizers. As of August 15, 1996, there are about twenty-two (22) registered producers of organic fertilizers with the FPA which is the regulating agency under the DA. The complete list of registered manufacturers including their brand names and their status is presented in Appendix 3.

For other fertilizer products, the number of product types in the whole Philippines are as follows:

- Inorganic fertilizers - 197
- Specialty - 8
- Soil Amend/ Conditioner - 39
- Other Agricultural Chemicals / Plant Growth Promoter - 21; and
- Raw materials - 48.

However, since the needs of the market vary as to the soil nutrients required, AWARE has recommended the following combination of organic and inorganic fertilizer for certain types of product.

<b>Product</b>	<b>No. of Kilos To Be Applied</b>	<b>When to Apply</b>	<b>Where to Apply</b>
Palay	600 kgs. Kalikasan 100 kgs. 14-14-14	-Last tilling before planting - 21 days after planting	-To be mixed with the soil -Spread over planted crops
Corn	750 kgs. Kalikasan & 150 kgs. 14-14-14	Before planting 45 days after planting	-10 cm from root & mix with the soil
Leafy vegetable (Pechay, cabbage, etc.)	500 kgs. Kalikasan & 200 kgs. Ammosol	-before planting -14 days after planting	-10 cm from root & mix with the soil
Fruit Vegetable (tomato,	400 kgs. Kalikasan & 100 kgs. 14-14-14	-before planting -21 days after planting	-10 cm from root & mix with the

<b>Product</b>	<b>No. of Kilos To Be Applied</b>	<b>When to Apply</b>	<b>Where to Apply</b>
eggplant, oca, etc.)			soil
Seed Vegetable (Mango, peanut,	500 kgs. Kalikasan & 75 kg. 14-14-14	-before planting -21 days after planting	-10 cm from root & mix with the soil
Flowering plant	50-100 grams for each tree depending on the size of the plant	-before planting or even if it is already planted	-base of the plant
Fruit trees	5-10 kgs. of Kalikasan for each tree	-before or during planting	-10 cm from root & mix with the soil

Source: AWARE

According to AWARE's brochure, Kalikasan Organic Fertilizer contains the following soil nutrients: 2% nitrogen, 5% phosphorus, 2% potassium, 5% calcium, 0.335% magnesium, 24.81% organic carbon, 7.75 ph, Zinc 1685 ppm, iron 9,918 ppm and other micro elements. (However, a compost sample which CAPS had tested with the Bureau of Soils and Water Management, DA, contained much less nutrient content - see Appendix 6.) Further, Kalikasan can be used in seedling nurseries as well as in fishponds. In nurseries, the mix should be 30 % Kalikasan and 70% garden soil. In fishponds, the fishpond must be made dry before mixing 12-20 bags of Kalikasan in 2.54 inches thick mud.

### **3.5.2. Marketing Mix**

This is defined to be the set of instruments that enterprises use in a certain way to approach their market segments/ customers they want to serve.

### **Compost Products**

There are various types of nutrient composition for compost that meet the needs of

different customers and AWARE had modified the composition of certain elements in compost production in order to meet the producers' requirements for organic fertilizer.

There are other types of compost products available in the market and are mainly produced out of animal manure. Refer to the table below.

**Organic Fertilizer Producers in the Philippines  
As of December, 1995**

<b>PRODUCT</b>	<b>COMPANY</b>	<b>GUARANTEED ANALYSIS NPK</b>	<b>EXPIRY DATE</b>
1. Green Harvest Organic	Amalia Farms	0.31-2.0-3.0	12-31-97
2. BioEarth Organic	Fabcon Phil.	0.6-1.5-0.6	12-31-96
3. BioEarth Rooting Mix	Fabcon Phil.	3-14-3	12-31-96
4. GASF Guano Fertilizer	GASF Marketing	P 205 - 15-22%	12-31-96
5. Dolomite	GASF Marketing	Ca - 41%	12-31-96
6. Greenbelt Liquid Fertilizer	Greenbelt Fertilizer	22-0-0	12-31-96
7. Hi-Gro Tech Organic	IGP Farm Corporation	2.5-5-2.5	12-31-97
8. Manila Organic	Manila Fertilizer	2-5-2	12-31-96
9. Complehumus Org. Fert. for Vegetables	Pine Valley Corp.	8-8-8	
10. Sanders Organic Fertilizer	Sanders Organic MKTG.	3-4-5	
11. Sagana 100	Sagana 100 Phil. Inc.	3.5-3.5-3.5	
12. Rock Phosphate	Solid Mining Corp.	Total P205 - 28%	
13. Farmers Product	Tadeja Enterprises	1-6-1	
14. Union Hikari Liquid	Union Hikari	5-0-1	

*Source: Fertilizer and Pesticide Authority  
Department of Agriculture*

### **Quality of Compost**

The quality of compost is maintained by periodic analysis of compost usually done on a per batch basis and this is being monitored by the FPA under the Department of Agriculture. Initially, producers of fertilizers are given a provisional status by the FPA. A holder of a provisional status is required to have their registrations renewed every year with their products also tested every year. Those holding full status are renewable every three (3) years.

### **Product Packaging**

Packaging used on the Kalikasan brand produced by AWARE are 50 kgs sacks the same

as those being used for the packaging of chemical fertilizers. There are however, producers that have packing size of 25 kgs. intended for ornamental plant enthusiasts and are household-based.

### **Strengths of the products**

Unlike other so called organic fertilizers, AWARE uses purely organic compounds in making the fertilizer. Compost mineral contents are periodically analyzed to maintain strict quality standards. Any shortfall in content which are due to the type of waste material composted are added with purely organic materials such as animal manure.

At present, AWARE is closely coordinating with various local government units in various regions and provinces on the different needs of these municipalities including the list of equipment needed to process and market the municipal bio-degradable waste. It has developed a low-cost mobile shredder that is locally designed and assembled making it affordable to assure the quality of the raw materials.

### **Distribution of the Compost Products**

Since the termination of the DA's program on the promotion of the use of organic fertilizer, the main market of the Kalikasan brand organic fertilizer are the farmers' cooperatives in the provinces of Bulacan, Nueva Ecija and Pampanga. These farmers' cooperatives in turn sell fertilizer to their members. It also sells to orchard growers and garden owners for fruit trees and ornamental plants. Presently, the LGUs where AWARE is in joint venture with is promoting and selling Kalikasan fertilizer to farmers.

The distribution channels and their estimated percentage consumption shares are estimated to be direct selling (75%), wholesalers (15%) and LGUs (10%).

At Sta. Maria Bulacan, AWARE has its marketing person (and at the same time the Accountant) who directly promotes Kalikasan to various farmers' cooperatives in coordination with the respective LGUs. It links with larger farmers associations/cooperatives for bulk buying of Kalikasan instead of selling directly to individual

farmers. It does not have a sophisticated marketing organization. It can however tap the existing institutional set-up with LGUs and DENR (in the promotion of composting to be integrated to the solid waste management program of the government) in the promotion to farmers' cooperatives, large orchard growers and garden owners in the use of Kalikasan fertilizer. This will not be difficult since the LGUs are already aware of the product and these LGUs have a direct linkage with farmers' cooperatives based in the municipality.

### **3.5.3 Pricing of the Product**

Kalikasan is still being sold at P155.00 per sack of 50 kilos or about P3.00 per kg even without the GPEP. The estimated production cost based on interviews with AWARE personnel is around P90.00 giving them a margin of P65.00 per sack.

For the duration of DA's program, AWARE used to market their product for P125.00 per sack as per contract with the DA. Other organic producers on the other hand were selling at higher than the government buying price but had to decrease their prices with the bulk purchasing of the government. All fertilizers acquired by the government through the DA are given to farmers free of charge as an initial incentive to use organics to counter the damaging effects of the continuous use of chemical fertilizers. But then due to the LGU's failure to allocate counterpart organic fertilizer volume, the DA program was terminated.

For chemical fertilizers, the 1995 price averages of the six major grades range from P212.93 per bag for Ammonium Sulfate (21-0-0) to P396.40 for the DiAmmonium Phosphate (18-46-0). There are no chemical fertilizers being sold in the market with the same low nutrient content as the compost.

### **3.5.4 Product Promotion**

AWARE promotes its product through information campaigns conducted by the government agencies such as the DA which is mandated to promote the usage of organic

fertilizers in the country, the DOST and the DENR. The DENR is about to enter into a MOA with AWARE to provide training to LGUs. The DA program has already been terminated and it is DOST and DENR which are in coordination with AWARE promotes composting to be integrated in the solid waste management program of each LGU.

### **3.5.5 Marketing Strategy**

AWARE uses an innovative approach in marketing its product. Aside from making use of government agencies to promote and market the product to the end users, AWARE also uses the LGUs not only to increase its production base but also serve as its marketing arm (Slide no. 26). Unlike other fertilizer producers which have a centralized production system, AWARE utilizes the local government units by entering into a contract to use of market wastes thereby decreasing the area needed for garbage disposal. At the same time, the local government earns from the venture through a profit sharing scheme which is negotiable. Any local government would only be too glad to enter into this joint venture if only to minimize its garbage disposal problem. Since only the brand name of Kalikasan is used in all ventures, the product is quickly marketed to a wide area.

Aside from Sta. Maria, Bulacan, AWARE has entered into joint venture with the municipalities of Hagonoy in Bulacan, Dinalupihan in Bataan, Gapan in Nueva Ecija and Naga City in Camarines Sur, among others (Slide No. 27).

It can however, link directly with the market users such as farmer cooperatives through the different LGUs where these cooperatives are based. Further, there are orchard growers and garden owners who may be invited in various LGU-AWARE promotions programs and can be tapped to promote Kalikasan brand of organic fertilizer.

## **3.6 FINANCIAL ANALYSIS**

This section attempts to analyze the financial performance of the composting plant of AWARE located in Sta. Maria, Bulacan. Unlike other organic fertilizer producers, this

project is between the municipality of Sta. Maria and AWARE wherein the municipality provides AWARE with land, building and equipment and the collection of biodegradable market wastes in exchange for minimal rental payments and maintenance of the dumpsite.

### **3.6.1 Production Level**

Since the start of operations in February 1994, the present production capacity of the plant is dependent upon the volume of waste materials recovered from the market. Present production volumes were estimated three (3) tons per day up from 1.5 MT per day during the initial year of operation. This is based on the projected increase of biodegradable wastes of four (4) tons (from the market and households) combined with the two (2) tons of organic additives based on a ratio of 1:2 to maintain the quality of the compost produced. Recovery rate is estimated to be 50% and thus compost production volume is around 3 tons per day.

AWARE is limited to a maximum production volume of three (3) tons of compost due to the space availability at the composting plant. There are only about 30-35 composting heaps with each heap containing about 2 to 3 tons. With a production cycle of 30 days, this translates to an average of about one heap per day. There is no room for expansion of the heaps because of the space limitations, it occupies only a part of the dumpsite property of the municipality.

Production levels are estimated to be as follows:

	Year 1-2	Year 3-10
Annual production	540,000 kgs.	1,080,000 kgs.
Monthly production	45,000 kgs.	90,000 kgs.
Daily production	1,500 kgs.	3,000 kgs.

It must be noted that even on Saturdays and Sundays they also harvest compost. Market wastes are delivered to the site daily except Sundays since the government offices, garbage collection unit included, are closed during these days. Thus, on Mondays, the

volume of market wastes delivered are two (2) times higher than the volume of market wastes during ordinary days.

### **3.6.2 Costs of Production**

Cost assumptions are divided into production cost, labor cost and administrative expenses. There are hidden costs which are part of the production process but were not necessarily spent by AWARE and these costs are likewise presented. These costs are classified as “hidden” because these are for the account of the municipality of Sta. Maria as part of the terms of the Memorandum of Agreement (see Appendix 6) between AWARE and the municipality. All costs presented in this table are in local Philippine currency and based on the actual costs gathered from interviews with personnel of AWARE, the DOST and the DA. The current exchange rate is one (1) US Dollar = 26.20 Philippine Pesos.

Table 1 presents the financial assumptions used in the analysis for the different cost components: materials costs, labor costs, other costs (overhead) and administrative expenses. These comprise the direct operating costs of the composting and recycling plant. In addition, there are “hidden costs” used in the processing of compost which are not directly incurred by AWARE but by other entities such as the municipal government of Sta. Maria, Bulacan and are likewise included in the analysis.

The fixed costs are costs incurred irrespective of the volume of compost production and comprise mainly of direct overhead or administrative expenses such as cost of personnel and payroll taxes, insurance, telephone, transportation, retained services (DOST or resource persons), office supplies and other miscellaneous expenses. As shown in Table 2, these costs amounted to around P441,600.00 from Year 1 to Year 2.

With respect to variable costs directly related to the volume of production, these costs include the cost of raw materials, labor costs directly involved in the operations/production. It should be noted that the biodegradable materials from market

wastes are provided free of charge by the municipal government of Sta. Maria, Bulacan as part of the MOA. Thus, these market and municipal wastes are brought to the site at no cost to AWARE and the costs entailed for hauling are part of the hidden costs.

Hence, the materials cost incurred by AWARE amounted to P544,680.00 in Years 1 and 2 on an average daily production input comprising of two (2) tons of biodegradable wastes plus additive of one (1) ton to produce at least 1.5-2 tons of compost. In the succeeding years, Years 3 to 10, there is an increase in input of four (4) tons as a result of effectiveness of sourcing raw materials and these biodegradable wastes are combined with two (2) tons of additives. With a recovery factor of 50%, the production output is expected to be around three (3) tons per day. Cost of raw materials was assumed to increase by five (5) percent every other year. The increase in the volume of raw material inputs and cost resulted to an increase in raw materials cost from P1,051,056 for Years 3 and 4 up to P1,211,962 in Year 10.

The direct labor costs include the cost of supervisor, foreman and laborers and totaled P388,800.00 in Years 1 and 2 and increasing to P650,160.00 in Year 3 up to P752,641.00 in Year 10. All cost items were assumed to increase by five (5) percent every other year. The other direct operating costs are fuel, repair and maintenance, laboratory, rental payment for land and space which totaled P114,000.00 in Year 1. In Year 2, other operating cost increased by 50 percent to P169,560.00 due to the payment of rent on the land which took effect. In Year 3, costs again posted another 50 percent increase over Year 2 with P260,160.00 mainly because of the doubling of raw material inputs. In Year 10, the cost amounted to P306,084.00.

Thus, the direct operating expenses and administrative expenses of AWARE amounted to around P1.00 million in Year 1 increasing to P1.073 million in Year 2 and P2.746 million in Year 10.

### 3.6.3 Hidden Costs

The hidden costs are mainly the cost of collecting the market wastes and hauling charges including labor costs. The depreciation of hauling trucks, building and equipment are no longer included since AWARE is paying rent to the municipality of Sta. Maria for the use of these facilities. DOST has provided AWARE with a drying equipment which is used during the rainy months to maintain the “quality” and lessen the moisture content of compost. Hence, the cost and depreciation of this equipment may be considered another hidden cost to its operations. Thus, the hidden costs are estimated to include the following:

- Cost of market wastes used as raw materials;
- Labor costs of collecting the wastes, shredding and hauling; and
- Depreciation of trucks used in hauling market wastes to the site.

Quantification of the above hidden cost items are presented in Tables 1 and 2.

AWARE is leasing a property from the municipality at a monthly fee of P4,630 per month. Included in the monthly rental fee is the use of the building and equipment which were acquired by the municipal government. During its initial year of operations, AWARE was given a free rental equivalent to P55,560.00 (or 4,630 per month x 12 months). After this period, AWARE is obligated to pay monthly lease payment of P4,630.00 for a period of nine (9) years, i.e. from 13th to 120th month of its operations. When the lease period is completed, the amount of the lease payment to the municipal government will be renegotiated.

The cost of the structure to house the processing and recycling plant was P253,000.00 while the equipment and tools for use in the processing and recycling amounted to P247,000.00. For purposes of analysis, depreciation of the building and equipment was not included since these are being paid monthly rentals by AWARE. For research and development purposes, AWARE was likewise granted the use of certain areas of the dumping site for experimentation in bio-intensive and organic farming, using fertilizer

produced from municipal wastes.

AWARE will have to shoulder the cost of daily upkeep and maintenance of the facility except in the case of damage(s) due to unforeseen circumstances or force majeure wherein the municipal government will be held responsible.

AWARE is buying the other raw materials used in composting such as additives which are mixed with the biodegradable market wastes to improve composting. These additives include animal manure, CFA, ash and rock phosphate. It also pays for the packing materials such as sacks. It also manufactures its own CFA or trichoderma and pays for utilities and fuel oil consumption as well as the repair costs of the equipment.

The costs of producing compost are computed on a per kilogram basis and are presented in Table 4 and these are classified into AWARE's direct cost of production as well as the hidden cost of its operations.

Thus, the quantified hidden costs of production which should be inputted in the overall cost of production amounted to P387,380.00 in Year 1 increasing to P741,237.00 in Year 10. It must be noted that these costs relate to direct inputs such as raw materials (received from the municipality) and hauling costs (charged to the municipal government which is part of their solid waste management effort).

A greater part of the costs are the hauling charges (around 50% of the total hidden costs) of bringing the market and municipal wastes from the market to the dumping site/compost production site. Refer to Tables 1 and 2 for the unit costs and total costs, respectively on an annual basis.

### **3.6.4 Results of Financial Analysis**

#### **AWARE's Financial Performance : Without Hidden Costs**

The financial analysis is undertaken for two case assumptions: (1) based on the actual costs incurred by AWARE and (b) incorporating the hidden costs in compost production.

It must be noted that AWARE had no capital investment in compost production and just leases the property, building and equipment of the municipal government of Sta. Maria for a period of ten (10) years. Thus for purposes for financial evaluation, a period of ten years is used.

The financial statement deals with the analysis of the revenue and cost items of AWARE based on their actual production cost parameters. Table 3 presents the projected ten-year profit and loss statement of AWARE. Underneath the profit (loss) item is the computed cash flow surplus (deficit) item. The revenues are estimated based on an annual production of 540 tons in Years 1 and 2, and this production output shall increase to 1,080 tons in Year 3 onwards. The selling price of compost was P125 per bag of 50 kg. in Year 1, P155 in years 2 and increasing by five percent every year thereafter.

An additional source of revenues are the sale of machineries and equipment to Local Government Units (LGUs) which will adopt the technology developed by AWARE. The equipment cost about P270,000 and assumed to increase at five percent per year. It is expected that when the seven feasibility studies for LGUs are completed there will be seven new users of the technology. It was further assumed that there will be two new projects every year even after the feasibility studies have been completed.

Further, AWARE charges a franchise fee to every LGU that it assists such as Hagonoy, Bulacan, Naga City in Bicol Region and Dinalupihan in Bataan. This fee is equivalent to 50% of the total profit (without hidden cost) projected for a project of the same production scale as that of Sta. Maria. Thus the franchising fee starts with P771,752 in

the initial year of operations of the LGU and increases to P860,207 and over in the succeeding years. The optimum scale of operations is 4 tons per day and any production beyond this volume is unsustainable and quality suffers.

Another source of revenue are recyclable materials which amounted to P146,000 in years 1 to 2 and P292,000 onwards. A consultancy fee in the amount of P200,000 was earned in Year 2 due to the MOA between AWARE and the Department of Science and Technology (DOST). The total revenues of AWARE amounted to P1.496 million in Year 1 and this grew to P2.29 million in Year 2 as a result of an increase in the selling price from P125 to P155 per bag. For Year 3, the projected revenue is P5.12 million due to additional inputs of raw materials from 2 to 4 tons of biodegradable wastes and from 1-2 tons of additives resulting to a daily production output of 3 tons of compost as well as from franchising fee being charged to LGUs. Revenues are expected to rise further to P9.7 million in Year 10.

Deducting the operating expenses amounting to P1.506 million in Year 1, P1.750 million in Year 2 and P2.867 million for Year 3 and increasing to P3.4 million in Year 10. The net operating revenues which is the profit (loss) item amounted to (P397,260) in Year 1, P144,680 in Year 2, P1.647 million in Year 3 and increasing to P5.55 million in Year 10. This indicates a relatively good financial performance for a new enterprise.

Thus, calculating the cash position of AWARE, if hidden costs are not included, the enterprise will register cumulative cash deficit of P9,880 in Year 1, cash surplus of P539,560 in Year 2 and a much larger cash surplus of more than P2 million from Year 3 onwards, sufficient to cover its costs of operations and probably expansion in some areas.

### **Hidden Costs Are Included in the Production Costs**

In the case wherein the hidden costs (item c) are included in the computation of the annual production costs, the results indicate a negative financial condition (deficit in cashflow) during the first year of operation. Refer to Table 3. Thus, annual production

costs (including hidden costs) will increase to around P1.89 million in Year 1 to P2.1 million in Year 2 and steadily growing to about P4.1 million in Year 10. Hence, there was a net operating loss of (P397,260) in year 1, but this was quickly offset from Year 2 when there was a net operating revenue of P144,680.

Calculating for the cash position if hidden costs are included in the computation, AWARE will have a cash deficit of (P397,260) in Year 1 but again turns positive from Year 3 onwards.

Thus, in order to determine the effect of an increase in price of compost, a sensitivity analysis is undertaken and presented in Table 3. Results indicate that AWARE will have a negative cash position only on the first year of operation. If production costs are calculated to increase by 20%, and assuming that there will be no increase in the market price of compost, AWARE will have a negative position until Year 3 indicating that the operations of the enterprise is highly sensitive to the production costs despite an increase in the level of production to maximize the economies of scale. Thus, it will have a positive cash position only in Year 3 based on the net operating income generated but based on the cumulative cash position, it can only recover from its operating losses by Year 4.

### **3.6.5 Production Costs Per Unit**

Calculating the production cost per kilogram of compost produced, the revenue per kg. is around P2.50 in Year 1 and this increased to around P3.10 per kg. in Year 2 and P4.58 in Year 10. The direct operating expenses broken down into each cost category are presented in Table 4. The cost of raw materials amounted to P1.01 per kg of compost in Years 1 and 2.

In the succeeding years this declined to P0.97 per kg. as a result of an increase in production output. Direct labor cost is around P0.72 per kg. in the first two years and this will decrease to P0.60 per kg. from Year 3 to 4. Administrative costs have gone

down by 50% from P0.85 per kg. in the first two years to P0.49 in the succeeding years due to an increase in production of compost.

Hence, the overall unit cost without accounting for the hidden costs is P2.79 per kg. in year 1 and P2.89 in Year 2 and this goes down to P2.31 per kg. and P2.54 in the subsequent years. The profit margin is therefore (P0.02) per kg. in Year 1, P1.0 in Year 2 , P 2.08 per kg. in Year 3 rising to P 5.83 in Year 10.

If hidden costs are included, then overall production cost per kg. of compost increases to P5.45 in year 1 and P5.67 in Year 2 and P 4.70 thereafter. Likewise, the profit margin per kg. of compost becomes smaller which is (P0.74) per kg. in Year 1, to a positive return of P 0.27 per kg. in Year 2 and P1.53 in year 3 and P 2.47 in Year 4. The amount of hidden cost per kg. is equivalent to P0.71 per kg. in Years 1 and 2 and this declines to P0.56 in Year 3 thereafter as a result of increase in compost production taking advantage of economies of scale in production technology and labor resource.

The hidden cost largely comprised of labor used in the collection and hauling of market and municipal wastes to production site. The depreciation cost component of the hidden cost is equivalent to around P0.09 per kg. in the first two years and this declined to P0.05 per kg. of compost. Clearly, there is a built-in advantage of economies of scale in compost production and AWARE has realized this. Since its operation is relatively labor-intensive, there is a need to maximize labor resource (both direct and indirect ) to fully recover its operating costs.

### **3.6.6 Percentage Shares of Unit Costs to Total Production Costs and Revenues**

Table 5 presents the computed percentage share of each unit cost to total cost which includes the hidden cost of production. AWARE's direct operating costs and administrative expenses comprised around 80% of the total production costs while the hidden cost component account for 20%.

The larger share of production costs of AWARE consists of raw materials costs (34%)

and administrative expenses which is around 16-20%. Additives account for 15% of total production cost. Hauling cost component of the hidden cost is 9%, salaries of administrative personnel accounted for 7-10% while direct labor cost account for 22%, which is largely the variable costs (mainly based on the level of production). There are other administrative costs such as insurance, telephone, retained services which account for another 10% of total production costs.

The cost components are likewise related to total revenues which include recyclables considering that the labor, administrative costs are shouldered by the whole enterprise in its composting and recycling activities. The percentage shares are presented in Table 6. Based on the computed shares, the direct costs of production has eaten up a larger part of revenues which is 100.7% in year 1, 76.4% in year 2 and with the increase in production levels and subsequently increase in revenues, its share decreased to around 36% in the succeeding years. Administrative costs are likewise large which is around 30.6% in year 1 but decreased to around 6% as a result of increase in revenues but no corresponding increase in administrative costs. Hidden costs particularly hauling charges if taken into account are large which is around 25.9% of the total revenues in Year 1 but this decreased to 7.6% in Year 10.

It is noted that the profit of the enterprise comprise almost 50% of total revenues in year 5 even with hidden cost and excluding hidden cost the enterprise profit is around 60.6% in year 6.

AWARE therefore, benefits from the use of the local government's building, trucks, equipment and tools without correspondingly sharing in the depreciation cost even if it pays a monthly lease of only P4,630 per month. Depreciation cost of the equipment, trucks and buildings is estimated to be P114,500 annually or a monthly equivalent cost of around P10,000 which is double the lease payment paid by AWARE to the municipal government.

Even for the cost of raw material inputs in the form of biodegradable market and

municipal wastes which are provided free of charge to AWARE, which on a monthly basis will amount to around P6,000 in Years 1 to 2 to P12,000 with the doubling of these inputs. All these are cost savings to AWARE in order that the production of compost be made profitable. The compost production and recycling project of AWARE however, has likewise benefitted the municipality of Sta. Maria, Bulacan in terms of its waste management and disposal which is now more effective and has also become a source of livelihood for the local recruits.

The financial ratios are computed for two cases: with and without hidden cost. Product ratio, gross profit ratio and fixed cost ratio are the same under the with and without hidden cost. The return on investment under the “with hidden cost” is 13% in year 2 but this increases to more 200% from Year 4 onwards. It is noted that AWARE did not have any investment (without hidden cost case) and thus, ROI is 0%. For the net profit ratio, it is more than 2% in year 10 for both cases. Refer to Table 7.

### **3.7 COOPERATION WITH OTHER ACTORS**

AWARE received and continues to receive cooperation and support from many organizations and institutions. These linkages have been mentioned above and described to a certain extent. This section will summarize these linkages and elaborate further as needed.

#### **3.7.1 Local Government Sector**

##### **Sta. Maria Municipal Government**

First and foremost, the composting project of AWARE may not have materialized without the support and cooperation of the government of the Municipality of Sta. Maria. The composting project started with a Memorandum of Agreement (MOA) between the municipal government and AWARE. The Sta. Maria Economic Foundation acted as primary witness to the MOA.

In 1993, the municipality experienced garbage disposal problem when its neighboring

town stopped accepting its garbage for disposal. It needed technical advice on SWM and AWARE offered its ecological waste management concept.

Based the MOA of 1994, the municipality provided a 2,000 square meter lot space within a government-owned dump site, a warehouse-type one-storey building and some equipment needed in the composting project. Essentially, the local government of Sta. Maria shelled out the capital expenses for the project. AWARE, on the other hand, took care of working capital for overall project management, employees' salaries, maintenance and other incidental expenses. Enforcement of municipal ordinance regarding sorting of solid waste and collection thereof was and still is the government's role.

At present, the MOA is being followed to the letter except for some inefficiencies in the collection and segregation of solid waste. (See Section 3.6.4 below for further discussion)

### **Naga City and other Local Government Units**

Naga City is one of the first local government units that adopted AWARE's project. Recently, Naga City begun composting its wet market waste using AWARE's technology. It will also use the Kalikasan brand name of AWARE. Naga City and AWARE has a MOA to this effect. In return for the use of the brand name, the two parties share 50-50 with the net profit. The former handles all aspects of management, production and marketing, while AWARE handles quality control. AWARE has entered into similar arrangements with the Municipality of Hagonoy, a neighboring town of Sta. Maria within the province of Bulacan. Hagonoy launched it ecological municipal SWM program while the case study was in progress.

In effect, AWARE is expanding its production and market reach by entering into franchise agreements. AWARE is negotiating or about to enter into other franchise arrangements with other municipalities. AWARE is very active in the Bulacan Sustainable Development Council with its president as chairperson of the SWM committee which meets weekly every Tuesday in the provincial Ecology Center.

### **3.7.2 National Government Sector**

#### **Department of Science and Technology (DOST)**

The DOST is highly regarded by AWARE as the one national agency which has assisted her a lot. Under its National Program on Rapid Composting, the DOST Region 3 Office covering Sta. Maria assisted and built AWARE's capability to shorten the composting period by about one-half the time required by natural means. The DOST provided AWARE with a technical assistance package worth P35,000.00. This consisted of P25,000.00 worth of training and equipment, and P10,000.00 in cash. The equipment include two autoclave worth P7,000.00 each and an inoculation chamber made of wood with glass viewing window. Other materials that went with the package were the initial culture of trichoderma and a few hundred plastic pouch. This assistance was covered by a MOA between them. A few months ago, the same government agency gave AWARE another equipment, a mechanical compost dryer that comes in handy during rainy season.

AWARE's relationship with DOST does not stop there. Realizing the economic and environmental potentials of AWARE's project, this regional DOST office started promoting market organic waste composting to the other municipalities under its jurisdiction. Several of the more than 50 municipalities signified interest. At present, the DOST is funding seven feasibility studies (FS) for a municipal integrated solid waste management program using the so-called ecological approach. The fee for these seven FS's amounts to P200,000.00 (an additional source of revenue for AWARE).

#### **The Department of Environment and Natural Resources (DENR)**

The DENR is another national line agency which took notice of AWARE's project. Like DOST, it saw the project's economic and environmental potentials. Through the World Bank-assisted Metropolitan Environmental Improvement Programme (MEIP), DENR promoted AWARE's project nation-wide. Going from one municipality to another, DENR brought the management and technical people of AWARE to give trainings and workshops. To show its seriousness, the DENR put up a pilot composting project, one within its compound and another in a public market within Manila.

To assist in this promotional activity, the DENR-MEIP funded a documentary production of the Sta. Maria experience to serve as an audio-visual aid in the workshops and seminar. A check with the MEIP office revealed that DENR and AWARE are about to sign a MOA to formalize these cooperation and promotional activities. Once the MOA is in effect, The DENR-MEIP will provide some cash amount for the time and expertise of AWARE's technical people.

Because of this and DOST's support, AWARE's composting project has become popular among many local government units and officials. Last July 17, 1996, the Municipality of Sta. Maria, along with 10 other municipalities, received a "Galing Pook" (Model Local Government Unit) Award from the President of the Republic in view of the composting project.

### **3.7.3 Other Composting Enterprises**

The brand name "Kalikasan" is new compared to most of the other brands. It has a provisional license as far as the Fertilizer and Pesticide Authority is concerned, meaning it has to undergo yearly evaluation until such time the FPA is satisfied with its quality and promote it to full license status. AWARE seldom sell retail to individual farmers. It tries, as much as possible, to sell wholesale to farmer cooperatives. Since production is still very small compared to its more established competitors, AWARE sometimes links up with other medium scale suppliers to attain volume deliveries. It has done this a few times already. However, one consortium member-supplier reported Kalikasan failed in one of the quality test, meaning Kalikasan didnot attain the 7 percent total NPK. Just like any new enterprise, AWARE suffers chronically from quality control problems and the management knows this and is conscious to solve them. AWARE is working closely with the FPA for periodic and proper testing.

### **3.7.4 Raw Material Suppliers and other Actors**

As mentioned, AWARE uses compostable market waste as the basic raw material input. The intention at the start of the project was also to collect household biodegradable

waste. This has not yet been realized. According to AWARE and the Municipality, the problem lies in the 3 E's - Education, Engineering and Enforcement. The Sta. Maria Economic Foundation, Inc. was supposed to take care of educating the households, informing them about the project and how to handle waste at the household level. Unfortunately, the Foundation lacked the resources to conduct a municipal-wide information campaign. The parties involved, therefore, decided to concentrate on the public market and educate the vendors first.

In the public market, vendors, specially those in the wet section, were instructed to segregate biodegradable from non-biodegradable solid waste. Several meeting and workshops were conducted. Trainers from the Recycling Movement of the Philippines were brought to Sta. Maria. When project implementation began, AWARE appointed two laborers under its payroll to work at the market to ensure proper segregation. An electric shredder operated by the two laborers was installed at the collection area within the public market. AWARE maintained this arrangement for several months. At present, sorting and collection of solid waste are at the hands of the municipal garbage collection staff. It was observed that sorting of market solid waste was more efficient before than now and the shredder is not being maintained and operated properly properly. Upon delivery to the composting site, AWARE's employees do further sorting of solid waste and manual shredding of the compostable waste.

Collection of biodegradable waste from the households is not a forgotten dream of AWARE. It has designed and fabricated two prototype mobile shredders (Figure 3.7) to collect from house to house. One is being tested in Naga City and the other in the Municipality of Hagonoy. (See Section 3.7.1) Eventually, house-to-house collection of compostable waste will be carried out in Sta. Maria.

Table 1 FINANCIAL ASSUMPTIONS

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<i>Days of operation : 360 days to account for a decline in production during rainy season</i>										
<b>I. Production Costs:</b>										
<b>Materials Costs:</b>										
<b>Kilograms</b>										
Organic waste material (kgs./ day)	2.000	2.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Price per kilo	-	-	-	-	-	-	-	-	-	-
Manure	600	600	1.200	1.200	1.200	1.200	1.200	1.200	1.200	1.200
Price per kilo	0,5	0,53	0,58	0,64	0,70	0,77	0,85	0,93	1,02	1,13
Ash	360	360	720	720	720	720	720	720	720	720
Price per kilo	0,5	0,53	0,58	0,64	0,70	0,77	0,85	0,93	1,02	1,13
CFA	20	20	40	40	40	40	40	40	40	40
Price per kilo	10	10,5	11,6	12,7	14,0	15,4	16,9	18,6	20,5	22,5
Rock Phosphate	20	20	40	40	40	40	40	40	40	40
Price per kilo	2,8	2,9	3,2	3,6	3,9	4,3	4,7	5,2	5,7	6,3
Adjustment (pesos per day)	150	150	150	150	150	150	150	150	150	150
Sacks per month	900	900	1.800	1.800	1.800	1.800	1.800	1.800	1.800	1.800
Price per sack	10	10	10	11,0	11,0	11,0	12,1	12,1	12,1	13,3
Aerators (pesos per day)	15	15	30	30	31,5	31,5	33,1	33,1	34,7	34,7
Covers (pesos per day)	252	252	504	504	529	529	556	556	583	583
Brochures	30	30	30	30	30	30	30	30	30	30
Price	2	2	2	2,2	2,2	2,2	2,4	2,4	2,4	2,7
<b>Labor Costs:</b>										
Supervisor (1)	6.000	6.300	6.615	6.946	7.293	7.658	8.041	8.443	8.865	9.308
Foreman (1)	5.000	5.250	5.513	5.788	6.078	6.381	6.700	7.036	7.387	7.757
Laborers	4	4	8	8	8	8	8	8	8	8
Salary	4.000	4.200	4.410	4.631	4.862	5.105	5.360	5.628	5.910	6.205
Payroll Taxes	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
<b>Other Costs: (pesos per month)</b>										
Fuel, repair & maintenance	4.000	4.000	8.000	8.000	8.400	8.400	8.820	8.820	9.261	9.261
Utilities	2.000	2.000	2.100	2.100	2.205	2.205	2.315	2.315	2.431	2.431
Laboratory	1.000	1.000	1.050	1.050	1.103	1.103	1.158	1.158	1.216	1.216
Rental/lease of the land and the structures (free for the first 12 mos. of operation)		4.630	4.630	4.630	4.630	4.630	4.630	4.630	4.630	4.630
<b>2. Administrative Expenses</b>										
<b>Pesos Per Month</b>										
Manager/ management fee (1)	10.000	10.500	11.025	11.576	12.155	12.763	13.401	14.071	14.775	15.513
Secretary (1)	4.000	4.200	4.410	4.631	4.862	5.105	5.360	5.628	5.910	6.205
Payroll Taxes (20% of salaries)	2.800	2.940	3.087	3.241	3.403	3.574	3.752	3.940	4.137	4.344
Insurance	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000
Telephone	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Transportation/gasoline	5.000	5.000	10.000	10.000	10.500	10.500	11.025	11.025	11.576	11.576
Retained services	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000
Office supplies	2.000	2.000	2.000	2.200	2.200	2.200	2.420	2.420	2.420	2.662
Miscellaneous	2.000	2.000	2.000	2.200	2.200	2.200	2.420	2.420	2.420	2.662
<b>3. Hidden Costs of Operations</b>										
<b>Hauling Expenses</b>										
Driver (1) per month	4.500	4.725	4.961	5.209	5.470	5.743	6.030	6.332	6.649	6.981
Laborers (2) at P 4,000 each per month	8.000	8.400	16.800	17.640	18.522	19.448	20.421	21.442	22.514	23.639
Fuel (Pesos/day)	70,50	70,50	141,00	141,00	148,05	148,05	155,45	155,45	163,23	163,23
Annual Truck Depreciation	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000
Cost of Raw Materials - Market wastes	200	210	441	463,05	486,203	510,513	536,038	562,84	590,982	620,5313
Per kilo (20% of animal manure's cost)	0,1	0,11	0,11	0,12	0,12	0,13	0,13	0,14	0,15	0,16
Volume per day	2.000	2.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000

**TABLE 2 Annual Production Costs**

	Year 1 2 tons	Year 2 2 tons	Year 3 4 tons	Year 4 4 tons	Year 5 4 tons	Year 6 4 tons	Year 7 4 tons	Year 8 4 tons	Year 9 4 tons	Year 10 4 tons
<b>I. PRODUCTION COSTS</b>										
<b>1. Raw Materials</b>										
Organic Waste Material (free)	--	--	--	--	--	--	--	--	--	--
Manure	108,000	108,000	226,800	226,800	238,140	238,140	250,047	250,047	262,549	262,549
Ash	64,800	64,800	136,080	136,080	142,884	142,884	150,028	150,028	157,530	157,530
C.F.A	72,000	72,000	151,200	151,200	158,760	158,760	166,698	166,698	175,033	175,033
Rock Phosphate	20,160	20,160	42,336	42,336	44,453	44,453	46,675	46,675	49,009	49,009
Adjustment	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000	54,000
Sacks	108,000	108,000	226,800	226,800	238,140	238,140	250,047	250,047	262,549	262,549
Aerators	5,400	5,400	10,800	10,800	11,340	11,340	11,907	11,907	12,502	12,502
Covers	90,720	90,720	181,440	181,440	190,512	190,512	200,038	200,038	210,039	210,039
Brochures	21,600	21,600	21,600	23,760	23,760	23,760	26,136	26,136	26,136	28,750
<b>Sub-total Materials</b>	<b>544,680</b>	<b>544,680</b>	<b>1,051,056</b>	<b>1,053,216</b>	<b>1,101,989</b>	<b>1,101,989</b>	<b>1,155,576</b>	<b>1,155,576</b>	<b>1,209,348</b>	<b>1,211,962</b>
<b>2. Salaries</b>										
Supervisor	72,000	72,000	75,600	75,600	79,380	79,380	83,349	83,349	87,516	87,516
Foreman	60,000	60,000	63,000	63,000	66,150	66,150	69,458	69,458	72,930	72,930
Laborers	192,000	192,000	403,200	403,200	423,360	423,360	444,528	444,528	466,754	466,754
Payroll taxes	64,800	64,800	108,360	108,360	113,778	113,778	119,467	119,467	125,440	125,440
<b>Sub-total Salaries</b>	<b>388,800</b>	<b>388,800</b>	<b>650,160</b>	<b>650,160</b>	<b>682,668</b>	<b>682,668</b>	<b>716,801</b>	<b>716,801</b>	<b>752,641</b>	<b>752,641</b>
<b>3. Other Costs</b>										
Delivery charges	54,000	54,000	118,800	118,800	129,600	129,600	140,400	140,400	151,200	151,200
Fuel, repair and maintenance	24,000	24,000	48,000	48,000	50,400	50,400	52,920	52,920	55,566	55,566
Utilities (Water, Electricity)	24,000	24,000	25,200	25,200	26,460	26,460	27,783	27,783	29,172	29,172
Laboratory	12,000	12,000	12,600	12,600	13,230	13,230	13,892	13,892	14,586	14,586
Cost of Rental Payment for land & space	-	55,560	55,560	55,560	55,560	55,560	55,560	55,560	55,560	55,560
<b>Sub-total Other Costs</b>	<b>114,000</b>	<b>169,560</b>	<b>260,160</b>	<b>260,160</b>	<b>275,250</b>	<b>275,250</b>	<b>290,555</b>	<b>290,555</b>	<b>306,084</b>	<b>306,084</b>
<b>Total Production Costs</b>	<b>1,047,480</b>	<b>1,103,040</b>	<b>1,961,376</b>	<b>1,963,536</b>	<b>2,059,907</b>	<b>2,059,907</b>	<b>2,162,932</b>	<b>2,162,932</b>	<b>2,268,074</b>	<b>2,270,688</b>

Composting in the Philippines,  
WASTE, December 1996

	Year 1 2 tons	Year 2 2 tons	Year 3 4 tons	Year 4 4 tons	Year 5 4 tons	Year 6 4 tons	Year 7 4 tons	Year 8 4 tons	Year 9 4 tons	Year 10 4 tons
<b>II. ADMINISTRATIVE EXPENSES</b>										
<b>1. Salaries</b>	<b>201,600</b>	<b>201,600</b>	<b>211,680</b>	<b>211,680</b>	<b>222,264</b>	<b>222,264</b>	<b>233,377</b>	<b>233,377</b>	<b>245,046</b>	<b>245,046</b>
Manager/ Management Fee	120,000	120,000	126,000	126,000	132,300	132,300	138,915	138,915	145,861	145,861
Secretary	48,000	48,000	50,400	50,400	52,920	52,920	55,566	55,566	58,344	58,344
Payroll taxes	33,600	33,600	35,280	35,280	37,044	37,044	38,896	38,896	40,841	40,841
<b>2. Other Administrative Costs</b>	<b>240,000</b>	<b>240,000</b>	<b>300,000</b>	<b>304,800</b>	<b>310,800</b>	<b>310,800</b>	<b>322,380</b>	<b>322,380</b>	<b>328,995</b>	<b>334,803</b>
Insurance	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000	48,000
Telephone	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000
Transportation/ gasoline	60,000	60,000	120,000	120,000	126,000	126,000	132,300	132,300	138,915	138,915
Office supplies	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
Retained Services	24,000	24,000	24,000	26,400	26,400	26,400	29,040	29,040	29,040	31,944
Miscellaneous	24,000	24,000	24,000	26,400	26,400	26,400	29,040	29,040	29,040	31,944
<b>Total Administrative Expenses</b>	<b>441,600</b>	<b>441,600</b>	<b>511,680</b>	<b>516,480</b>	<b>533,064</b>	<b>533,064</b>	<b>555,757</b>	<b>555,757</b>	<b>574,041</b>	<b>579,849</b>
<b>TOTAL ANNUAL EXPENSES</b>	<b>1,489,080</b>	<b>1,544,640</b>	<b>2,473,056</b>	<b>2,473,056</b>	<b>2,592,971</b>	<b>2,592,971</b>	<b>2,718,689</b>	<b>2,718,689</b>	<b>2,842,115</b>	<b>2,842,115</b>
<b>Add: Hidden Cost</b>										
Cost of Raw materials	72,000	72,000	151,200	151,200	158,760	158,760	166,698	166,698	175,033	175,033
Hauling Costs	175,380	182,880	311,895	324,952	341,199	355,594	373,374	389,245	408,707	426,204
Depreciation Expense	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Interest Expense	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000	90,000
<b>Subtotal Hidden Costs</b>	<b>387,380</b>	<b>394,880</b>	<b>603,095</b>	<b>616,152</b>	<b>639,959</b>	<b>654,354</b>	<b>680,072</b>	<b>695,943</b>	<b>723,740</b>	<b>741,237</b>
<b>GRAND TOTAL</b>	<b>1,876,460</b>	<b>1,939,520</b>	<b>3,076,151</b>	<b>3,089,208</b>	<b>3,232,930</b>	<b>3,247,325</b>	<b>3,398,761</b>	<b>3,414,632</b>	<b>3,565,855</b>	<b>3,583,352</b>

**TABLE 3 PROJECTED TEN YEAR PROFIT AND LOSS STATEMENT AWARE COMPOSTING PLANT**

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
	2 tons	2 tons	4 tons	4 tons	4 tons	4 tons	4 tons	4 tons	4 tons	4 tons
<b>REVENUES</b>										
Sale of Organic Fertilizer	1,350,000	1,674,000	3,515,400	3,691,170	3,875,729	4,069,515	4,272,991	4,486,640	4,710,972	4,946,521
Sale of Machineries and Equipment		270,000	540,000	567,000	595,350	625,118	656,373	689,192	723,652	759,834
Consultancy		200,000								
Recyclables	146,000	146,000	292,000	292,000	292,000	292,000	292,000	292,000	292,000	292,000
Franchise Fee-Hagonoy, Bulacan			771,752	860,207	899,821	1,001,179	1,044,283	1,156,030	1,211,166	1,331,464
-Naga City, Camarines Sur				771,752	860,207	899,821	1,001,179	1,044,283	1,156,030	1,211,166
-Dinalupihan, Bataan					771,752	860,207	899,821	1,001,179	1,044,283	1,156,030
<b>TOTAL REVENUES</b>	1,496,000	2,290,000	5,119,152	6,182,129	7,294,858	7,747,838	8,166,646	8,669,323	9,138,102	9,697,015
<b>EXPENSES</b>										
<b>(a) Production Costs</b>										
Materials	544,680	544,680	1,051,056	1,053,216	1,101,989	1,101,989	1,155,576	1,155,576	1,209,348	1,209,348
Salaries	388,800	388,800	650,160	650,160	682,668	682,668	716,801	716,801	752,641	752,641
Cost of Goods Sold	-	189,000	378,000	396,900	416,745	437,582	459,461	482,434	506,556	531,884
Other costs	114,000	169,560	260,160	260,160	275,250	275,250	290,555	290,555	306,084	306,084
<b>Sub-total</b>	1,047,480	1,292,040	2,339,376	2,360,436	2,476,652	2,497,489	2,622,394	2,645,367	2,774,630	2,799,958
<b>(b) Administrative Costs</b>										
Salaries	201,600	201,600	211,680	211,680	222,264	222,264	233,377	233,377	245,046	245,046
Other Administrative costs	240,000	240,000	300,000	304,800	310,800	310,800	322,380	322,380	328,995	334,803
13th Month Bonus	16,800	16,800	17,640	17,640	18,522	18,522	19,448	19,448	20,421	20,421

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
	2 tons	2 tons	4 tons	4 tons	4 tons	4 tons	4 tons	4 tons	4 tons	4 tons
<b>Sub-total</b>	458.400	458.400	529.320	534.120	551.586	551.586	575.205	575.205	594.462	600.270
<b>Total (a) and (b)</b>	1,505.880	1,750.440	2,868.696	2,894.556	3,028.238	3,049.075	3,197.599	3,220.572	3,369.092	3,400.227
<b>Add: (c) Hidden Cost</b>	387.380	394.880	603.095	616.152	639.959	654.354	680.072	695.943	723.740	741.237
<b>Total (a), (b) and (c)</b>	1,893.260	2,145.320	3,471.791	3,510.708	3,668.197	3,703.429	3,877.671	3,916.515	4,092.831	4,141.465
<b>Profit (Loss) without (c)</b>	(9.880)	539.560	2,250.456	3,287.573	4,266.620	4,698.763	4,969.047	5,448.751	5,769.011	6,296.788
<b>Profit (Loss) with (c)</b>	(397.260)	144.680	1,647.361	2,671.421	3,626.661	4,044.409	4,288.975	4,752.809	5,045.271	5,555.550
<b>Without (C) Hidden Costs:</b>										
<b>Cash Flow Surplus (Deficit)</b>	(9.880)	529.680	2,780.136	6,067.709	10,334.329	15,033.093	20,002.139	25,450.891	31,219.901	37,516.689
<b>Cumulative Surplus (Deficit)</b>	(9.880)	519.800	3,299.936	9,367.645	19,701.974	34,735.067	54,737.206	80,188.097	111,407.998	148,924.687
<b>With (C) Hidden Costs:</b>										
<b>Cash Flow Surplus (Deficit)</b>	(397.260)	(252.580)	1,394.781	4,066.202	7,692.863	11,737.272	16,026.247	20,779.055	25,824.326	31,379.877
<b>Cumulative Surplus (Deficit)</b>	(397.260)	(649.840)	744.941	4,811.143	12,504.006	24,241.278	40,267.525	61,046.581	86,870.907	118,250.784

**Table 4 Revenue and Production Cost Per Kilogram of Compost AWARE Composting Plant**

	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>	<i>Year 5</i>	<i>Year 6</i>	<i>Year 7</i>	<i>Year 8</i>	<i>Year 9</i>	<i>Year 10</i>
<b>REVENUES</b>										
Sale of Organic Fertilizer	2,50	3,10	3,26	3,42	3,59	3,77	3,96	4,15	4,36	4,58
<b>EXPENSES</b>										
<b>(a) Production Costs</b>										
Materials	1,01	1,01	0,97	0,98	1,02	1,02	1,07	1,07	1,12	1,12
Salaries	0,72	0,72	0,60	0,60	0,63	0,63	0,66	0,66	0,70	0,70
Other costs	0,21	0,31	0,24	0,24	0,25	0,25	0,27	0,27	0,28	0,28
<b>Sub-total</b>	1,94	2,04	1,82	1,82	1,91	1,91	2,00	2,00	2,10	2,10
<b>(b) Administrative Costs</b>										
Salaries	0,37	0,37	0,20	0,20	0,21	0,21	0,22	0,22	0,23	0,23
Other Administrative costs	0,44	0,44	0,28	0,28	0,29	0,29	0,30	0,30	0,30	0,31
13th Month Bonus	0,03	0,03	0,02	0,02	0,02	0,02	0,02	0,02	0,02	0,02
<b>Sub-total</b>	0,85	0,85	0,49	0,49	0,51	0,51	0,53	0,53	0,55	0,56
<b>Total (a) and (b)</b>	2,79	2,89	2,31	2,31	2,42	2,42	2,54	2,54	2,65	2,66
<b>(c) Hidden Cost</b>	0,72	0,73	0,56	0,57	0,59	0,61	0,63	0,64	0,67	0,69
<b>Total (a), (b) and (c)</b>	5,45	5,67	4,68	4,70	4,92	4,93	5,17	5,18	5,42	5,44
<b>Profit (Loss) without (c)</b>	(0,02)	1,00	2,08	3,04	3,95	4,35	4,60	5,05	5,34	5,83
<b>Profit (Loss) with (c)</b>	(0,74)	0,27	1,53	2,47	3,36	3,74	3,97	4,40	4,67	5,14
<b>Hidden Costs</b>										
<b>Cost of Raw Materials</b>	0,13	0,13	0,14	0,14	0,15	0,15	0,15	0,15	0,16	0,16
<b>Hauling Charges</b>	0,32	0,34	0,29	0,30	0,32	0,33	0,35	0,36	0,38	0,39
<b>Depreciation Expense</b>	0,09	0,09	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05
<b>Interest Expense</b>	0,17	0,17	0,08	0,08	0,08	0,08	0,08	0,08	0,08	0,08

**Table 5 Percentage of Unit Production Costs to Total Costs**

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>I. PRODUCTION COSTS</b>										
<b>1. Raw Materials</b>										
Organic Waste Material (free)	--	--	--	--	--	--	--	--	--	--
Manure	5,8%	5,6%	7,4%	7,3%	7,4%	7,3%	7,4%	7,3%	7,4%	7,3%
Ash	3,5%	3,3%	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%	4,4%
C.F.A.	3,8%	3,7%	4,9%	4,9%	4,9%	4,9%	4,9%	4,9%	4,9%	4,9%
Rock Phosphate	1,1%	1,0%	1,4%	1,4%	1,4%	1,4%	1,4%	1,4%	1,4%	1,4%
Adjustment	2,9%	2,8%	1,8%	1,7%	1,7%	1,7%	1,6%	1,6%	1,5%	1,5%
Sacks	5,8%	5,6%	7,4%	7,3%	7,4%	7,3%	7,4%	7,3%	7,4%	7,3%
Aerators	0,3%	0,3%	0,4%	0,3%	0,4%	0,3%	0,4%	0,3%	0,4%	0,3%
Brochures	4,8%	4,7%	5,9%	5,9%	5,9%	5,9%	5,9%	5,9%	5,9%	5,9%
	1,2%	1,1%	0,7%	0,8%	0,7%	0,7%	0,8%	0,8%	0,7%	0,8%
<b>Sub-total Materials</b>	29,0%	28,1%	34,2%	34,1%	34,1%	33,9%	34,0%	33,8%	33,9%	33,8%
-										
<b>2. Salaries</b>										
Supervisor	3,8%	3,7%	2,5%	2,4%	2,5%	2,4%	2,5%	2,4%	2,5%	2,4%
Foreman	3,2%	3,1%	2,0%	2,0%	2,0%	2,0%	2,0%	2,0%	2,0%	2,0%
Laborers	10,2%	9,9%	13,1%	13,1%	13,1%	13,0%	13,1%	13,0%	13,1%	13,0%
Payroll Taxes	3,5%	3,3%	3,5%	3,5%	3,5%	3,5%	3,5%	3,5%	3,5%	3,5%
<b>Sub-total Salaries</b>	20,7%	20,0%	21,1%	21,0%	21,1%	21,0%	21,1%	21,0%	21,1%	21,0%
<b>3. Other Costs</b>										
Fuel, repair and Maintenance	1,3%	1,2%	1,6%	1,6%	1,6%	1,6%	1,6%	1,5%	1,6%	1,6%
Utilities (Water & Electricity)	1,3%	1,2%	0,8%	0,8%	0,8%	0,8%	0,8%	0,8%	0,8%	0,8%
Laboratory	0,6%	0,6%	0,4%	0,4%	0,4%	0,4%	0,4%	0,4%	0,4%	0,4%
Cost of Rental payment for land & space	0,0%	2,9%	1,8%	1,8%	1,7%	1,7%	1,6%	1,6%	1,6%	1,6%
	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
<b>Sub-total Other Costs</b>	6,1%	8,7%	8,5%	8,4%	8,5%	8,5%	8,5%	8,5%	8,6%	8,5%
<b>Total Production Costs</b>	55,8%	56,9%	63,8%	63,6%	63,7%	63,4%	63,6%	63,3%	63,6%	63,4%
<b>II. ADMINISTRATIVE EXPENSES</b>										
<b>1. Salaries</b>										
Manager/ Management Fee	6,4%	6,2%	4,1%	4,1%	4,1%	4,1%	4,1%	4,1%	4,1%	4,1%
Secretary	2,6%	2,5%	1,6%	1,6%	1,6%	1,6%	1,6%	1,6%	1,6%	1,6%
Payroll taxes	1,8%	1,7%	1,1%	1,1%	1,1%	1,1%	1,1%	1,1%	1,1%	1,1%
<b>2. Other Administrative Costs</b>										
Insurance	2,6%	2,5%	1,6%	1,6%	1,5%	1,5%	1,4%	1,4%	1,3%	1,3%
Telephone	1,3%	1,2%	0,8%	0,8%	0,7%	0,7%	0,7%	0,7%	0,7%	0,7%
Transportation/ gasoline	3,2%	3,1%	3,9%	3,9%	3,9%	3,9%	3,9%	3,9%	3,9%	3,9%
Office supplies	3,2%	3,1%	2,0%	1,9%	1,9%	1,8%	1,8%	1,8%	1,7%	1,7%
Retained Services	1,3%	1,2%	0,8%	0,9%	0,8%	0,8%	0,9%	0,9%	0,8%	0,9%
Miscellaneous	1,3%	1,2%	0,8%	0,9%	0,8%	0,8%	0,9%	0,9%	0,8%	0,9%
<b>Total Administrative Expenses</b>	23,5%	22,8%	16,6%	16,7%	16,5%	16,4%	16,4%	16,3%	16,1%	16,2%

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>TOTAL ANNUAL EXPENSES</b>	79,4%	79,6%	80,4%	80,1%	80,2%	79,8%	80,0%	79,6%	79,7%	79,3%
<b>Add: Hidden Cost</b>										
Cost of Raw Materials	3,8%	3,7%	4,9%	4,9%	4,9%	4,9%	4,9%	4,9%	4,9%	4,9%
Hauling Costs	9,3%	9,4%	10,1%	10,5%	10,6%	11,0%	11,0%	11,4%	11,5%	11,9%
Depreciation Expense	2,7%	2,6%	1,6%	1,6%	1,5%	1,5%	1,5%	1,5%	1,4%	1,4%
Interest Expense	4,8%	4,6%	2,9%	2,9%	2,8%	2,8%	2,6%	2,6%	2,5%	2,5%
<b>Sub-total Hidden Costs</b>	20,6%	20,4%	19,6%	19,9%	19,8%	20,2%	20,0%	20,4%	20,3%	20,7%
<b>GRAND TOTAL</b>	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

**Table 6 Percentage Share of Production Costs to Revenues AWARE Composting Plant**

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
<b>REVENUES</b>										
Sale of Organic Fertilizer	90,2%	73,1%	68,7%	59,7%	53,1%	52,5%	52,3%	51,8%	51,6%	51,0%
Sale of Machineries and Equipment		11,8%	10,5%	9,2%	8,2%	8,1%	8,0%	7,9%	7,9%	7,8%
Consultancy		8,7%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Recyclables	9,8%	6,4%	5,7%	4,7%	4,0%	3,8%	3,6%	3,4%	3,2%	3,0%
Franchise Fee-Hagonoy			15,1%	13,9%	12,3%	12,9%	12,8%	13,3%	13,3%	13,7%
-Naga				12,5%	11,8%	11,6%	12,3%	12,0%	12,7%	12,5%
-Dinalupihan					10,6%	11,1%	11,0%	11,5%	11,4%	11,9%
<b>TOTAL REVENUES</b>	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
<b>EXPENSES</b>										
<b>(a) Production Costs</b>										
Materials	36,4%	23,8%	20,5%	17,0%	15,1%	14,2%	14,1%	13,3%	13,2%	12,5%
Salaries	26,0%	17,0%	12,7%	10,5%	9,4%	8,8%	8,8%	8,3%	8,2%	7,8%
Cost of Goods Sold		8,3%	7,4%	6,4%	5,7%	5,6%	5,6%	5,6%	5,5%	5,5%
Other costs	7,6%	7,4%	5,1%	4,2%	3,8%	3,6%	3,6%	3,4%	3,3%	3,2%
<b>Sub-total</b>	70,0%	56,4%	45,7%	38,2%	34,0%	32,2%	32,1%	30,5%	30,4%	28,9%
<b>(b) Administrative Costs</b>										
Salaries	13,5%	8,8%	4,1%	3,4%	3,0%	2,9%	2,9%	2,7%	2,7%	2,5%
Other Administrative costs	16,0%	10,5%	5,9%	4,9%	4,3%	4,0%	3,9%	3,7%	3,6%	3,5%
13th Month Bonus	1,1%	0,7%	0,3%	0,3%	0,3%	0,2%	0,2%	0,2%	0,2%	0,2%
<b>Sub-total</b>	30,6%	20,0%	10,3%	8,6%	7,6%	7,1%	7,0%	6,6%	6,5%	6,2%
<b>Total (a) and (b)</b>	100,7%	76,4%	56,0%	46,8%	41,5%	39,4%	39,2%	37,1%	36,9%	35,1%
<b>(c) Hidden Cost</b>	25,9%	17,2%	11,8%	10,0%	8,8%	8,4%	8,3%	8,0%	7,9%	7,6%

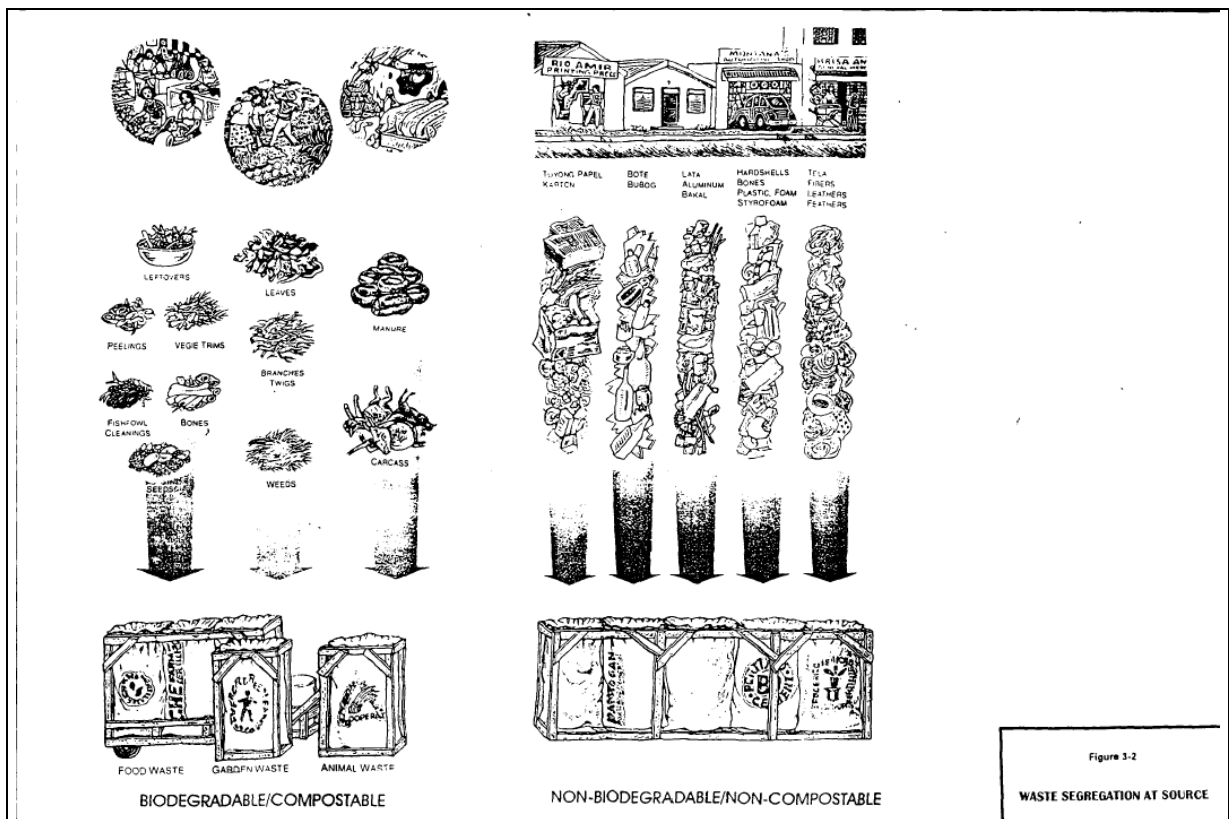
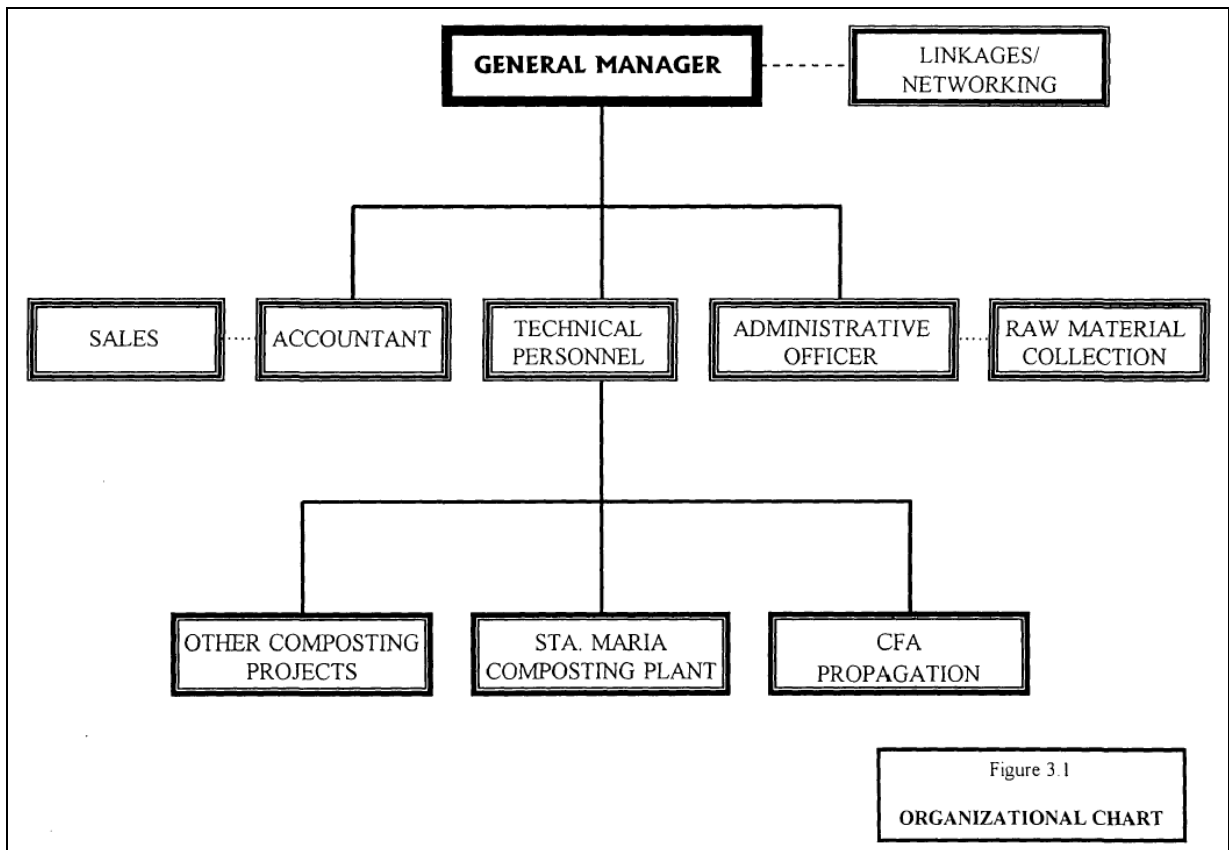
	<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>	<i>Year 5</i>	<i>Year 6</i>	<i>Year 7</i>	<i>Year 8</i>	<i>Year 9</i>	<i>Year 10</i>
<b>Total (a), (b) and (c)</b>	126,6%	93,7%	67,8%	56,8%	50,3%	47,8%	47,5%	45,2%	44,8%	42,7%
<b>Profit (Loss) without (c)</b>	-0,7%	23,6%	44,0%	53,2%	58,5%	60,6%	60,8%	62,9%	63,1%	64,9%
<b>Profit (Loss) with (c)</b>	-26,6%	6,3%	32,2%	43,2%	49,7%	52,2%	52,5%	54,8%	55,2%	57,3%
<b>Hidden Costs</b>	15,8%	15,7%	16,7%	17,0%	17,0%	17,4%	17,4%	17,7%	17,8%	18,2%
<b>Cost of Raw Materials</b>	3,8%	3,7%	4,9%	4,9%	4,9%	4,9%	4,9%	4,9%	4,9%	4,9%
<b>Hauling Charges</b>	9,3%	9,4%	10,1%	10,5%	10,6%	11,0%	11,0%	11,4%	11,5%	11,9%
<b>Depreciation Expense</b>	2,7%	2,6%	1,6%	1,6%	1,5%	1,5%	1,5%	1,5%	1,4%	1,4%
<b>Interest Expense</b>	4,8%	4,6%	2,9%	2,9%	2,8%	2,8%	2,6%	2,6%	2,5%	2,5%

Table 7 Financial Ratio without hidden costs

Without hidden costs	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Year 6</b>	<b>Year 7</b>	<b>Year 8</b>	<b>Year 9</b>	<b>Year 10</b>
Product ratio	22%	34%	44%	47%	47%	49%	49%	52%	52%	54%
Gross profit ratio	-12%	7%	29%	32%	33%	36%	36%	39%	39%	42%
Return on investment	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Fixed cost ration	34%	27%	15%	14%	14%	14%	13%	13%	13%	12%
Net Profit ratio	-0.01%	0.64%	1.28%	1.78%	2.20%	2.31%	2.33%	2.43%	2.45%	2.55%

Table 8 Financial Ratio with hidden costs

With hidden costs	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Year 6</b>	<b>Year 7</b>	<b>Year 8</b>	<b>Year 9</b>	<b>Year 10</b>
Product ratio	22%	34%	44%	47%	47%	49%	49%	52%	52%	54%
Gross profit ratio	-12%	7%	29%	32%	33%	36%	36%	39%	39%	42%
Return on investment	-35%	13%	144%	233%	317%	353%	375%	415%	441%	485%
Fixed cost ration	34%	27%	15%	14%	14%	14%	13%	13%	13%	12%
Net Profit ratio										



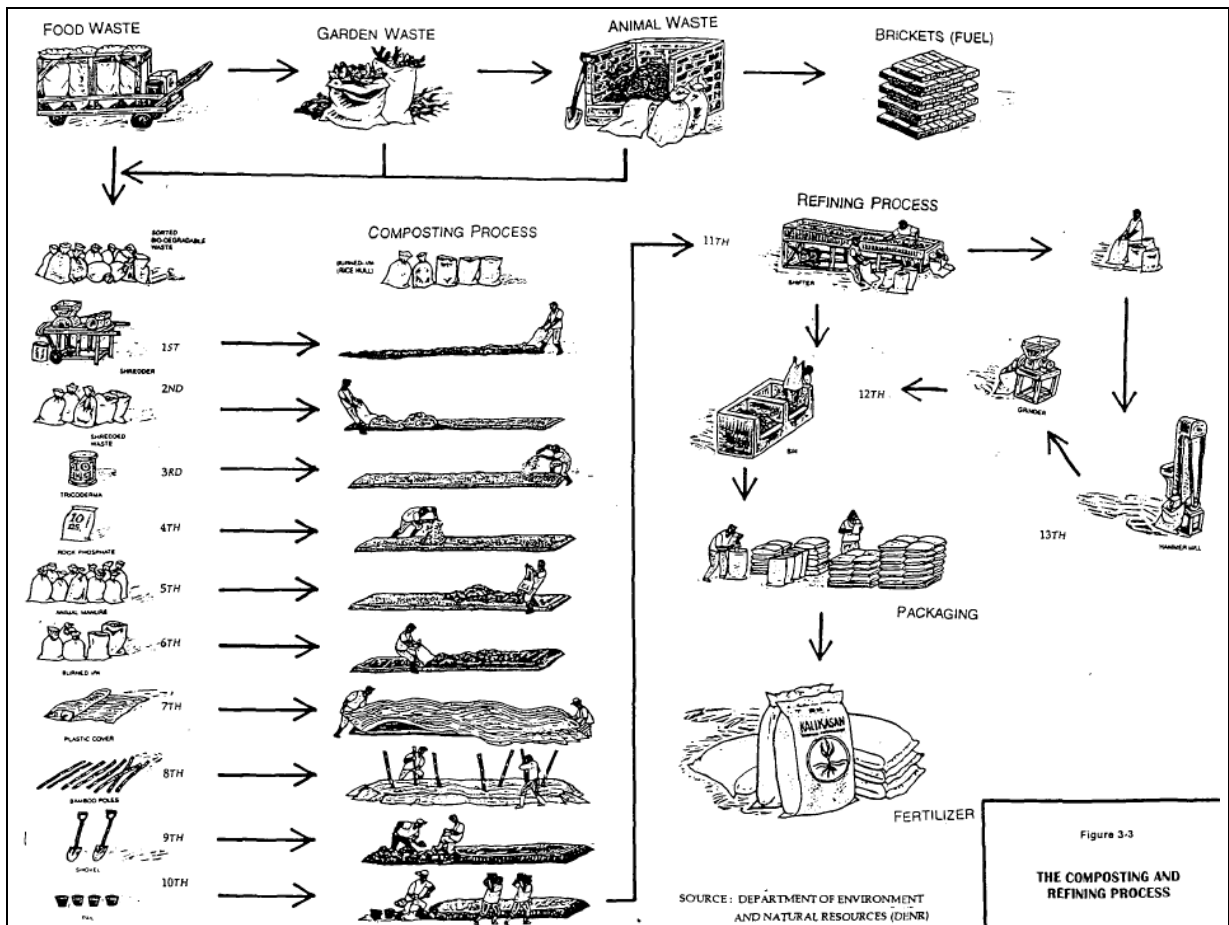
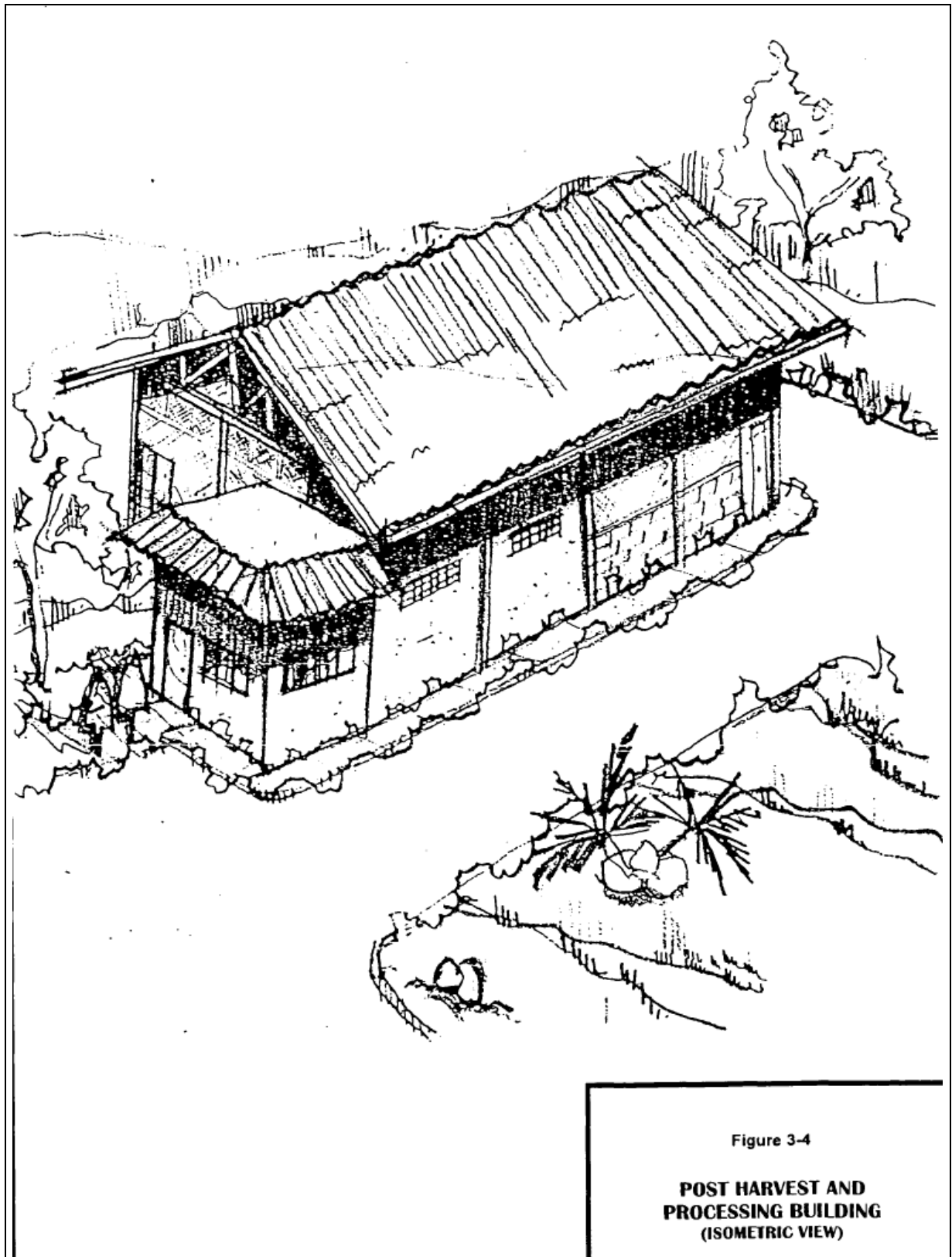


Figure 3-3

**THE COMPOSTING AND REFINING PROCESS**



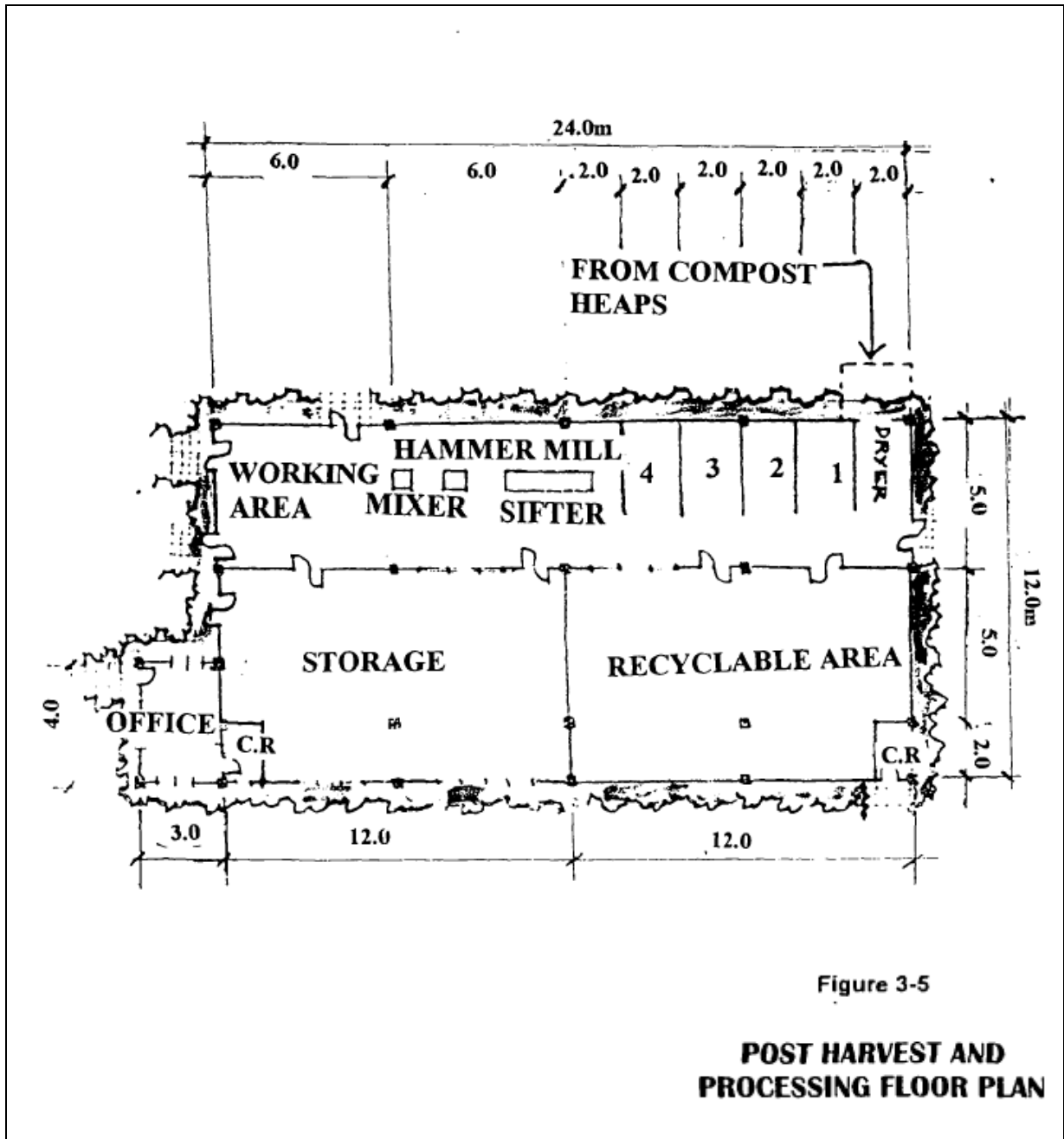
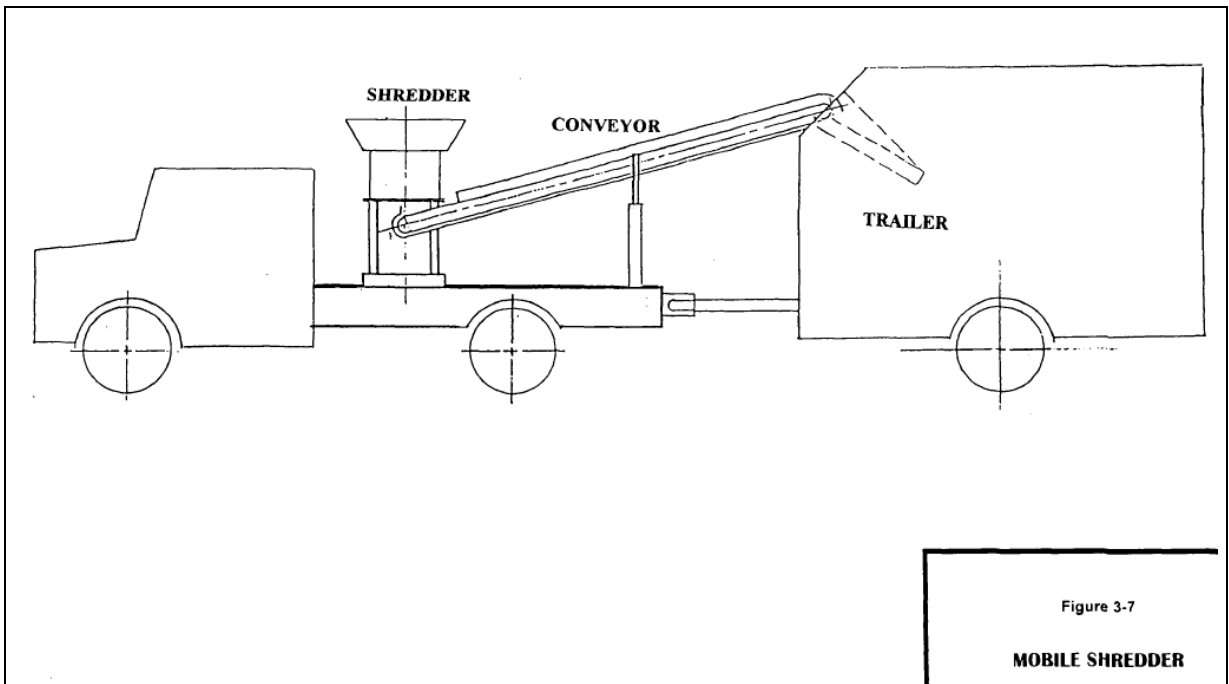
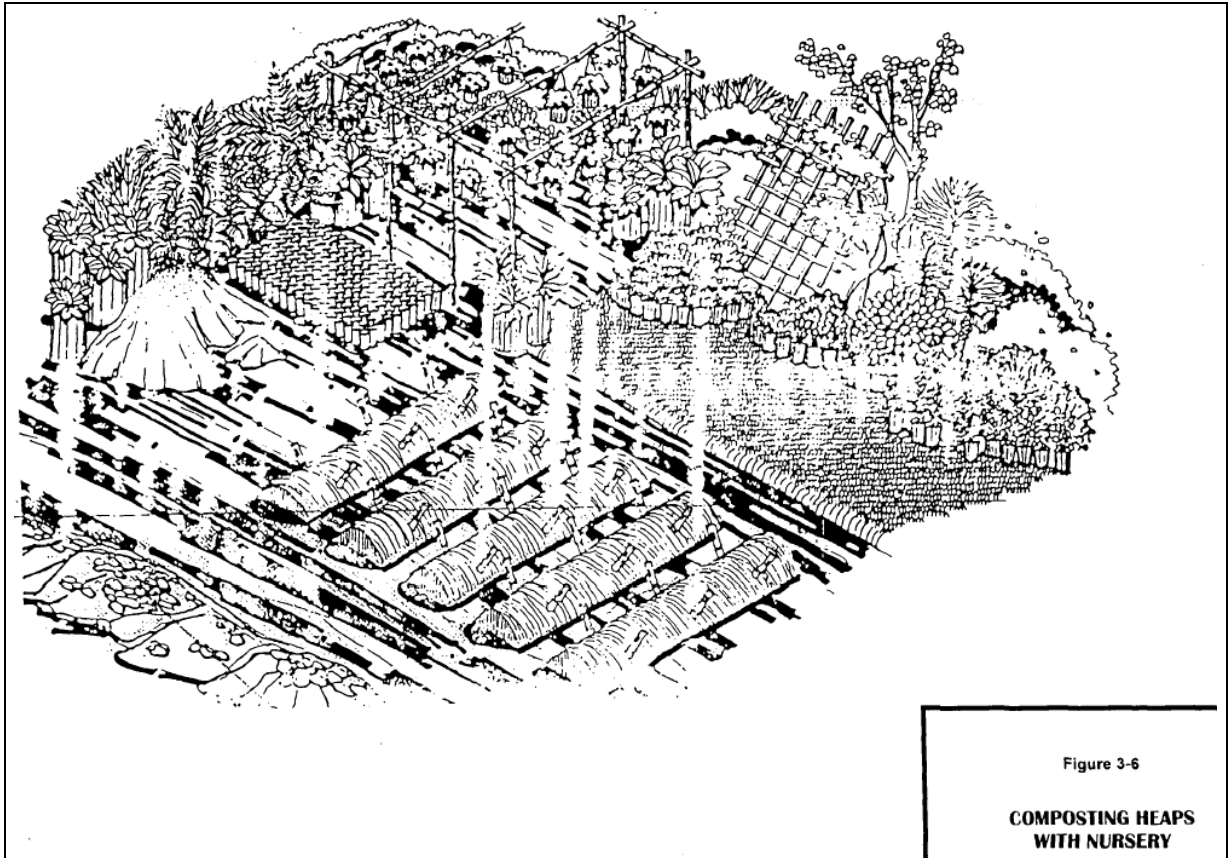
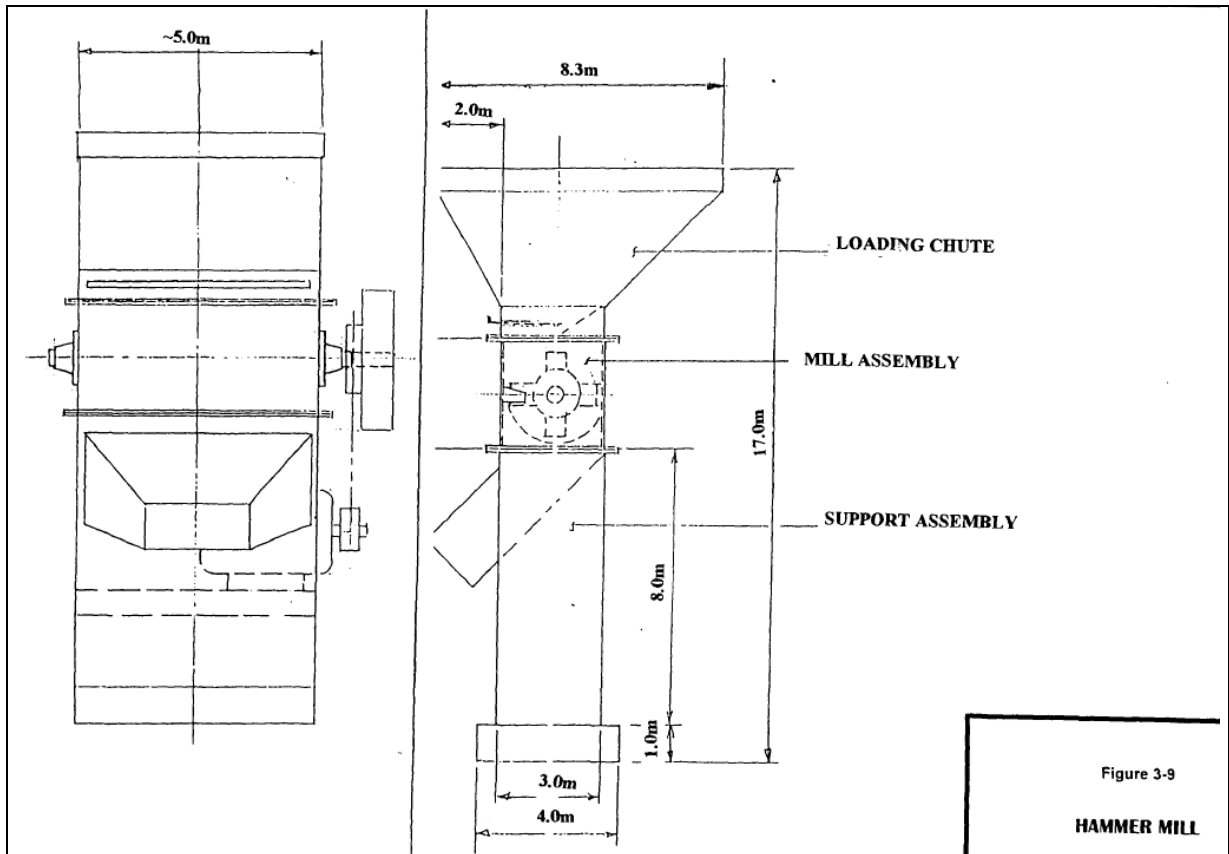
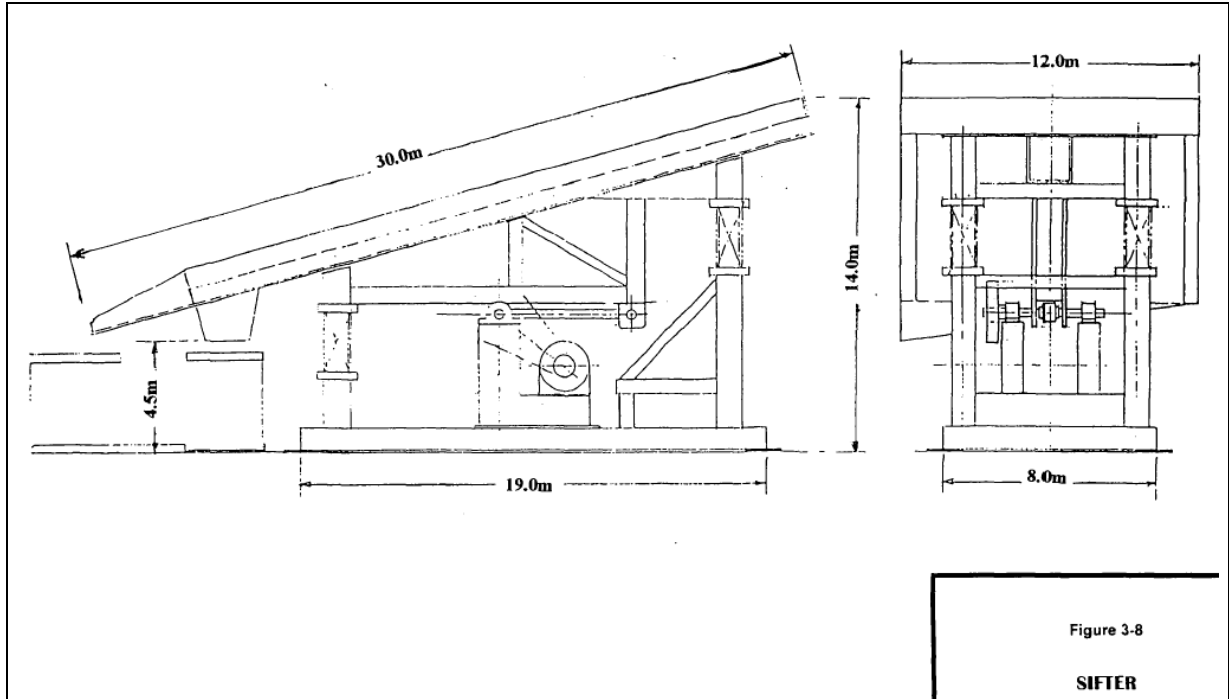


Figure 3-5

**POST HARVEST AND  
PROCESSING FLOOR PLAN**





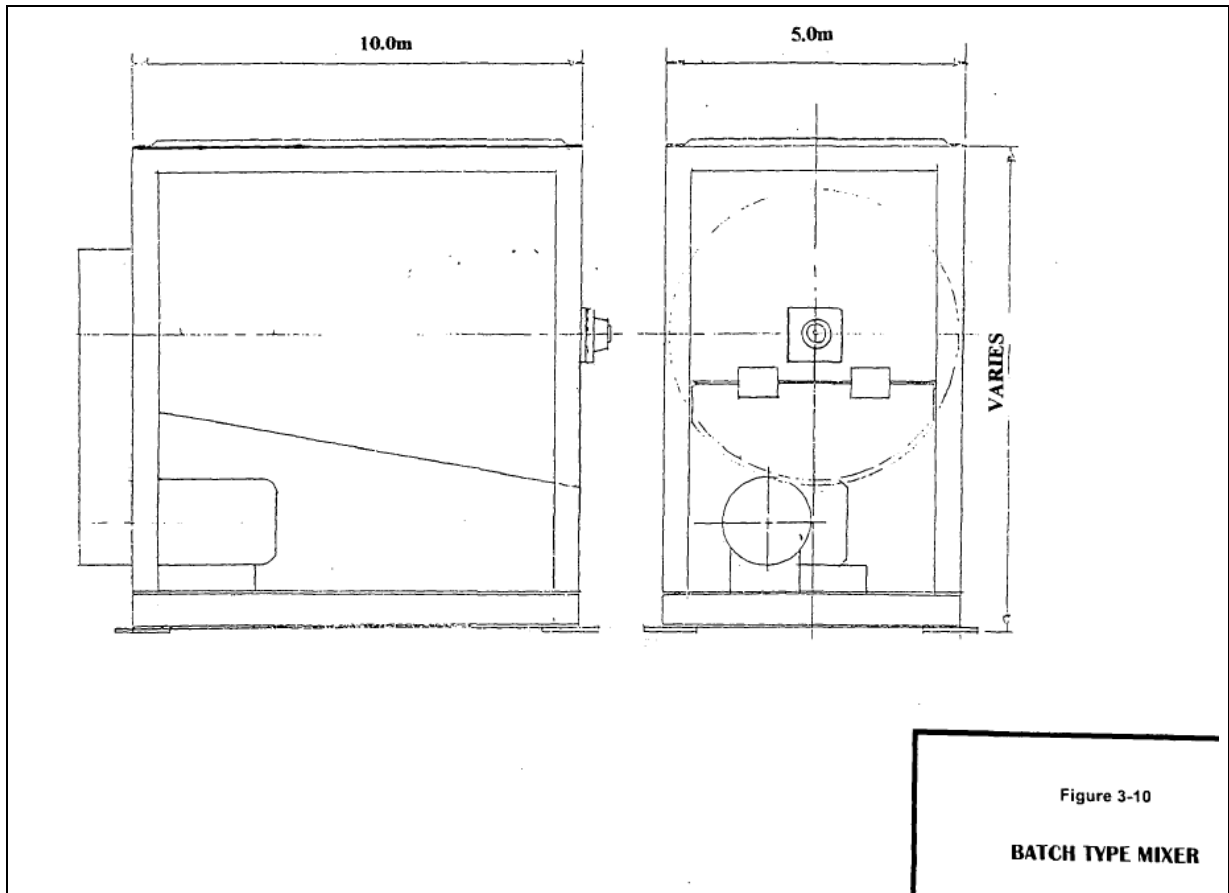
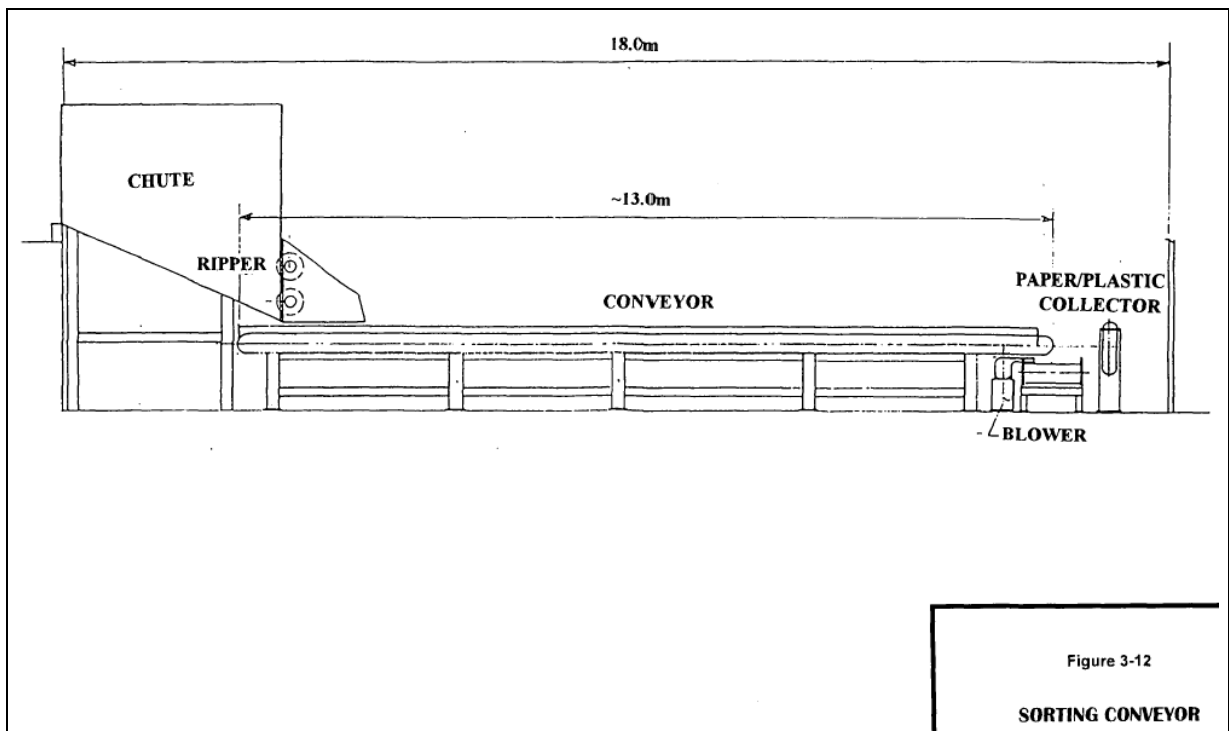
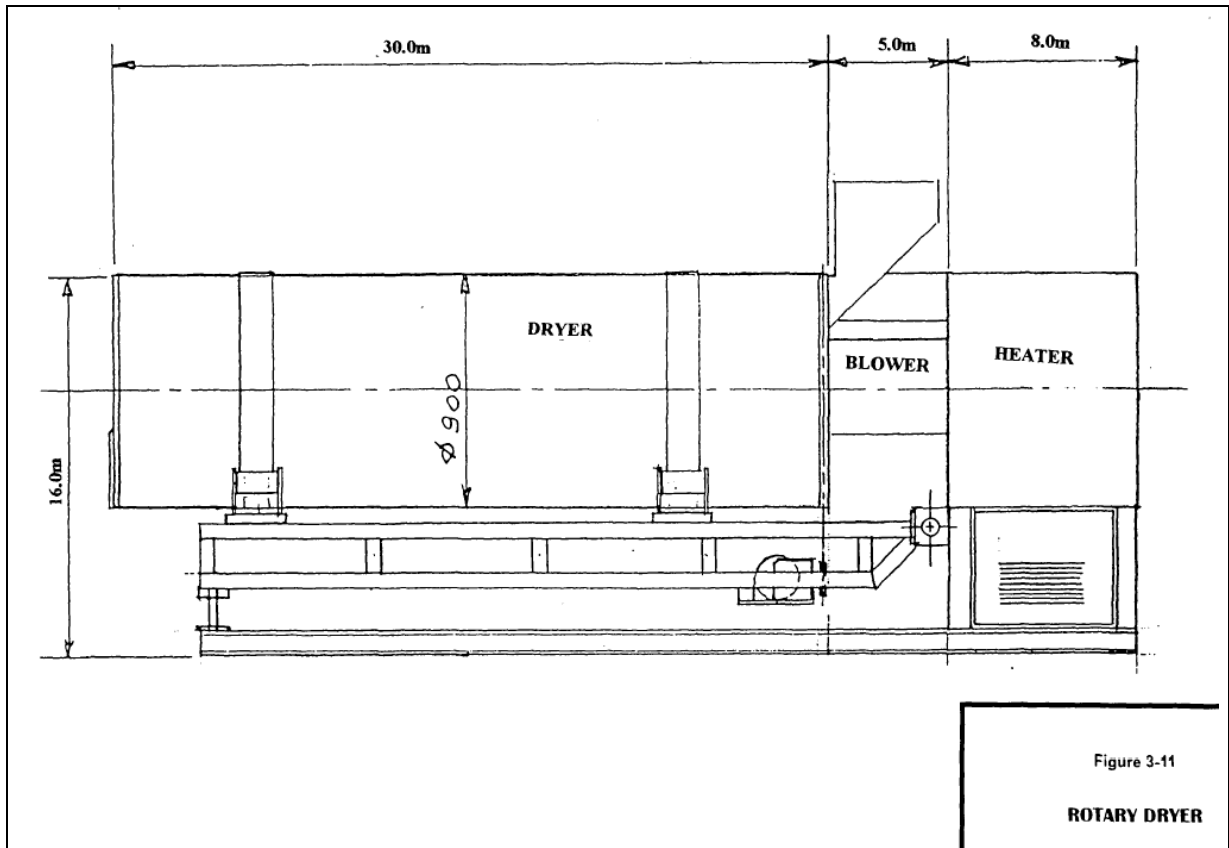
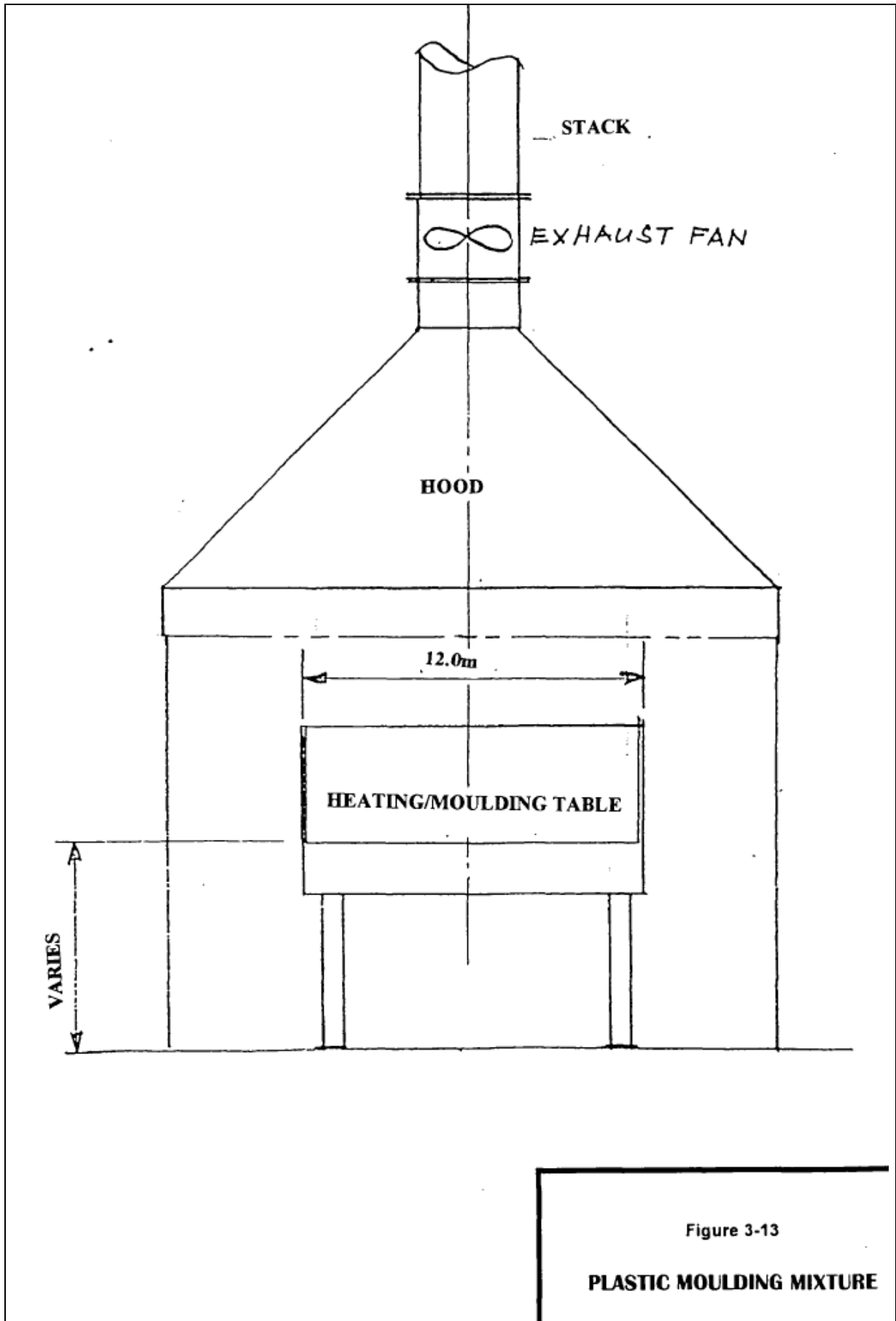


Figure 3-10

**BATCH TYPE MIXER**





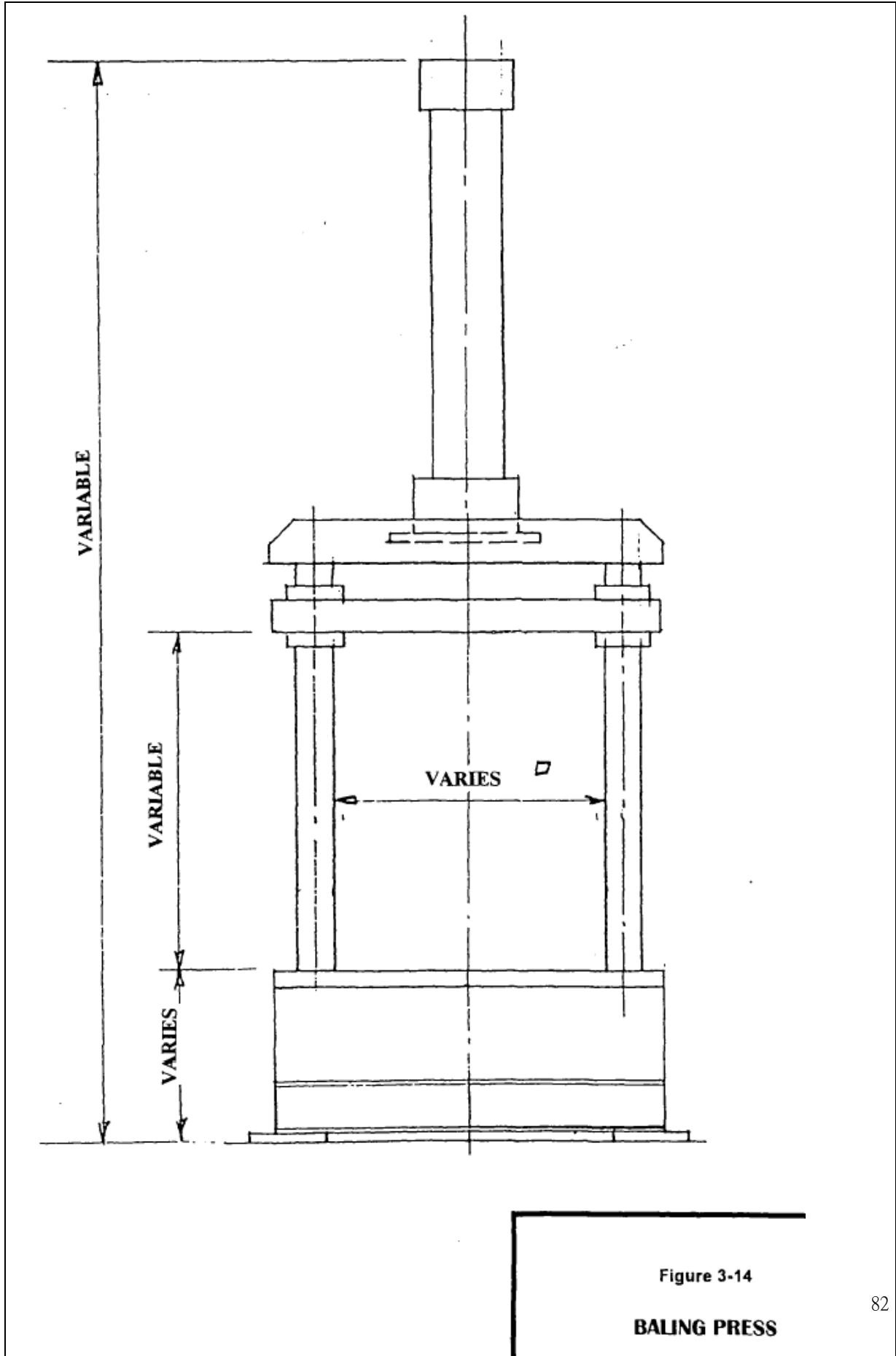


Figure 3-14  
BALING PRESS

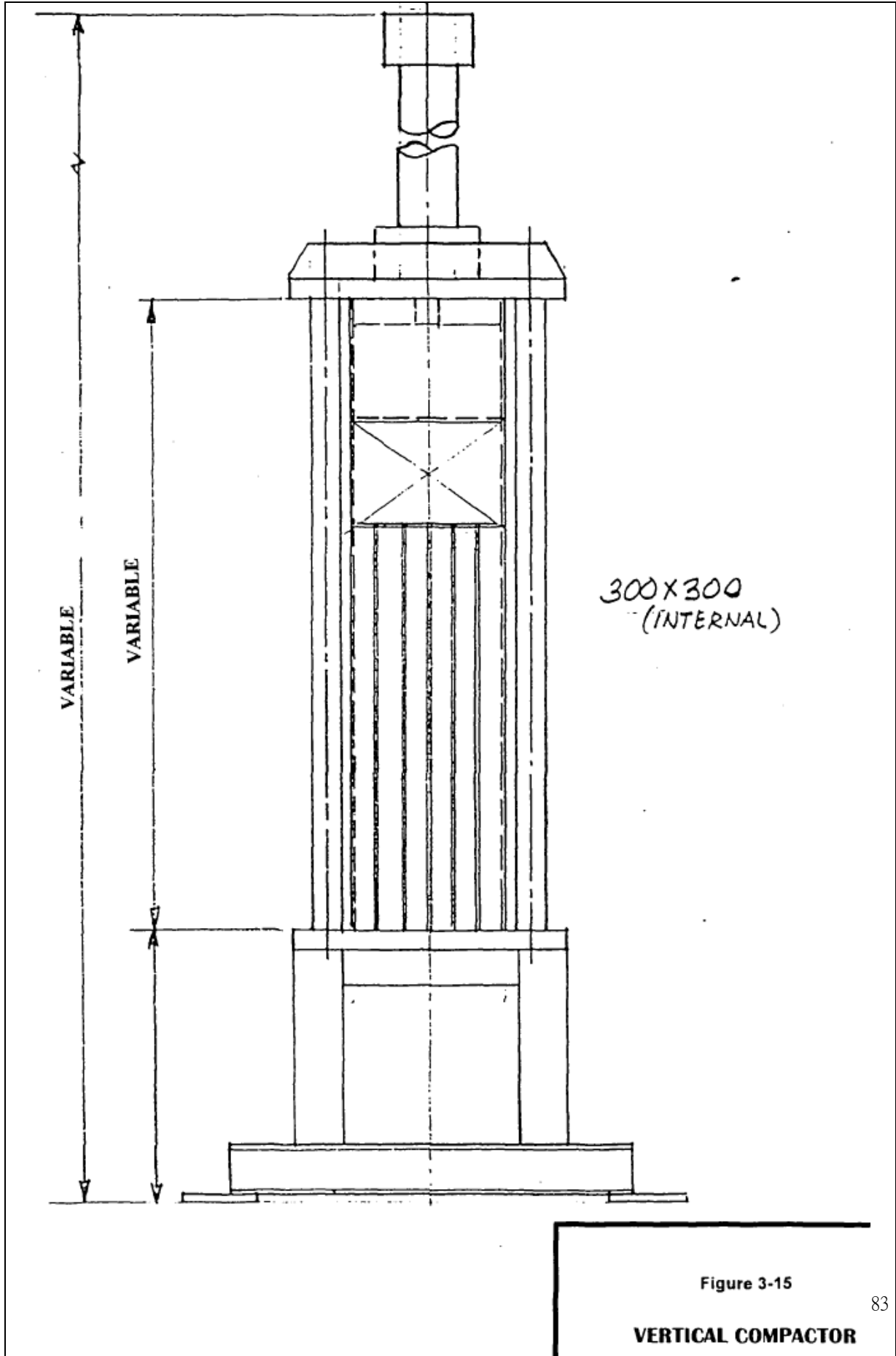
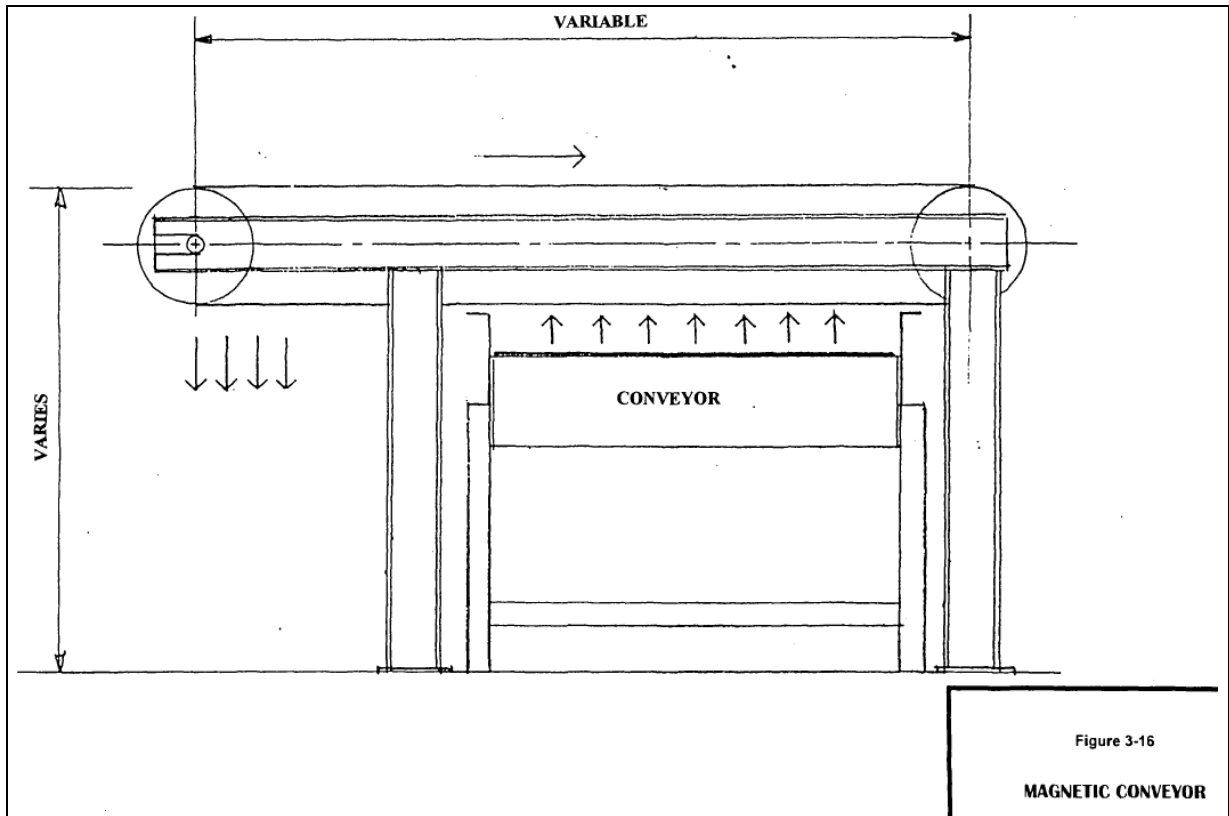


Figure 3-15

**VERTICAL COMPACTOR**



## **4.0 ANALYSIS AND CONCLUSION**

### **4.1 EFFICIENCY AND EFFECTIVENESS OF THE ENTERPRISE**

The ultimate proof of efficiency and effectiveness of an enterprise can be tested in the quality of its final product or service. In this case study, it is believed that AWARE has yet to improve on its management tools and procedures. For one, the laboratory test results of the nutrient level of Kalikasan did not measure up to the claim of AWARE in its brochure (See Appendix 7.). However, this does not mean that AWARE did not achieve the nutrient level it claims for its product. In fact, it apparently did based on its citing of its earlier testing conducted by the Bureau of Soils. What is inferred here is that AWARE is not yet consistent in its production process. But again, this does not mean that AWARE is remiss in their responsibility over the quality of their product. The inconsistency in its product quality stems from the various problems all newly built enterprises experience. One of these problems is the difficulty in sourcing the proper raw materials in sufficient quantities. As mentioned, AWARE is experiencing competition in obtaining nutrient-rich solid waste as part and as additive to the market waste delivered to them. Moreover, some raw materials, like animal manure, have seasonal supply. With its continuing research and development, AWARE is looking into other options to enhance the nutrients of its compost. According to one key staff, AWARE normally puts in additional organic matter to enhance nutrient level before final packing into sacks. Unfortunately, the same staff was evasive when asked what the additional stuff were. This issue is partly discussed below in the 'Obstacles.'

Another indication of efficiency is whether the cost of production is low or high. In the case of AWARE, its production cost is high. Without the hidden cost, cost of production accounts for 93% (2nd year) to 58% (10th year) of revenue per unit. With the hidden cost, production cost per unit is higher than revenue from sale of organic fertilizer. (See Table 4.) Given this situation, AWARE's sale of compost will hardly support the enterprise specially when hidden cost are factored in. AWARE experienced profit after the first year mainly due to its other sources of income such as the sale of equipment and

recyclables and franchising fees from joint ventures.

At the CFA propagation unit, however, the two female employees assigned here seems to have their system running smoothly. Although daily production figures were not given, this CFA team is able to fulfill the CFA requirement of the composting operation. There are times when it stops production for a day or two and spends time tending the small experiments in the backyard garden of the Center. This team has a potential for becoming an income generating unit should AWARE decides to sell CFA in volume to outsiders.

Nonetheless, the general picture for AWARE as an enterprise is that it needs to refine its management policies and procedures in many aspects of its operations. It cannot allow its compost producing unit to have very low or no profit margin at all. Although as a whole, AWARE has a positive bottom line brought about by other revenue sources, it would be bad management policy and unsustainable in the long run to have its main product subsidized by other units of the operation.

#### **4.2 OBSTACLES AND OPPORTUNITIES FOR IMPROVEMENT**

The main obstacle in AWARE's operation in Sta. Maria can be focused on the problem of space. Based on its experience and taking into consideration the socio-demographic and economic situation in Sta. Maria, the maximum composting scale for AWARE is six tons a day (4 tons solid waste and 2 tons additives). More than this, AWARE will need more land space, more personnel and probably will have to retool its equipment. But among these items, space is the controlling factor. AWARE cannot expand, spacewise, within its present site of 2,000 square meters. As the dumpsite fills, space will be a critical issue. On the fifth year on-ward (new mayors will have been elected by then), which is just two years for now (1996), the 2.5 hectare dumpsite will be over fifty percent full. Open space for solid waste handling equipment, like dumptrucks, tractors and payloaders, will become somewhat restricted. At this stage, the municipality will have to start finding other land for solid waste disposal, which will not be easy because of the NIMBY syndrome.

It is therefore logical for Mr. Vargas to expand AWARE's production of Kalikasan under joint venture agreements with other LGUs. Space problem is solved and, at the same time, market opportunities are widened. Since the LGUs have a big stake in the operation and production of Kalikasan (which will most likely be located in their respective dumpsite or landfills) they will naturally, promote the product within their area of influence. As such, it can be said that opportunities for expansion, both in terms of production and marketing, are already being laid out even at this early stage. This foresight of Mr. Vargas is very cunning and most appropriate.

Other obstacles that can be cited are, of course, product quality and raw material source competition. As noted by a fellow compost producer and the soil test by CAPS, Kalikasan's nutrient level is not always as high as AWARE claims it to be. The quality of the product should be maintained. The deterioration of the quality desired for fertilizers may affect sales and eventually its operation. Thus, nutrients to keep the fertilizer within the standards should be maintained or a substitute waste must be added to supply the required nutrients. As mentioned earlier, AWARE has competition in sourcing some of its raw materials. A mechanism to address the problem on the collection of nutrition-rich wastes should be adopted, or, co-composting of garbage with other compostable materials should be a part of research and development.

Similarly, improvements for equipment and other technical matters must be addressed by AWARE. It is noteworthy to mention, however, that some innovations are already in the offing as shown in text and figures of Section 3.3.

Moreover, the use of protective gadgets should be made compulsory to personnel involved in the process. A training/seminar is essential on health and hygiene, as well as occupational safety to address the occupational health hazards of the process. Likewise, mitigating measures to address the environmental effects of the project should be monitored.

#### **4.3 KEY FACTORS THAT DETERMINE THE REPLICABILITY OF THE ENTERPRISE**

1. Ever growing concern on SWM by LGUs which are ecological, feasible and income generating.

AWARE is offering a very attractive model, a paradigm shift if you want, towards SWM. The traditional mentality was just to collect and dispose. Now, there are various incentives or factors the LGUs are interested in. They can be awarded model communities if they adopt this ecological approach to SWM. Along comes with the award are monetary prizes from the national government and other donor agencies. Moreover, these LGUs are aware of the benefits that accrue from the separation/compost operation. These benefits can be quantified, such as reducing the need for sanitary landfill of garbage and recovering materials for industry, which often obviate importation or mining of similar industrial materials. For specific waste management activities, the careful integration of composting operations allows for more efficient collection networks, the savings of which can easily be quantified and used to offset the cost of composting. SWM under the AWARE model is an income generating activity and not anymore an outright expense. Therefore part of the cost SWM is recovered from the profit from Kalikasan.

2. Government support and cooperation, both from the national level and the local government level.

As shown, national agencies such as DENR (promotional) and DOST (technical) have assisted AWARE in various ways. Local governments, as in the case of Sta. Maria, are willing to support AWARE's project through joint ventures including capital assets, operational assistance like transport and land space, etc. Without these many forms of support, AWARE would have tremendous difficulty in recovering its costs of production (including the hidden costs) as well as in financing its capital requirements for the compost production.

3. Low technology

The composting technology being adopted by AWARE in Sta. Maria, Bulacan is simple,

economical and achievable. This is the very reason why it is now being duplicated by many urbanizing municipalities. There is very little or no demand on sophisticated means of production which lowly urbanized municipalities do not have.

#### **4.4 REPLICABILITY IN OTHER COUNTRIES**

Speaking of replicability, other developing countries can also adopt AWARE's approach. Technically, equipment and procedures are mostly low technology in nature. So, they are easy to duplicate even using local talents and resource. Even the culture and propagation of the CFA is technically feasible since many South countries have the same hot tropical and humid environment.

However, the success of AWARE in the Philippine setting has a lot to do the social factors - with current openness ('craving' maybe a better term) towards innovative SWM approaches, specially those that have environmental and ecological flavor. This openness stretches from the national government to the local government and to the public at large. Along side this is the growing local market for organic fertilizers. It can be said therefore, that the favorable psychological, economic and political elements (or attitudes) have played important roles in AWARE's success. Without such openness and support from the community, replication in other countries may experience rough sailing.

Last but not least, a replicated project anywhere would need a dedicate person or a team of persons to make the project succeed. The project must be led by leaders who are both aware of the environmental benefits of the project as well as its economic sustainability. Without one, the project can be likened to a person standing on one leg. Balance will be hard to sustain.

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## APPENDIX 1.

### A Brief on the Integrated National SWM System Framework

The Integrated National SWM System Framework (INSWMSF) was formulated by the Presidential Task Force on Waste Management (PTFWM) due to the realization of the national government that the country's waste generation, consequent to the increasing population and rapid development, is increasing at a rate faster than it can devise efficient waste disposal systems. As such, the INSWMSF delineates the following policy objectives:

1. The reduction of waste generated at source with a target of 30% waste reduction;
2. The improvement of collection efficiency for all sources of solid waste;
3. The reduction of solid waste volume to extend the serviceability of the final disposal sites; and,
4. The provision of a safe, environment-friendly and acceptable way of disposing wastes collected from source.

The guiding principles for solid waste policy formulations are:

1. Waste Minimization;
2. Polluters Pay
3. Cooperation
4. Environment Compatibility

The policy issues for an integrated SWM system are:

- Declaration of a National solid Waste Policy - Towards this end, the government may need to categorically state a policy prescribing the following hierarchy of priorities:

Source Reduction  
Reuse/Recycling/Composting  
Waste-to-energy Technologies  
Volume-reduction Combustion  
Landfilling

- Strengthen Government Support of Public and Private Sector Initiatives on Waste Minimization and Recycling - Towards this end, programmes that may be undertaken are as follows:

Create a Waste Minimization Coordinating Unit at the national level and require all local government units to incorporate a waste minimization program for their respective constitutencies.

Encourage entrepreneurship in waste minimization through financial incentives.

Provide financial support for research and development of products from waste

materials, technology inventions and innovations.

Implement and Eco-labelling scheme which awards environment-friendly products with eco-labels.

Organize waste pickers into registered cooperatives and give them exclusive rights to recover from municipal refuse.

Make waste segregation mandatory and require separate collection of recyclables.

Require all NGOs and State Colleges and Universities to implement a waste minimization program.

Establish a Procurement Preference Program that will promote the purchase or use of recycled or products with recycled materials whenever possible.

Incorporation of ecological waste activities in curricular and non-curricular courses in public schools.

- Imposition of User Fees, e.g., garbage collection fees and tipping fees for waste disposal.
- Private Sector Participation in SWM

## APPENDIX 2

POLICY MEASURES ON WASTE MANAGEMENT IN THE PHILIPPINES	
Policy Measures	Provisions/Contents
Presidential Decrees (PD)	
PD No. 552	prescribing sanitation requirements in the operation of establishments and facilities catering to the travelling public
PD No. 825	providing penalty for improper disposal of garbage and other forms of uncleanness
PD No. 856 (Code on Sanitation of the Philippines)	prescribing sanitation requirements for food establishments and the refuse collection and disposal systems in cities and municipalities
P.D. No. 953	requiring the planting of trees in certain places and penalizing unauthorized cutting
PD No. 984	defining the powers and functions of the National Pollution Control Commission with respect to the determination of the location, magnitude, extent, severity, causes, effects, and other pertinent information regarding pollution of the water, air and land resources of the country
PD No. 67	instituting a Water Code, thereby reviving and consolidating the laws governing the ownership, appropriation, utilization, exploitation, development, conservation and protection of water resources
PD No. 1151	declaring the Philippine Environmental Policy
PD No. 1152	consolidating the Philippine Environment Code
PD No. 1160	vesting authority in barangay captains to enforce pollution control and environmental laws
PD No. 1586	establishing environmentally related measures
Commonwealth Act No. 383	punishing the dumping of refuse or substances of any kind that may bring about the rise or filling in of riverbeds or cause blockage of a stream
General Order No. 13	stating the responsibility of residents to keep their surroundings clean
Executive Order No. 32	establishing the national and local beautification committees to undertake beautification and cleanliness campaigns
Executive Order No. 432	ordering the strict enforcement of Presidential Decree No. 825 providing the penalties for improper disposal of garbage and other forms of uncleanness
Executive Order Reducing Tariff on Packaging Materials	an amendment to an earlier issued executive order (EO 189) will extend reduced tariff rates to packaging items such as paper, glass and plastics. Metal-based packaging materials like tin are not covered
LOI 558	addressing the Commissioner, National Pollution Control Commission, Heads of Authorities, City and Municipal Mayors, and Heads of Government Owned and Controlled Corporations to appoint Pollution Control Offices to enforce the rules and regulations implementing PD 984
Section 2238 of Revised Administrative Code	stipulating the general powers of the Council to enact ordinances and make such regulations on health and safety for the comfort and convenience of the community and the protection of the property therein
RA 623	passed in the early 50s and grants local producers of condiments the privilege of using used bottles to market their products provided that their maximum capitalization does not exceed 2 million pesos

POLICY MEASURES ON WASTE MANAGEMENT IN THE PHILIPPINES

Policy Measures	Provisions/Contents
RA 6977 and 6978	Magna Carta of Small and Medium Enterprises which define that capitalization up to P5 million will be considered a small enterprise and those above P5 million but does not exceed P20 million will be considered as a medium enterprise thus amending RA 623
RA 6969	Toxic Substances and Hazardous Wastes Control Act 1990
RA 7160 Local Government Code	devolving certain powers to the local government units, including that on enforcement of laws on cleanliness and sanitation, solid waste management, and other environmental matters
Senate Bill No. 906 (Binzon, Bill)	protecting the Philippine Environment against pollution and garbage problem through reduction, re-use, and recycling scheme of waste management (3Rs)
Senate P.S. Res. NO. 369 (introduced by Sen. Arma Dominique Coseteng)	resolution urging the Department of Science and Technology and the Department of Interior and Local Government to Formulate and Implement a Comprehensive Solid Waste Management Program using the Recycling System in All Local Government Units from the Provincial Level Down to the Barangay Level
Senate P.S. Res. No. 267 (introduced by Sen. Heherson Alvarez)	resolution urging the Department of Health, the Department of Interior and Local Government to Encourage the Development and Implementation of a Waste Reduction and Sorting for Recycling System of Solid Waste Management in all Educational and Health Institutions and Local Government Units
Senate P.S. Res. No. 460 (introduced by Sen. Heherson Alvarez)	resolution urging the President of the Republic of the Philippines to adopt and Implement a Comprehensive and Integrated National Solid Waste Management Program for Waste Minimization through Segregation, Recycling and Composting
Senate S. No. 811 (introduced by Sen. Ramon Revilla)	An Act Amending Section 2 of P.D. No. 825 (Providing Penalty for Improper Disposal of Garbage and Other Forms of Uncleanliness and other Purposes)
Senate S. No. 1043 (introduced by Sen. Orlan S. Mercado)	An Act Requiring the Use of Recyclable Materials for the Packaging of Consumer Products to be Sold Commercially, Providing Mechanisms Therefor, and other Purposes
Senate S. No. 1378 (introduced by Sen. Heherson Alvarez)	An Act Providing for a Comprehensive Solid Waste Management Planning and Control Program, Declaring Certain Acts Prohibited, Providing Penalties Therefor, and for other Purposes
House Bill 30400	will amend RA. 623 when passed, prohibiting the use of duly registered and market containers for purposes other than what they were registered for if their capitalization is more than two million pesos.
House Bill 9825 (introduced by Cong. Manuel R. Sanchez)	An Act Prohibiting the Manufacture, Use of Styrofoam Food Containers in All Fast Food, Restaurant, Hotels and Other Food Establishments and Providing Penalties Therefor
House Bill No. 5824 (introduced by Cong. Ceferino S. Paredes, Jr.)	An Act promoting the Development of an Industry involved in the Processing and/or Recycling of Liquid and Solid Wastes for This Purpose Prohibiting the Disposal/Discharge of any Unprocessed Solid and/or Liquid Wastes Directly Into the Earth and/or Waterway(s), providing Funds Therefor and Penalties for Violation Therefor
House Bill 4942 (introduced by Cong. Al Francis C. Bichara)	An Act Regulating the Manufacture, Distribution and Direct Usage of Non-Biodegradable Plastic bags and Establish the Production of Biodegradable Substitutes

**POLICY MEASURES ON WASTE MANAGEMENT IN THE PHILIPPINES**

Policy Measures	Provisions/Contents
Mkt Ordinance No 93-111	an ordinance requiring all owners of vacant lots to install provisional walls on their premises and providing penalty for violation thereof
Mkt Ordinance No 93-172	an ordinance amending Ordinance No 93 series of 1938 of the Municipal Council of Makati, Metro Manila, prohibiting the dumping of waste, refuse, garbage materials, papers, cigarette butts, and the like, in any place in the streets or public building or property to include waterways, creeks and/or river banks not designated as dumping place, and providing for a penalty for violation thereof
Mkt Ordinance No 93-299	an ordinance requiring owners, lessee, tenants and the like of residential houses, commercial establishments, buildings and other entities in this municipality to separate, sort-out their solid waste refuse, garbage materials into biodegradable (wet) and non biodegradable(dry) and providing
Marula Ordinance 7510	an ordinance authorizing scavenging in the city of Marula, except on the tourist belt and commercial zones, and providing penalty for violation thereof
Henera Resolution City of Manila	For the Adoption of an Educational Campaign on the Zero Waste Management System and the Creation of a Task Force to Undertake Studies and Steps to Implement it
Henera Resolution City of Manila	Urging the Mayor, Hon. Alfredo B. Lam, to set up a Number of Pilot Projects in Selected Schools Government Offices and Barangays to Convert Biodegradable Garbage into Compost in Controlled and Manageable Volumes

### **ECOLOGICAL WASTE MANAGEMENT Boon to Local Government Units (Source: Public Affairs Office, DENR)**

With solid waste management under the jurisdiction of local government units, communities all over the country are seeking ways and means of developing and implementing environmentally-acceptable solid waste management schemes that are also economically feasible and sustainable. Ecological waste management offers communities the opportunity to unite environment and economics in a low technology, people oriented solutions to the management of solid waste.

Under the ecological waste management, the tenets of waste reduction, waste segregation, composting and recycling address the basic reasons behind excessive waste generation, improper waste management, and disease; while providing income-generating opportunities for families and communities. Waste reduction addresses excessive waste generation. Waste segregation prepares solid waste for renewed usefulness as compost or as recyclables. Composting returns organic wastes back to their original source - the earth, instead of providing a breeding ground for disease vectors like flies and rats. The resulting organic fertilizer also helps new life spring from earth, as crops, vegetables, fruit trees and ornamental plants. Recycling returns inorganic materials back to factories where they find new lives in new products, or are re-used repeatedly for the same purpose, as in the case of beverage and condiment bottles. The process flow of the ecological waste management scheme is shown in Figure A-1.

Composting and recycling are income generators and help keep ecological waste management, such as the municipalities of Bustos and Sta. Maria in Bulacan, find many reasons to remain committed to this scheme. The organic fertilizer from Sta. Maria, for instance sells at P155.00 per sack of 50 kilos, with a production cost of about P85.00 per sack. A profit of P70.00 is, therefore, earned from each sack, a profit which was basically earned from garbage.

The Department of Environment and Natural Resources (DENR) lauded the program and launched a nationwide information dissemination through a 1996 calendar and other form of media. The Secretary of DENR stated that “ Ecological Waste Management is the practical, community-based, people-oriented approach to our solid waste problem”.

## APPENDIX 5

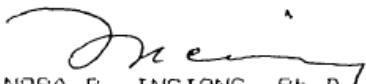
Republic of the Philippines  
Department of Agriculture  
BUREAU OF SOILS & WATER MANAGEMENT  
Quezon City

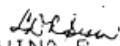

ASSAY OF SAMPLE SUBMITTED AS : COMPOST

Name of Owner : MR. ROBERT M. SERRANO  
Address :  
Submitted by :  
Address :  
Date Submitted : June 25, 1996  
Date Finished : July 5, 1996

Laboratory Number	F - 540	
Description		
Constituents (Content)	As Received	
	Moist Basis	Oven-dry basis
Total Nitrogen (N), %	0.82	1.27
Total Phosphorus (P <sub>2</sub> O <sub>5</sub> ), %	2.56	3.96
Available Phosphorus (P <sub>2</sub> O <sub>5</sub> ), %	-	-
Total Potassium (K <sub>2</sub> O), %	0.77	1.20
Total Calcium (CaO), %	-	-
Total Magnesium (MgO), %	-	-
pH	7.0	-
Moisture Content, %	35.49	-
Sodium (Na), %	-	-
Zinc (Zn) ppm	595.0	922.0
Copper (Cu) ppm	357.0	554.0
Manganese (Mn) ppm	1,172	1,816
Iron (Fe) ppm	5,156	7,993
Organic Carbon (Walkley Black Method) %	3.61	5.60

Noted by:

  
NORA B. INCIONG, Ph.D.  
Chief, Laboratory Services Division

  
LUZ DIVINA R. SISON  
Laboratory Supervisor 

## APPENDIX 6

### MEMORANDUM OF AGREEMENT

KNOW ALL MEN BY THESE PRESENTS:

This AGREEMENT made by and between:

The MUNICIPALITY OF STA. MARIA, Province of Bulacan, as represented by its Municipal Mayor Hon. REYNILA G. NICOLAS, with office address at Municipal Hall. Sta. Maria, Bulacan. hereinafter to be referred to as the PARTY OF THE FIRST PART:

-and-

AWARE, INC. a corporation duly organized to do business under the laws of Republic of the Philippines, with office address at # 127 Poblacion, Sta. Maria, Bulacan herein represented by its President MR. LUIS R. VARGAS, and hereinafter to be referred to as the PARTY OF THE SECOND PART.

#### W I T H E S S E T H :

WHEREAS, the PARTY OF THE FIRST PART is engaged in the effort towards an ecologically sound environmental program and is desirous of initiating a waste management system that would institute the Zero Waste Concept for the proper disposition of municipal garbage and other types of waste:

WHEREAS, the PARTY OF THE SECOND PART is a legally organized corporation involved in waste management particularly advocating the recycling, re-composition, re-use of waste and turning it into an employment and income generating endeavor:

WHEREAS, both parties are desirous of setting up a Waste Processing and Recycling Plant the operations of which shall be self-sustaining and without additional cost to the Municipality of Sta. Maria:

#### NOW THEREFORE :

Pursuant of the common objective to help the community deal with the garbage problem while promoting the concept of Zero Waste and "Trash is Cash", the PARTY OF THE FIRST PART and the PARTY OF THE SECOND PART hereby enter into this agreement to put up a Waste Processing and Recycling Plant subject to the following stipulation, obligations, terms and conditions:

## SECTION 1. ON THE PART OF THE PARTY OF THE FIRST PART

1. The PARTY OF THE FIRST PART shall allocate a 2,000 square meters portion of its designated Municipal dump site located at Sitio Pila, Barangay Catmon, Sta. Maria, Bulacan which shall be the site of the garbage processing and recycling plant.
2. The PARTY OF THE FIRST PART shall build or cause to be built the structure to house the processing and recycling plant. according to plan design and construction drawing to be submitted by the PARTY OF THE SECOND PART. The amount on structure however. shall not exceed P253,0000.00.
3. The PARTY OF THE FIRST PART shall purchase certain equipment and tools the list of which shall be submitted by the PARTY OF THE SECOND PART for its use in the processing and recycling plant. The total cost of these equipment shall not exceed P247,000.00.
4. The PARTY OF THE FIRST PART shall vigorously enforce the ordinance(s) pertaining to the sorting out of garbega and shall instruct its garbage collection personnel to coordinate with the collection. scheduling, delivery and disposition of garbage.
5. The PARTY OF THE FIRST PART shall allow the PARTY OF THE SECOND PART the use of certain areas of the dump site, when said areas are not in use, for experimentation in bio-intensive and organic farming, using fertilizer produced from municipal waste.
6. The PARTY OF THE FIRST PART shall lease to the PARTY OF THE SECOND PART the 2,000 sq. mts., the structure(s) thereon and the equipment and tools listed, for a period of ten (10) years commencing immediately upon completion of construction and delivery and installation of tools and equipment.

The lease to be paid by the PARTY OF THE SECOND PART to the PARTY OF THE FIRST PART shall be:

- a) First tweve (12) months \_\_\_\_ no payment
- b) 13th to 120th month \_\_\_\_\_ P4,630.00

The day to day upkeep and maintenance of the facility shall be the responsibility of the PARTY OF THE SECOND PART, excepting however damage(s) that may be cause by unforeseen circumstances or force majeure, in which case the damage or damaged item shall either be repaire or replaced by the PARTY OF THE FIRST PART. and the end often years from commencement, the lease will be renegotiated.

## SECTION 2. ON THE PART OF THE PARTY OF THE SECOND PART

1. The PARTY OF THE SECOND PART shall lease from the PARTY OF THE FIRST PART The area, the physical plant facility and all the equipment and tools above mentioned under the terms and condition herein specified.
2. The PARTY OF THE SECOND PART SHALL manage the operations of the processing and recycling plant. hire their own resources for the proper, effective, and efficient operation of the the plant. Compost, table waste shall be processed into fertilizer and non-compostable waste or non-biodegradable waste shall be sorted out and recycled Disposable waste shall be directed to the dumpsite for proper disposition.
3. The PARTY OF THE SECOND PART shall undertake product research, development. promotions and marketing of any and all products that may be produced out of municipal waste. Proceed from sales and any income derived from these activities including income from its agricultural experimentations shall solely belong to the PARTY OF THE SECOND PART to cover operational expenses and to provide incentives for continuity. It is expressly understood that the employees, consultant, agents and other personnel that PARTY OF THE SECOND PART may hire for this project shall be exclusively its employees, receiving instruction from them and are not in any way or manner employees of the PARTY OF THE FIRST PART.
4. The PARTY OF THE SECOND PART, at its own expenses may improve, renovate,add or construct divisions or additions to the physical facility at they may deem necessary for thir operatios. They may also bring additional equipment and tools as maybe needed, again at their own expenses.
5. The PARTY OF THE SECOND PART, working with the Sta. Maria Economic Foundation, an N G O, shall launch an agressive information campaign to educate people of the community on the concept of Zero Waste, their participation in the sorting out process and the proper disposition on the garbage. Together with the Sta. Maria Economic Foundation, PARTY OF THE SECOND PART shall also develop projects involving cleanliness, health and beautification projects.
6. The PARTY OF THE SECOND PART warrant that the premises hereunto leased shall not be used for any unlawful or illegal activity, and that any such use shall be cause for abrogation of this agreement.

### SECTION 3. REGULATIONS AND STANDARD

1. The PARTY OF THE FIRST PART and PARTY OF THE SECOND PART shall both see to it that the plant for the facility, the construction, the purchase of tools & equipment, and operation of the plant shall conform to all the pertinently Goverment Regulations and Standard.

### SECTION 4. REPORTING AND REVIEW

1. The PARTY OF THE FIRST PART and The PARTY OF SECOND PART shall each designate two (2) representatives who shall meet once a month to assess project progress and review plans and procedures for better efficiency.

SECTION 5. AMMENDMENTS

1. No modification of the agreements or its provisions shall be made except by written statement mutually signed by both parties.

SECTION 6. EFFECTIVITY

1. The agreement shall take effect starting immediately upon signing of this agreement and shall remain in the force till the end of the lease period, at which time the contract is extended on a month basis, unless one of the parties advises the other, with 30 days notice, that they no longer wish to extend the contract.

IN WITNESS WHEREOF, both parties have hereunto set their signature this 21st day of January 1994 hereat Sta. Maria, Bulacan.

ORIGINAL SIGNED

ORIGINAL SIGNED

\_\_\_\_\_  
HON. REYNILA G. NICOLAS  
Party of the First Part  
(Municipal Mayor)

\_\_\_\_\_  
MR. LUIS R. VARGAS  
Party of the Second Part  
Representing AWARE INC.

C O N F O R M E :

ORIGINAL SIGNED

\_\_\_\_\_  
DR. ROMAN CUCIO  
President  
Sta. Maria Economic Foundation

SIGNED IN THE PRESENCE OF :

ORIGINAL SIGNED

ORIGINAL SIGNED

\_\_\_\_\_

LEAFLET BEING DISTRIBUTED BY AWARE, INC.



Ang Gamitin Natin . . .

Para sa Balanseng Ugnayan ng Lupa, Tubig  
at Halaman, Para sa Ligtas at Masaganang  
Ani, Tunay na Kaibigan ng  
Kalikasan

A Product of AWARE, INC.  
127 J.P. Rizal St. Poblacion  
Sta. Maria Bulacan  
Philippines

• **ANO BA ANG KALIKASAN  
ORGANIC FERTILIZER?**

Ang KALIKASAN ORGANIC FERTILIZER ay isang uri ng abono o patabang katutubo na ginawa buhat sa natural na mga bagay na nabubulok, dumi ng mga hayop at iba pang mga natural na sangkap. Isinagawa ito sa pamamagitan ng makabago at siyentipikong pamamaraan upang sa gayon ay maging mabisa at mabuting kaibigan ng ating kalikasan at mga magsasaka.

Ito ay isang patabang nagtataglay ng kumpletong sangkap ng pagkain ng mga tanim. Naglalaman ito ng himugit kumulang na NITROGEN 2%; PHOSPHOROUS 5%; POTASIMUM 2%; CALCIUM 5%; MAGNESIUM 0.335%; ORGANIC CARBON 24.81%; <sup>ph</sup> 7.75; ZINC 1686 ppm; COPPER 455 ppm; MANGANESE 14,486 ppm; IRON 9,918 ppm; at iba pang micro elements, ayon sa pagsusuring ginawa ng BUREAU OF SOILS and WATER MANAGEMENT (BSWM).

• **BAKIT BA ITO TINAWAG  
NA KALIKASAN ORGANIC  
FERTILIZER?**

Sa kadahilanang ang mga sangkap na bumubuo rito ay mga bagay na nabubulok tulad ng gulay, prutas, karne, isda, halaman,

dumi nang hayop at iba pa, na kung itatapon lamang ay makakasira pa sa kapaligiran. Ang lahat nang ito ay nagmula sa kalikasan at marapat lamang na ibalik sa kalikasan sa pamamaraang makakatulong na mapanatili ang balanseng ugnayan nang hayop, halaman at kapaligiran o ang tinatawag nating "ECOLOGY".

**• ANU-ANO BA ANG MGA PAKINABANG NA MAIDU-DULOT NG KALIKASAN ORGANIC FERTILIZER?**

- nagbibigay ito ng pangunahing elemento (N-P-K) at iba pang sangkap (Ca, Mg, Fe, Cu, Mn, Zn, atbp.) na sadyang kailangan sa pagpapalaki at pagpapataba ng mga tanim at lupa.
- ginagawang buhaghag at maluwag ang lupa; mas maraming tubig ang naiimbak nito para sa tanim, at malayang nakakapasok at nakakalabas ang hangin.
- napapatagal nito ang pananatili sa lupa ng mga pangunahing sangkap ng pagkain para sa mga tanim.
- nakakatulong ito sa pagpapanatili sa lupa ng mga mikrobyo na kinakailangan sa pagpapalaki ng tanim.
- sa pamamagitan ng siyentipikong pamamaraan, nagiging ganap ang pagkabalok nang mga sangkap kaya ang

Fertilizer na ito ay walang masamang amoy, hindi nakakasunog o nakakamatay ng halaman at madaling isabog nang kahit pakamay lamang.

- napipigil nito ang pagbitak-bitak ng lupa.
- nakakabawas ng asim ng lupa.
- walang masamang epekto sa kapaligiran.

**• PAPAANO GINAGAMIT ANG KALIKASAN ORGANIC FERTILIZER?**

TANIM	ILANG KILO?	KAILAN?	SAAN ILALAGAY?
PALAY	600 Kgs. Kalikasan at 100 Kgs 14-14-14	• Sa huling pagsusuyod bago maglanim • 21 araw pagkatapos maglanim	• Ihalo sa linang • Isabog sa larim
MAIS	750 Kgs Kalikasan at 150 Kgs 14-14-14	• Bago maglanim • 45 araw pagkatapos maglanim	• Sa tuling • Sa tuling o 10 cm mula sa puno
DAHONG GULAY (petsay, mustasa, repolyo atbp.)	500 Kgs. Kalikasan at 200 Kgs Ammosol	• Bago maglanim • 14 araw matapos maglanim	• Ihalo sa lupa • 10 cm mula sa puno
BUNGANG GULAY (tamatis, talong, okra atbp.)	400 Kgs. Kalikasan at 100 Kgs 14-14-14	• Bago maglanim • 21 araw matapos maglanim	• Sa tuling • Sa tuling o 10 cm mula sa puno

TANIM	ILANG KILO?	KAILAN?	SAAN ILALAGAY?
BUTONG GULAY (Mari, Mongo, Siaw atbp)	500 Kgs. Kalikasan al 75 Kg 14-14-14	• Bago maglanim • 21 araw matapos maglanim	• Ihalo sa lupa o sa tudling • Sa tudling o 10 cm mula sa puno
BUNGANG KAHoy Pangmatagalang puno	5 - 10 Kgs Kalikasan bawat puno	• Bago o kasabay ng pagtalanim	• Sa hukay kahalo ng lupang pantabon
HALA-MANG NAMUMU-LAKLAK	50-100 gms bawat puno o batay sa laki ng halaman	• Bago maglanim o kabil nakalanim na	• Sa puno ng halaman

- Ang mga nabanggit na rekomendasyon ay maaaring mabago batay sa taglay na taba ng lupa at uri ng halaman.
- Ang KALIKASAN ORGANIC FERTILIZER ay maaari ring gamitin sa mga nursery bilang taniman at patubuan. Ihalo ang tatumpung (30) bahagi ng KALIKASAN ORGANIC FERTILIZER sa pitumpung (70) bahagi ng garden soil.
- Kung sa palaisdaan naman gagamitin, patuyuin lamang ang palaisdaan, at pagkatapos ay ihalo ang 12-20 sako ng KALIKASAN ORGANIC FERTILIZER sa putik sa lalim na 2.54 sentimetro para sa mabisang produksyon ng lablab.

Ang KALIKASAN ORGANIC FERTILIZER ay isa sa mga produkto ng "STA. MARIA MUNICIPAL WASTE PROCESSING and RECYCLING PROJECT," proyektong pinagtutulungan nang Pamahalaang Bayan ng Sta. Maria, Bulacan, nang Sta. Maria Economic Foundations at nang AWARE, INC. Ang proyektong ito ay nagtataguyod nang programang "ZERO WASTE" o muling paggamit nang mga bagay na Panapon upang mapakinabangan sa produksyon at hindi makapinsala sa ating kapaligiran.

*"Sta. Maria Waste Processing and Recycling Project"*

PLANT : Pila  
Barangay Catmon  
Sta. Maria, Bulacan

LEAD ORGANIZATIONS : AWARE, INC.  
OFFICE : # 127 J.P. Rizal St.  
Poblacion, Sta.  
Maria Bulacan

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Radio City #1485