Pilot Project: Medium-Scale Vermi Composting of Vegetable Market Waste in Kathmandu Metropolitan City

Final Report

Kathmandu Metropolitan City (KMC)
Pesticide Monitor Nepal (PEMON)
Clean Energy Nepal (CEN)

30 June 2005
# Project Summary

<table>
<thead>
<tr>
<th>Title</th>
<th>Pilot Project for Medium Scale Vermi Composting of Vegetable Market Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>Demonstrate the use of vermi composting technology to manage market waste</td>
</tr>
<tr>
<td>Technology</td>
<td>Aerobic Composting and Vermi Composting</td>
</tr>
</tbody>
</table>
| Project Activities | - Research on Vermi Composting  
- Site selection and design of vermi beds, aerobic composting chamber and compost box  
- Construction of vermi composting shed, compost chamber, compost box and other related infrastructure  
- Procurement of necessary equipment and materials, including earthworms, for vermi composting  
- Operation of vermi composting plant  
- Quality analysis of vermi compost  
- Preparation of marketing strategy for vermicompost  
- Preparation of vermi composting manual |
| Input | 500 kg Waste from Kalimati Vegetable Market |
| Outputs | 1. Infrastructure and system set up for production of 200 kg of vermi compost per day  
2. Increased knowledge and understanding on the feasibility of medium scale vermi composting in Nepal  
3. Enhanced capacity of municipal staff and other key stakeholders on vermi composting  
4. Increased awareness on waste minimization and vermi composting  
5. Strategy for marketing vermi compost  
6. Manual on vermi composting |
| Location | North-east corner Teku Transfer Station, Kathmandu |
| Project Duration | Phase 1: Feb-March 2005 – Construct Vermi Compost Plant  
Phase 2: April-June 2005 – Operate of Vermi compost Plant |
| Implementing Agency | KMC, PEMON & CEN |
# TABLE OF CONTENTS

1. **Introduction** 1  
1.1 Background 1  
1.2 Objectives 1  
1.3 Project Components 2  

2. **Vermi Composting Process** 3  
2.1 Preparation 3  
2.2 Aerobic Degradation 3  
2.3 Vermi Composting 5  
2.4 Maturation 6  
2.5 Screening 6  
2.6 Quality Control 6  
2.7 Packaging 6  
2.8 Storage 6  
2.9 Marketing 6  

3. **Project Activities** 7  
3.1 Review of Information on Vermi Composting 7  
3.2 Preparation 7  
3.2.1 Site Selection 7  
3.2.2 Design Options 9  
3.2.3 Detail Design 9  
3.3 Construction of Shed and Procurement of Equipment 10  
3.4 Inauguration and Interaction Program 10  
3.5 Operation of Vermi Compost Plant 11  
3.6 Quality Analysis 13  
3.7 Training 14  
3.8 Marketing Strategy 14  
3.9 Vermi Composting Manual 16  

4. **Project Management** 17  

5. **Conclusion & Recommendations** 19  
5.1 Conclusion 19  
5.2 Problems to be Addressed 19  
5.3 Recommendations 21  

Annex 1: Process of Vermi Composting  
Annex 2: Photographs  
Annex 3: Location of Pilot Project  
Annex 4: Design Drawings  
Annex 5: Presentations Made During Interaction Programme  
Annex 6: List of Participants for Training Workshops  
Annex 7: Designs for Packaging and Promotional Materials  
Annex 8: Marketing Survey  
Annex 10: Selected Newspaper Clippings
1. INTRODUCTION

1.1 Background

Waste minimization is a very important aspect of waste management systems. As organic waste is by far the largest component in Kathmandu's waste stream and it is also responsible for many environmental problems such as production of bad smell, leachate and combustible gas when it is disposed in a landfill, recycling of organic waste needs to be a top priority in managing Kathmandu's waste.

Vermi composting is a process that utilizes special types of earthworms to produce worm castings, which can be a very useful organic fertilizer. Recently, vermi composting has been introduced in Nepal and its use is growing. Experience from India has shown that vermi composting can be done at the household level or on a larger scale. In Kathmandu, however, vermi composting has so far been limited to household level.

Kathmandu Metropolitan City (KMC) started conducting experiments in vermi composting seven years ago by importing earthworms of the species *Eisenia fetida*, from India. KMC is now selling vermi compost kits, which includes a plastic tub, other necessary accessories and 300 worms, for Rs. 500. This includes a half-day training on vermi composting. These compost kits can be setup in a small space inside the kitchen and it does not cause odour problems. KMC estimates that there are about 100 households practicing vermi composting.

Pesticides Monitor Nepal (PEMON) is a local non-government organization involved in promoting vermi composting, organic farming, proper use of pesticides and sustainable agriculture. It has organized several training programmes on vermi composting.

Clean Energy Nepal (CEN) is a local non-government organization involved in conducting research-based education and advocacy on environmental and energy issues. CEN is actively involved in promoting composting and recycling.

In order to upscale the use of vermi composting technology and demonstrate the use of vermi composting to treat waste from vegetable markets, KMC has joined hands with PEMON and CEN to implement a pilot project to set up and operate a vermi composting plant with a capacity to treat about 500 kg per day of vegetable market waste. The pilot project was implemented with the support of Clean Kathmandu Valley Study, a joint initiative of His Majesty's Government and JICA.

This report summarizes the activities conducted during the pilot project from February to June 2005.
1.2 Objectives

The main objectives of the pilot project are as follows:

- Demonstrate use of vermi composting for managing market waste.
- Upscale the use of vermi composting technology.
- Test different methods for aerobic composting and vermi composting.
- Reduce the amount of waste to be landfilled.
- Strengthen KMC’s ability to minimize waste using an environment-friendly technology.

1.3 Project Components

This pilot project was implemented in two phases. The first phase focused on setting up the vermi compost plant. Activities conducted during the first phase are as follows:

- Review experiences in vermi composting.
- Site selection and design of vermi beds, aerobic composting chamber and compost box.
- Construction of vermi composting shed, compost chamber, compost box and other related infrastructure.
- Procurement of necessary equipment and materials, including earthworms, for vermi composting.

The second phase of the plant focused on operating the plant and conducting research to sustain the plant. Activities conducted during the second phase are as follows:

- Operation of vermi composting plant.
- Quality analysis of vermi compost.
- Preparation of marketing strategy for vermi compost.
- Preparation of vermi composting manual.
2. **PROCESS OF VERMI COMPOSTING**

The process of vermi composting as practiced during pilot project involves several steps. These are described below and shown in Annex 1.

### 2.1 Preparation

The first step is to collect the organic waste and convert it into raw material for vermi composting. This step involves collection of organic materials, sorting it to remove any contaminants, cutting large pieces of waste to about 1 cubic inch in size and mixing the waste with other materials if necessary. If the waste is rich in nitrogen, then materials with high carbon content, such as saw dust or ash or rice husk will be added. Similarly, if the waste seems to be rich in carbon, then materials with high nitrogen content such as sewage sludge, urine or fresh dung will be added. In order to improve aeration, hollow materials with air pockets, such as small pieces of pipes can be also be added.

This process is completed within one day.

### 2.2 Aerobic Degradation

The waste is initially degraded in an aerobic environment for two to four weeks to ensure that the waste can be consumed easily by the worms. The challenge is to allow the temperature to increase due to biological degradation, while keeping the waste well aerated in order to ensure that the temperature does not rise once the waste is placed in the worm bed.

Aerobic degradation can be done in several ways. Some of these include the following:

**Honeycomb Compost Box made from bricks** – In this method, a box is made from bricks arranged with holes in between, and the bottom has a grill made from steel rods or bamboo sticks to allow drainage and aeration. This method is also being used by Waste Concern in Bangladesh for aerobic composting (see Annex 2 photographs and Annex 4 for design drawings)

**Compost Barrels made from plastics** – 60 to 200 litre capacity plastic bins, with holes on the side for aeration and holes on the bottom for drainage, can be used to store the waste for two weeks while it degrades. Smaller (60 litre) containers will take up more space but because they can be lifted by one or two persons their use makes waste handling easier.
Aerated Windrows – In this method, waste is piled in windrows that are about 1.5 wide and 1 meter high. The windrows aerated through perforated pipes or a bamboo frame at the bottom as seen in figure 2. This method is simple and inexpensive but it requires more space and because the waste is exposed, it can get wet and it may not look very good.

Compost Chamber - Some municipalities, such as Madhyapur Thimi, have built compost chambers to make compost. During this project, a modified version of this chamber was designed and used for aerobic composting. The chamber consists of two sets of three chambers each that are arranged vertically one on top of another (see Annex 2 photographs and Annex 4 for design drawings). The waste is placed in the top chamber and after about ten days, the bamboo sticks at the bottom of the chamber is removed to drop the waste into the second chamber. The process of dropping the waste will aerate the waste. Similarly, after another 10 days, the bamboo sticks at the bottom of the second chamber is also removed to drop the waste in the bottom...
chamber where the waste stays for another 10 days before it is taken to the vermi beds.

**Vermi Tank** – The initial composting can also be done in the vermi tanks. The waste is piled at a height of about 0.5 meter on the beds and after about two weeks the required number of worms is released on the waste. This will reduce the need for waste handling, thus reducing operating costs, but this will need more area and more vermi beds. There is also a possibility of insufficient aeration during the initial degradation phase. This could result in anaerobic conditions.

The advantages and disadvantages of various methods are described in Table 1.

**Table 1 Advantages and Disadvantages of Various Methods for Aerobic Degradation**

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vermi Tank</td>
<td>No need to transfer the waste after aerobic composting.</td>
<td>Requires more space</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anaerobic conditions may be a problem</td>
</tr>
<tr>
<td>Honeycomb Box</td>
<td>Relatively low cost Good natural aeration</td>
<td>Waste is partially visible</td>
</tr>
<tr>
<td>Barrel</td>
<td>Waste handling is easy Waste is not visible</td>
<td>Relatively expensive</td>
</tr>
<tr>
<td>Pile</td>
<td>Very low cost</td>
<td>Requires a lot of space Waste is visible Aeration may be difficult</td>
</tr>
<tr>
<td>Chamber</td>
<td>Waste is not visible Amount of space required is relatively low</td>
<td>Relatively expensive</td>
</tr>
</tbody>
</table>

2.3 Vermi Composting

After two to four weeks of aerobic decomposition, the waste will be placed in vermi tanks made from bricks and cement. The beds are 1 meter wide, 0.6 meter high and three meter long. Two beds are placed next to each other and in between each set of two beds there will be a passage way of about 0.6 meter or two feet.

**Figure 5 Vermi Beds**

The beds have a layer of coconut husk at the bottom to facilitate drainage and movement of the worms. Worms of the species *Eisenia*
foetida will be released on top of the waste. Approximately 30 kg of worms or about 100,000 worms is required for each of the vermi bed.

Vermi composting is done for 30 to 40 days. During this time the waste is regularly monitored to ensure that the temperature does not go up, the moisture content is about 50 percent and the worms are healthy.

2.4 Maturation

After 30 to 40 days, the vermi compost is harvested manually and the harvested compost is stored for about two weeks to allow cocoons to hatch. At the end of this period the worms in the compost is again separated and the worms are placed back in the vermi beds.

2.5 Screening

The compost is screened manually using inclined screens with mesh size of 8mm and 4mm.

2.6 Quality Control

In order to ensure that quality of the compost is tested in a lab to determine the nitrogen, phosphorus and potassium and organic content. The compost will also be tested in the field by applying it in test plots. This will provide suggestions for improving the quality of the compost and also assists in its marketing.

2.7 Packaging

The compost, which is now ready for marketing is weighed packed in 1kg, 5 kg and 50 kg bags. The bags are designed to be attractive and informative. It also contains the brand name of the compost, its content and its application rates.

2.8 Storage

The packed compost is stored before it is distributed in the market. This will require a store room with a capacity of storing at least 5 tons of compost.

2.9 Marketing

A marketing strategy has been prepared to market the compost in various market segments such as farmers, nurseries, institutions and home gardeners. The strategy includes product design, pricing, distribution and promotional strategies. The strategy will be used to market the compost in order to ensure that project is sustainable.
3 PROJECT ACTIVITIES

The project was implemented in two phases. During the first phase the compost plant was designed and constructed and in the second phase, vermi compost was prepared. The second phase also included training programs on vermi composting and preparation of marketing strategy and vermi composting manual.

3.1 Review of Information on Vermi Composting

The project reviewed available information on vermi composting and submitted a report to CKV JICA on 20 March 2004. The report included a synopsis of 9 reports related to vermi composting that was available in Kathmandu and it also presented some articles and information from the internet.

A Google search using "vermi" as key word resulted in more than 141,000 sites. Some of the sites reviewed were as follows:

- http://www.howtocompost.org
- www.erfindia.org

The short study of available information on vermi composting concluded that although there is very little literature on vermi composting in Nepal, there is plenty of information on vermi composting in general on the internet. Some of this information can be useful.

There are others as well. The study recommended that additional research is required to generate more information on vermi composting in Nepal. It also recommended that it would be useful to obtain some books on vermi composting. One such book is, "Recycle with Earthworms" available at www.vemicoast.com.

3.2 Preparation

The following activities were conducted during the first few weeks of the project as part of the preparatory work.

- Site Selection
- Evaluation of Design Options
- Preparation of Detail Design

3.2.1 Site Selection

Initially KMC had suggested a site on the southern end of the garden located on the western side of Teku Transfer Station (TTS) for the vermi composting project. However, more detail investigations
revealed several disadvantages related to the site. These include the following:

- The space available is limited
- As the location is away from the TTS, operation of the plant would require transportation of the fresh waste by handcarts
- The project would partially damage the existing garden
- As the area consists of an old dump site, building structures on the site may not be technically feasible.

Several other sites were considered during the initial stages of the projects. These sites are briefly described below and also shown in Photos 1, 2, and 3, in Annex 2 and in Annex 3:

**Area Next to the Existing Incinerator**

This site is located within the Teku Transfer Station and is closer to the waste transfer area than the original site. However the space is limited and the space has been allocated for vehicle parking. KMC had built a vermi bed near this site in 1998 but it was never used for vermi composting and it is now used as a sludge drying bed (see photo 1). This area, along with the sludge drying bed can be used for expanding the vermi composting project in the future if necessary.

**Area Below the New Waste Transfer Ramp**

This site is located at the newly constructed waste transfer Ramp at Teku Transfer Station (see Photo 2). The main advantages of this site is that it is located next to the existing transfer station and it will require less initial investment as there is no need for the shed. Although the site is very good for setting up a vermi composting unit, it had to be disregarded because KMC wants to use the site as a storage area or parking space. In the future, if the site is not used as a store it may be used for vermi composting instead of leaving it open.

**Tukucha Vegetable Market**

An area is available south of the Tukucha Vegetable market immediately south of Exhibition Road and west of Tukucha river (see photo 3). The site was previously used as part of the market but now it has some vacant sheds. The main advantage of the site is that it is located right next to the source of the waste and because it is in the centre of the city, it will have good visibility. The main disadvantage of the site is that the site is currently being leased by a private party from the Social Welfare Council and the pilot project would have to pay a certain amount for using the site. This would have increased the cost of the project. Plus, because the site is located next to a crowded market, even slight problems at the site can cause opposition from the local people. Therefore, it may be possible to use the site once KMC is more confident about the technology following the pilot project.
Along Eastern Wall of Teku Transfer Station

The north-east corner of the Teku Transfer station along the eastern wall (see Photo 5) was finally selected as the project site because it is easily accessible and located right next to the area where waste is being dumped at Teku Transfer Station. In the Teku Transfer Station Improvement Plan the north-east corner is designated as a Tipping area where approximately 40 percent of the waste (80 tons per day) will be tipped and sorted by scavengers. According to the plan, the tipping area will have six unloading bays, an area for scavengers and six storage bays for sorted materials, an area for operating the loader and a road for trucks to collect the sorted materials and it will occupy a total area of 675 m². The vermi compost plant is located east of the tipping area and will not disturb the waste sorting activities as it will only take up the space allocated as the driving lane for vehicles that collect scrap materials. These vehicles do not need a separate lane and can access the materials from platform its self as collection of the recyclable materials and their transport will not happen at the same time.

3.2.2 Evaluation of Design Options

Several design options were considered. Originally, the vermi tanks had been designed in two rows along a semi-circular corridor. This had to be changed because of the limitations in the new location. Finally it was decided to have 20 tanks of three meters length so that it was easier to access the bed and the beds could be filled up in batches if necessary. This also allowed different experiments to be done in different beds. The height of the beds was fixed at 60 cm in order to facilitate loading and unloading of the waste in the beds.

Originally, the aerobic composting area was located next to the vermi composting beds within the main shed, but this had to be changed because of the presence of a large drain at the site. The aerobic composting area was therefore separated from the vermi composting area. Compost boxes and a compost chamber were designed for aerobic composting. In addition, aerobic composting was also done in open piles and in barrels. Three compost boxes 1 meter wide, 1.5 meter long and 1 meter high were designed for construction under the existing compost shed north of the vermi composting area. The size of the compost boxes was designed to fit within the available space. Similarly, the design of the compost chamber has also been done based on available space.

3.2.2 Preparation of Detail Designs

Uni-Tech Consortium prepared the detail designs for the vermi shed, aerobic compost box and compost chamber. Structural strength, cost effectiveness, operation of the plant and aesthetics were considered in preparing the final designs. The final drawings are presented in Annex 3 of this report.
3.3 Construction of Shed and Procurement of Equipment

The project included construction of the following structures:

- Vermi shed
- Compost Boxes
- Compost Chamber

PEMON signed an agreement with a private contractor for the construction of the vermi shed in the last week of February and the construction was completed in 3 weeks. Although the contractor had some difficulties because of the large amount of waste at the site, there was no major problem and KMC helped in clearing the site.

A shed that is 33 meter long and 3 meter wide, was constructed. The shed has 20 vermi tanks, each of which is 3 meter long, 1 meter wide and 60 cm high, and a screening area that is 5 meter long and 3 meter wide.

For aerobic composting three aerobic compost boxes that are 1.5 meter long, 1 meter wide and 1 meter high have also been constructed. The size of these boxes had to be reduced slightly from the original plan because of site limitations.

Similarly, an aerobic composting chamber was also constructed.

In order to start the composting process, the project has also procured some necessary equipment such as a rickshaw, a hand cart, shovels, rakes, chopping equipment and screens.

3.4 Inauguration and Interaction Programme

The vermi composting plant was inaugurated during a function on 21 March 2005 and the inauguration ceremony was followed by an interaction programme on vermi composting.

The inauguration was of the plant was officially done by Mr. Som Nath Subedi, Joint Secretary of Ministry of Local Development and the function was attended and addressed by various guests including Mr. Surya Man Shakya, General Manager of SWMRMC, Mr. Surya Silwal, Executive Officer at KMC, Mr. Indra Man Singh Suwal, Head of KMC's Environment Department KMC, Mr. Toshiyuki Ujiie, Team Leader CKV JICA Study Team, Ms. Shriju Pradhan Tuladhar, Coordinator of Community Mobilisation Unit of KMC and Ms. Ananda Shova Tamrakar, Chairperson of PEMON.

After the formal session, the participants were given a tour of the vermi compost plant and the plant was inaugurated by releasing earthworms in the vermi beds.

During the interaction programme, Ms. Shriju Pradhan Tuladhar from KMC presented a paper titled "Introduction to Vermi Composting," and Ms. Ananda Shova Tamrakar of PEMON presented a paper on the
technical aspects of vermi composting. The first paper introduced the concept of vermi composting and explained how it was introduced in Kathmandu and what KMC is doing to promote it. The paper also highlighted some of the objectives and activities of the pilot project. The second paper explained vermi composting technology, its use around the world, and the characteristics and benefits of vermi compost. The two papers were followed by an open interaction where the paper presenters answered the questions of the participants.

A small exhibition was also set up during the inauguration programme. The exhibition demonstrated home vermi composting kits being sold by KMC, various literature on vermi composting, vermi compost produced in Nepal and India and various promotional materials on vermi composting.

All together more than 60 people, including many people from the media, attended the inauguration ceremony and it was well covered in the national news on radio, television and major newspapers, the following day.

3.5 Operation of Vermi Compost Plant

Operation of the vermi compost plant started on 21 March 2005. However due to various difficulties, such as the unavailability of sufficient quantities of earthworms, unavailability of trained workers and irregularity in the delivery of waste, the amount of waste processed was very low in the initial stages.

During the two-month period between 7th April and 7th June 2005, a total of 11 tons of waste was processed in the plant. This is equivalent to an average waste intake of 182 kg per day. This rate is much lower than the proposed rate of 500 kg per day. The waste intake is thus being increased now and at present about 500 kg of waste is being processed per day.

Waste is either brought in a truck by KMC or in a rickshaw by one of the project workers. The delivery of required amount of waste by KMC truck is not always reliable because sometimes the waste is mixed with the rest of the waste in Teku Transfer Station. Although collection of waste by the rickshaw is more reliable, this is a time consuming activity. Collection of one rickshaw full of waste takes more than one hour and at one time only about 150 kg of waste can be collected.

Once the waste is collected it is unloaded at the project site and then sorted and chopped if necessary. Usually, about 97 percent of the collected waste is organic waste that can be used. The waste is then weighed and mixed with saw dust in about 10:1 ratio.

Once the waste is ready for composting it is then composted for about 30 days in an aerobic system. During the two-month project period, various options for aerobic composting has been tried.
In the compost chamber, the top compartment holds about 1000 kg of waste. After 10 days, the waste is dropped to the second compartment and from there it is dropped to the third compartment after 10 more days. Therefore, the existing compost chamber with two sets of three compartments, is capable of processing 2000 kg of waste every 10 days or 6 tons of waste per month. Smell was not a problem and by the end of 10 days the volume of waste had reduced by 40 percent.

In the honeycomb compost box, each box is able to hold about 600 kg of waste. In the beginning two of the boxes are filled with waste. After 15 days, the volume of the waste reduces by about half and the semi decomposed waste from the boxes is transferred in to the empty box. Therefore the set of three honeycomb boxes is capable of processing 1200 kg of waste every 15 days or 2.4 tons per month.

The compost barrel is capable of holding about 100 kg of waste at one time. As the volume of the waste reduces by about 50 percent by the end of 15 days, waste from two barrels can be emptied into another barrel at the end of 15 days. In this way, a set of three barrels can process 400 kg of waste per month.

During the pilot project, composting was also done in piles, 1 m³ old waste containers and vermi beds. However, aeration in these methods were difficult and in the case of pile composting protection from rain was also a problem.

During aerobic composting, the temperature and volume was regularly monitored. The temperature usually reached a maximum of about 60 degrees C after about six days. At the end of 10 days the temperature was between 40 to 50 degrees C and by the end of 10 days the temperature went down to 26 to 32 degrees C.

After aerobic composting it was placed in the vermi tanks with earthworms. Initially, waste that had been composted for about 15 days was placed in the vermi beds. But this resulted in increase in temperature in the vermi beds and this caused worms to die.

During the pilot project 200,000 worms were used. But it is clear that a lot more worms are required.

If we are to process 500 kg of fresh waste per day, then by the end of one month of aerobic composting the amount of waste will have decreased to about 250 kg per day. Each of the vermi tanks has a capacity of 1.8 m³ or about 1 ton. This means that one tank will be filled in about four days. If we let the worms feed on the waste for about 40 days than a total of about 10 vermi tanks will be required. Furthermore, if we put 1 ton of waste in one vermi tank and plan to leave the waste in the tank for 40 days then we need enough worms to consume 25 kg of waste per day. According to different literature, worms can eat waste equivalent to 0.5 to 1 time their body weight each day. This means we need 25 kg to 50 kg of worms per tank. As each kg of worms consists of approximately 3000 worms, the total number of worms required per tank is 75,000 to 150,000. As we require a total of 10 tanks to process 500 kg of fresh waste or 250 kg
of partially decomposed waste per day, the total number of worms is 7.5 million to 15 million.

After 40 days in the vermi tanks, the vermi compost removed and harvested, then the compost is put aside for about two days to allow hatching of worms from cocoons. At present this is being done in a few of the tanks. As the vermi composting process further reduces the volume of compost by about half, the total amount of vermi compost produced will be only about 125 kg per day if we start with 500 kg of fresh waste per day. This means that one of the vermi tanks will be filled with vermi compost in about 8 days. Therefore two of the vermi tanks or equivalent amount of space will be required for maturation of the compost.

After the composting process is complete, it needs to be screened and then packed and stored. At present, there is a small area for screening at the end of the vermi tanks but this area seems to be insufficient. In the future some of the vermi tanks will be used for screening and storage of final product as well.

In the two months of the project a total of 926 kg of vermi compost was produced. In the future the project should be able to produce at least 125 kg of vermi compost per day. Originally, it was assumed that 500 kg of fresh waste will result in about 200 kg of vermi compost. But experiments done during the pilot project indicates that volume reduction is more than expected and therefore the capacity of the plant is probably closer to 125 kg per day.

### 3.6 Quality Analysis

Six samples of the compost were tested in a lab for nitrogen, phosphorus, potassium and organic content. The results of the quality analysis are presented in Table 2.

<table>
<thead>
<tr>
<th>No.</th>
<th>pH</th>
<th>Nitrogen</th>
<th>Phosphorus</th>
<th>Potassium</th>
<th>Organic Matter</th>
<th>Moisture</th>
<th>C:N Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7.5</td>
<td>0.67</td>
<td>0.92</td>
<td>4.2</td>
<td>22.11</td>
<td>52.51</td>
<td>19</td>
</tr>
<tr>
<td>2</td>
<td>8.2</td>
<td>0.61</td>
<td>0.82</td>
<td>3.5</td>
<td>16.17</td>
<td>70.85</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>8.0</td>
<td>0.60</td>
<td>0.78</td>
<td>2.93</td>
<td>12.21</td>
<td>57.26</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>7.9</td>
<td>0.62</td>
<td>0.87</td>
<td>3.62</td>
<td>18.48</td>
<td>56.6</td>
<td>17</td>
</tr>
<tr>
<td>5</td>
<td>7.9</td>
<td>0.61</td>
<td>0.79</td>
<td>2.99</td>
<td>14.52</td>
<td>53.26</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>8.5</td>
<td>0.63</td>
<td>0.88</td>
<td>3.69</td>
<td>18.81</td>
<td>61.72</td>
<td>18</td>
</tr>
<tr>
<td>Avg.</td>
<td>8.0</td>
<td>0.62</td>
<td>0.84</td>
<td>3.49</td>
<td>17.05</td>
<td>58.70</td>
<td>15.83</td>
</tr>
</tbody>
</table>

The results of the analysis were quite different from what can be expected from vermi compost based on previous studies. The results show that the amounts of major nutrients, particularly nitrogen, as well as organic matter in the tested samples, are much lower than results obtained from previous studies. Most recently, Maharjan (2004) had analyzed vermi compost made from vegetable waste from Kalimati Vegetable Market on a small scale and found the nitrogen,
phosphorus, potassium and organic content to be 1.81 percent, 2.49 percent, 4.59 percent and 35.16 percent respectively.

Some possible reasons for the extremely low values of NPK and organic matter found in the vermi compost samples from this pilot project are as follows:

- As the number of earthworms was very low in the initial stages, most of the compost in the samples is probably ordinary aerobic compost instead of vermi cast. The values for NPK for ordinary compost are usually much lower than vermi compost.

- In the initial stages, the waste had been left outside for several days, as a result much of the nutrients were lost during this stage through the air as well as leachate.

Whatever the reasons may be, the initial quality analysis clearly indicates the need to improve the quality of the compost. This needs to be done by significantly increasing the quantity of earthworms and reduce the possibilities of nutrient losses through the air or leachate. There is a need to do additional tests once the vermi composting process is improved in order to ensure the production of better quality compost.

### 3.7 Training

During the project, two training workshops were conducted for gardeners, agricultural extension workers and farmers. During the workshops, the main concepts and process of vermi composting were explained and the participants leaned about the pilot project. The main objectives of the workshop were to raise awareness on vermi composting among potential users and also expand the market for vermi compost.

The first training workshop was organized on 29 May and had 31 participants mostly gardeners from various hotels, embassies and other institutions.

The second training workshop was organized on the following day on 30 May and had 31 participants, most of whom were farmers.

The list of participants for both the training workshops are presented in Annex.

### 3.8 Marketing Strategy

As product marketing is a very important part of any compost project and most composting projects tend to fail because of poor marketing, during this pilot project a market survey was conducted and a marketing strategy was developed to market the vermi compost.
The first part of marketing strategy formulation was a situational analysis that was conducted based on primary as well as secondary information. The primary research involved questionnaire survey of 23 nurseries and agro-vets, and 100 customers visiting nurseries. Discussions with department stores and grocery stores were also held. The situational analysis included the following types of analysis:

Market Analysis – Assessment of potential markets included farmers, nurseries, households and institution. The analysis recommended prioritization of household and institutions.

Competitive Analysis – The strengths and weaknesses of four competing products – household compost, household vermi compost, other organic fertilizer and chemical fertilizer – were assessed.

Product/Price Analysis – The current market price of various types of competing products were analysed.

Distribution Analysis – Potential distribution channels – nurseries, agro-vets, department stores and grocery stores – were analysed.

Promotional Analysis – This analysis recommended communications materials to focus on product feature, product benefits, product use and availability channels.

Based on the situational analysis marketing objectives and marketing strategy was formulated. The marketing strategy includes recommendations for product development, prices, distributional channels and promotional activities.

The draft marketing strategy was presented and discussed at an interaction program organized in KMC on 19 June 2005.

Based on the marketing strategy and discussion with stakeholders, the brand name “Healthy Gro” has been recommended and the recommended price for distributors, retailers and consumers is Rs. 10, 12, and 15 respectively per kg. Assuming that the cost of production is Rs. 7.5 per kg, this pricing structure would result in profit margins of 33 percent to the producer, 20 percent to the distributor and 25 percent to the retailer. For 5 kg and 50 kg packets the price per kg will be slightly lower. The prices will also be slightly lower during the initial promotional stage.

About 150 nurseries and agro-vets will be the primary channels to take the vermi compost to the consumers. A two-tier (distributor & retailer) distribution mechanism is proposed. A distributor with facilities for storing and transporting the products, and good networking with retailers will be selected.

For promotional activities, the objectives will be to create brand awareness and encourage product trial. This will be done through marketing communications and sales promotion. Marketing communications will primarily focus on in-store-advertisement such as leaflets and point-of-purchase (POP) display. Other means of communication will be advertorials and product watch. The objective
of sales promotional activities such as special promotional prices and exhibitions is rapid penetration of the brand among consumers.

3.9 Vermi Composting Manual

A manual for medium scale vermi composting has been produced. The manual describes vermi composting, the process of vermi composting and the uses of vermi compost as well as the worms. The manual has been prepared based on the experiences of the pilot project and will be helpful for anyone interested in replicating the project.
4. **PROJECT MANAGEMENT**

The pilot project had two project coordinators, one from KMC and one from PEMON to provide overall guidance and supervision. Shriju Pradhan Tuladhar, Coordinator of Community Mobilization Unit, was responsible for the project implementation from KMC and Dr. Ananda Shova Tamrakar, Chairperson of PEMON, was the project coordinators. Bhushan Tuladhar from Clean Energy Nepal provided technical advice.

The responsibilities of Coordinator from KMC were as follows:

- Coordinate project related activities within KMC
- Ensure the availability of required land within the Teku Transfer Station
- Ensure the timely delivery of the 500 kg of market waste per day
- Organize an interaction programme on vermi composting
- Assist in making and marketing the compost
- Monitor the project activities and ensure its smooth implementation
- Based on the project outcome, develop plans for operating and expanding the plant

The responsibility of Project Coordinator from PEMON were as follows:

- Design the compost plant
- Ensure proper and timely construction of the plant
- Develop and implement appropriate operating procedures to ensure that 500 kg of waste is composted in a proper manner
- Test the quality of the compost
- Design and implement a strategy for marketing the vermi compost
- Organize workshop for farmers
- Design and Develop a vermi composting manual
- Submit and mid-term and final reports.

The project had three supervisors with experience in vermi composting, who were responsible for implementing the project in the field. Although the supervisors were working on a part-time basis, there was always one or more supervisors at the site.

The responsibilities of the supervisors were as follows:

- Supervise the day-to-day operation of the compost plant, including the work of the compost makers
- Conduct experiments on various methods of operating the compost plant.
- Report progress to project coordinators
The staff of Community Mobilization Unit of KMC provided necessary assistance to the supervisors and also monitored the progress from KMC.

The project had three compost makers who were responsible for the following:

- Collect market waste and bring it to the project site
- Sort the waste
- Cut the waste into small pieces
- Compost the waste
- Screen and package the compost

Based on the experience of the pilot project, in the future, the compost plant can operate with one full-time supervisor and three compost makers. However, in order to effectively market the product, a distributor needs to be selected.
5. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

Overall the pilot project has been successful in demonstrating the application of vermi composting technology to process vegetable market waste. Both technical and financial feasibility of the application of this technology on a medium scale has been demonstrated.

Technically, although there have been some initial problems in operating the plant and the quality and quantity of compost needs to be improved, overall, there is enough reasons to believe that the plant can produce at least 125 kg per day of good quality vermi compost.

Cost calculations and the results of the marketing survey also indicate that the plant can be operated in a sustainable manner. At present, the cost of vermi compost production is estimated to be approximately Rs. 7.5 per kg. As the market survey indicates that this compost can be sold for Rs. 15 to 20 per kg and there is a sufficiently large market for this compost, the plant can be operated as a profit center.

5.2 Problems to be Addressed

Some of the main problems encountered during the project are as follows:

Problems Related to Plant Design and Construction

1. There is no adequate provision for drainage at the site. As a result, during rain, the runoff from the entire paved area within the transfer station comes to the project site and damages the compost as well as cause difficulties in operating the plant due to water logging. Therefore there is an urgent need to properly manage the runoff by providing adequate drainage infrastructure.

2. As the site is located next to the transfer station, air-borne litter is also a major problem at the site. Some kind of barrier between the project site and the tipping floor of the transfer station is required.

3. The vermi tanks are exposed to direct sunlight in the afternoon. Now plastic sheets have been set up to block direct sunlight and rain. In the future, the roof should be made a bit lower and it should be extended beyond the shed to block sunlight and rain.

4. As trails for walking and transporting of waste was not originally constructed, transporting the waste, particularly during rainy days is very difficult in the project area. Therefore, the site should be improved by constructing a paved trail for...
walking and transporting waste. The will also improve the overall aesthetics in the project area.

5. Construction quality of some of the infrastructure, particularly the honeycomb compost box, is poor. Proper construction supervision is necessary to ensure good quality construction.

6. Provision for drainage and collection of leachate from the vermi tank, honeycomb boxes and compost chamber is not adequate. More slope should be maintained for proper flow of leachate and in the case of the vermi tank, a drainage layer consisting of small stones should be tried. This layer should be separated from the waste by a layer of geo membrane or sack. In the case of compost chamber and honeycomb boxes, a drainage system for the leachate should be made.

7. Infrastructure for aerobic composting is not adequate. As composting in the one cubic meter container is difficult, some more honeycomb boxes or compost chambers need to be constructed or more compost barrels need to be set up. Right now the existing compost chamber, honeycomb boxes and barrels have a capacity to process about 8.8 tons of waste per month. This needs to be increased to at least 15 tons per month. This can be either done by adding a compost chamber and three more compost barrels or by adding six more honeycomb boxes and 12 more compost barrels.

8. Space for screening and storage of compost is insufficient.

9. As there is no shed for workers involved in waste sorting and preparation, this becomes a difficult during hot sunning days or during rain.

Problems Associated with Operation and Management of the Plant

10. The delivery of waste to the compost site has not been very regular. KMC should ensure that at least 500 kg of vegetable market waste is delivered to the site each day. Alternatively about 1 ton of waste can be delivered once every two days.

11. The number of worms needs to be increased significantly in order to ensure proper vermi composting. When the project was designed an assumption was made that 200,000 worms would be enough but now it looks like at least five times more worms than this number is required.

12. The current production rate needs to be increased and the capacity of the plant needs to be fully and effectively utilized.

13. The quality of the compost needs to be improved. This should be done by increasing the number of worms and reducing losses due to leachate and exposure to air.
14. Although a marketing strategy has been developed the pilot project has not yet started to market the compost. Efforts should be made to implement the marketing plan as soon as possible. This will require finalization of promotional materials, selection of a distributor and retailers. However, as the initial quality analysis indicates that the quality of the compost is not as expected, efforts should first be made to improve both the quality and quantity of vermi compost that is produced.

5.3 Recommendations

Although the plant is yet to operate in its full capacity, the required facilities have been set up and initial experiments have been completed. The challenge now is to operate the plant in full capacity in a sustainable manner. In order to achieve this, the project should focus on fine-tuning the technical aspects of operating the plant and marketing the final product.

Key recommendations for future action are as follows:

1. KMC should improve the drainage system around the site immediately so as to ensure proper operation of the plant, particularly during the rainy season.

2. The area next to the vermi tanks should be paved so as to assist in transporting of waste and compost.

3. Additional facilities should be set up for aerobic composting. This can be in the form of honeycomb compost boxes, compost barrels or compost barrels. Additional facilities should have the capacity to process at least 6 tons of waste per month, although the target should be to double the existing capacity for aerobic composting.

4. Leachate collection system needs to improved in all the structures. The bottom slopes of the vermi tanks, honeycomb boxes and compost chambers should be increased so that the leachate flows properly. In the vermi tanks, a separate drainage layer with stones or gravel should be tried out.

5. The number of worms in the vermi tanks should be increased, either by purchasing worms or waiting for the existing worms to reproduce. Ultimately each tank should have about 100,000 worms.

6. KMC should provide more space for screening and storing the compost, as well as sorting the waste when it first arrives. This can be done by building a large shed immediately west of the existing vermi tanks or aerobic composting chamber.

7. The quality of the compost should be regularly tested to ensure that the quality improves.
8. The capacity of the plant should be fully utilized by increasing the amount of waste processed and making the system more efficient in terms of space and time required for composting.

9. Once the plant start to operate smoothly, the responsibility of operating the plant can be transferred to a suitable private party in order to ensure the sustainable operation of the plant.

10. The responsibility for marketing the compost should be given to a private company and the marketing strategy should be followed.

11. Once the plant starts to operate in full capacity, the capacity of the plant should be expanded by developing additional infrastructure for aerobic and vermi composting. The capacity of the plant should be increased to at least one ton per day and preferably it should have the capacity to compost all the organic waste generated by Kalimati Vegetable Market. Some possible areas for expansion is the area immediately north or south of the existing project area or the area next to the exiting wastewater treatment plant or the area beneath the newly constructed ramp.

12. Similar plants should also be established in other locations where feasible, as public-private partnership ventures. For this, the municipality or vegetable market owner should provide the initial investment and a private operator should operate the plant and market the compost. Some possible areas include the area along the northern wall of the Kalimati Compost Plant or the area south of the Tukucha Vegetable Market.
Annex 1: Process of Vermi Composting

1. Preparation
   - Waste collection
   - Sorting
   - Size reduction
   - Mixing

2. Aerobic Degradation
   - Box, bin, pile or chamber
   - Aeration
   - Addition of EM activator
   - Moisture control

3. Vermi Composting
   - Introduction of worms
   - Monitoring
   - Harvesting

4. Maturation
   - Hatching of cocoons
   - Separation of vermi

5. Screening
   - 8 mm & 4 mm screens

6. Quality Control
   - Lab tests
   - Field Tests

7. Packaging
   - 1kg, 5 kg, and 50 kg Bags

8. Storage

9. Marketing
   - Nurseries
   - Farmers cooperatives
   - Fertilizer dealers
   - Department stores

Undegraded organic materials
Reacks
Landfill
Worms

Lab tests
Field Tests
Annex 2: Photographs

Photo 1: Alternate Site Next to Incineration

Note: the structure in front that is currently being used as a sludge drying bed can also be used for vermi composting in the future.

Photo 2: Alternate Site Below the New Ramp at Teku
Photo 3: Alternate Site at Tukucha Vegetable Market

Photo 4: Vegetable Market Waste
Photo 5: Project Site

Photo 6: Site After Clearance
Photo 7: Engineers Assess the Site for the Compost Chamber

Photo 8: Project Coordinators and Project Engineer Sign Agreement at the Site
Photo 9: Foundation Trenches

Photo 10: Construction of the Foundation
Photo 11: Placing Concrete on the Floor

Photo 12: Building the Walls of the Vermi Beds
Photo 13: Construction of Vermi Beds

Photo 14: Project Coordinator Puts up the Board After Completion of the Construction
Photo 15: Aerobic Composting Boxes

Photo 16: Grill Inside Compost Box
Photo 17: Compost Chamber

Photo 18 Pile Composting
Photo 19: Aerobic Composting in Old Waste Containers

Photo 20: One of the Site Supervisor Checks out the Compost Barrel and Box
Photo 21 Inauguration Ceremony of the Vermi Compost Plant on 21 March 2005

Photo 22: Project Coordinator explains the project to the media
Photo 23: TV Camera Men Line Up to Shoot the Worms

Photo 24: Exhibition on Vermi Composting Technology
Photo 25: Presentation During the Interaction Programme

Photo 26: Unloading of Vegetable Market Waste from Rickshaw
Photo 27: Chopping of Incoming Waste

Photo 28: Spraying EM solution on Waste
Photo 29: Waste Inside the Compost Chamber

Photo 30: Removal of Poles in the Compost Chamber to Drop the Waste from the First to Second Compartment
Photo 31: Site Supervisors Feed the Worms

Photo 32: Site Supervisor Checks on the Worms while a Worker Waters a Vermi Bed
Photo 33: Harvesting Vermi Compost

Photo 34: Storage of Compost Prior to Screening
Photo 35: Vermi Composting Training to Gardeners

Photo 36: Vermi Training to Farmers
Photo 37: Potential area for Expansion of the Project. This area needs to be paved and a shed needs to be built on it make more room for sorting and screening

Photo 38: Healthy Worms
Annex 3: Location of Pilot Project
Annex 4: Design Drawings
Annex 5: Presentations Made During the Interaction Programme
Annex 6: List of Participants of Training Workshops

Training for Gardeners (29 May 2005)

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Organization</th>
<th>Contact Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chok B. Goyal</td>
<td>Hotel De’l Annapurna</td>
<td>4221711</td>
</tr>
<tr>
<td>2</td>
<td>Purshottam Adhikari</td>
<td></td>
<td>4411141</td>
</tr>
<tr>
<td>3</td>
<td>Ganga Bahadur</td>
<td>USAID</td>
<td>4270144</td>
</tr>
<tr>
<td>4</td>
<td>Ram B. Tamang</td>
<td>USAID</td>
<td>4270144</td>
</tr>
<tr>
<td>5</td>
<td>Yagya L. Pandey</td>
<td>Hotel Yak &amp; Yeti</td>
<td>4248999</td>
</tr>
<tr>
<td>6</td>
<td>Manahari Thapa</td>
<td>German Embassy</td>
<td>4416655</td>
</tr>
<tr>
<td>7</td>
<td>Gyan Ratna Maharjan</td>
<td>British Embassy</td>
<td>4410583</td>
</tr>
<tr>
<td>8</td>
<td>Sushil Thapaliya</td>
<td>Hotel Soaltee</td>
<td>4272555</td>
</tr>
<tr>
<td>9</td>
<td>Pancha Narayan</td>
<td>Israel Embassy</td>
<td>412156</td>
</tr>
<tr>
<td>10</td>
<td>Bhim Bahadur</td>
<td>French Embassy</td>
<td>412332</td>
</tr>
<tr>
<td>11</td>
<td>Narayan Das</td>
<td>USA Embassy</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Dilip Bade</td>
<td>Jaya Kisan Nursery</td>
<td>4490478</td>
</tr>
<tr>
<td>13</td>
<td>Ramesh Tamang</td>
<td>IUCN Nepal</td>
<td>5528761</td>
</tr>
<tr>
<td>14</td>
<td>Sanyaka Giri</td>
<td>Rastriya Sabha Griha</td>
<td>4225639</td>
</tr>
<tr>
<td>15</td>
<td>Indra Lal Regmi</td>
<td>Rastriya Sabha Griha</td>
<td>4225639</td>
</tr>
<tr>
<td>16</td>
<td>Ram Bhattarai</td>
<td>-</td>
<td>4281252</td>
</tr>
<tr>
<td>17</td>
<td>Ganesh B. Tamang</td>
<td>Ratna Park</td>
<td>4232415</td>
</tr>
<tr>
<td>18</td>
<td>Narayan</td>
<td>Everest Hotel</td>
<td>4780100</td>
</tr>
<tr>
<td>19</td>
<td>Deepa Rai</td>
<td>Thankot</td>
<td>4310317</td>
</tr>
<tr>
<td>20</td>
<td>Bunty Shrestha</td>
<td>SchEMS</td>
<td>2090304</td>
</tr>
<tr>
<td>21</td>
<td>Rajaram Karmacharya</td>
<td>KMC</td>
<td>4242148</td>
</tr>
<tr>
<td>22</td>
<td>Sanumaiya Maharjan</td>
<td>KMC</td>
<td>4301313</td>
</tr>
<tr>
<td>23</td>
<td>Rajesh Shrestha</td>
<td>KMC</td>
<td>4438331</td>
</tr>
<tr>
<td>24</td>
<td>Robert Dangol</td>
<td>KMC</td>
<td>4246044</td>
</tr>
<tr>
<td>25</td>
<td>Srijana Shakya</td>
<td>KMC</td>
<td>4288124</td>
</tr>
<tr>
<td>26</td>
<td>Karuna Maharjan</td>
<td>KMC</td>
<td>4279564</td>
</tr>
<tr>
<td>27</td>
<td>Kishor Maharjan</td>
<td>PEMON</td>
<td>4283170</td>
</tr>
<tr>
<td>28</td>
<td>Sushil Anu</td>
<td>PEMON</td>
<td>5527733</td>
</tr>
<tr>
<td>29</td>
<td>Dibya Tara Tuladhar</td>
<td>PEMON</td>
<td>4254238</td>
</tr>
<tr>
<td>30</td>
<td>Gautam Bir</td>
<td>PEMON</td>
<td>4381177</td>
</tr>
<tr>
<td>31</td>
<td>Kiyoshi Shimizu</td>
<td>JICA CKV Team</td>
<td>5555373</td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Organization</td>
<td>Contact Phone</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------</td>
<td>--------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>1</td>
<td>Ram Prasad Thapaliya</td>
<td>District Agriculture Development Office Kathmandu</td>
<td>4484381</td>
</tr>
<tr>
<td>2</td>
<td>Damador Neupane</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
<tr>
<td>3</td>
<td>Shree Ram Khadka</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
<tr>
<td>4</td>
<td>Prakash Raj Aryal</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
<tr>
<td>5</td>
<td>Raghunath Ghimire</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
<tr>
<td>6</td>
<td>Devi Prasad Sharma</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
<tr>
<td>7</td>
<td>Arjun Baral</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
<tr>
<td>8</td>
<td>Gopal Sapkota</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
<tr>
<td>9</td>
<td>Ishwori Khanal</td>
<td>Mulpani Mahila Krishak Samuha</td>
<td>4450942</td>
</tr>
<tr>
<td>10</td>
<td>Sangeeta Khanal</td>
<td>Mulpani Mahila Krishak Samuha</td>
<td>4450942</td>
</tr>
<tr>
<td>11</td>
<td>Prabha Dhungel</td>
<td>Mulpani Gramin Mahila Jagaran Samuha</td>
<td>445349</td>
</tr>
<tr>
<td>12</td>
<td>Nirmala Acharya</td>
<td>Mulpani Gramin Mahila Jagaran Samuha</td>
<td>445349</td>
</tr>
<tr>
<td>13</td>
<td>Siddhi Bahadur</td>
<td>Kirtipur Municipality - 15</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>Parvati Dangol</td>
<td>Kirtipur Municipality - 12</td>
<td>4334137</td>
</tr>
<tr>
<td>15</td>
<td>Binu Maharjan</td>
<td>Kirtipur Municipality - 4</td>
<td>4332052</td>
</tr>
<tr>
<td>16</td>
<td>Laxmi Raila</td>
<td>Kirtipur Municipality - 15</td>
<td>2031300</td>
</tr>
<tr>
<td>17</td>
<td>Bindu Shrestha</td>
<td>Thankot - 7</td>
<td>4310105</td>
</tr>
<tr>
<td>18</td>
<td>Chandika Shrestha</td>
<td>Thankot - 7</td>
<td>4310105</td>
</tr>
<tr>
<td>19</td>
<td>Tara Kaki</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td>Krishna P. Bhattarai</td>
<td>Ramkot – 4</td>
<td>4286207</td>
</tr>
<tr>
<td>21</td>
<td>Jaya Ram Puri</td>
<td>Ramkot - 4</td>
<td>4282297</td>
</tr>
<tr>
<td>22</td>
<td>Bhagwati Aryal</td>
<td>Jeetpur Phedi - 8</td>
<td>-</td>
</tr>
<tr>
<td>23</td>
<td>Sarita Timilsina</td>
<td>Dharmasthali – 4</td>
<td>-</td>
</tr>
<tr>
<td>24</td>
<td>Bhagwati Aryal (a)</td>
<td>Jeetpur Phedi – 9</td>
<td>-</td>
</tr>
<tr>
<td>25</td>
<td>Bhagwati Aryal (b)</td>
<td>Jeetpur Phedi – 9</td>
<td>-</td>
</tr>
<tr>
<td>26</td>
<td>Mathura Phuyal</td>
<td>Kabhresthali – 2</td>
<td>-</td>
</tr>
<tr>
<td>27</td>
<td>Jamuna Bhandari</td>
<td>Kabhresthali – 4</td>
<td>-</td>
</tr>
<tr>
<td>28</td>
<td>Srijana Shakya</td>
<td>KMC</td>
<td>4288124</td>
</tr>
<tr>
<td>29</td>
<td>Kishor Maharjan</td>
<td>PEMON</td>
<td>4283170</td>
</tr>
<tr>
<td>30</td>
<td>Deepa Rai</td>
<td>Thankot</td>
<td>4310317</td>
</tr>
<tr>
<td>31</td>
<td>Bunty Shrestha</td>
<td>SchEMS</td>
<td>2090304</td>
</tr>
<tr>
<td>32</td>
<td>Sushil Anu</td>
<td>PEMON</td>
<td>5527733</td>
</tr>
<tr>
<td>33</td>
<td>Ratnakaji Maharjan</td>
<td>KMC</td>
<td>4231719</td>
</tr>
</tbody>
</table>
Annex 7 Promotional Materials for "Vermi" & "Healthy Gro" Brands of Vermi Compost

Poster for "Vermi"

Poster for "Healthy Gro"
Pack Design for "Vermi"

Pack Design for "Healthy Gro"
Annex 8: Market Survey
MARKETING STRATEGY
FOR
VERMICOMPOST

June 2005
# TABLE OF CONTENTS

1 SITUATIONAL ANALYSIS

1.1 Target Market Analysis

1.1.1 Key Conclusions

1.2 Competitive Analysis

1.2.1 Households that make their own compost

1.2.2 Households practicing vermi-composting

1.2.3 Substitute organic fertilizers

1.2.4 Chemical fertilizers

1.2.5 Key Conclusions

1.3 Product/Price Analysis

1.3.1 Comparative pricing of products

1.3.2 Compost types used in households and prices paid

1.3.3 Key Conclusions

1.4 Distribution Analysis

1.4.1 Key Conclusions

1.5 Promotion Analysis

1.5.1 Key Conclusions

2 STRATEGIC IMPLEMENTATION PLAN

2.1 Marketing Objectives

2.2 Marketing Strategy

2.2.1 Sales Targets

2.2.2 Product

2.2.2.1 Product Feature Description

2.2.2.2 Product Benefit Description

2.2.2.2.1 Functional Benefits

2.2.2.2.2 Non-functional benefits

2.2.2.3 Branding

2.2.2.3.1 Brand Name
SITUATIONAL ANALYSIS

This section of the marketing plan is an analysis of background information on the product and its market. Such analyses form the base of the marketing strategy developed towards the latter half of this document.

Target Market Analysis

Secondary\(^1\) as well as primary research\(^2\) conducted for the target groups of fertilizers, in general, reveal the following main target segments:

- Farmers
- Nurseries
- Households
- Institutions

The table below contains additional behavioral information on each target segment:

<table>
<thead>
<tr>
<th>Target Group</th>
<th>Behavioral Characteristics</th>
</tr>
</thead>
</table>
| Farmers      | - The total area under cultivation in Kathmandu valley is 52,865 hectares (National Development Institute, 2002);  
               - The agricultural sector is the largest consumer of compost in and around Kathmandu Valley;  
               - Most predominant forms of compost are (a) compost derived from cattle and chicken waste, and (b) compost made out of plant residue from the farm;  
               - Typically, compost required for farming is made by the farmers themselves;  
               - Average compost application rate for Kathmandu valley is 17.274 tons per hectare per year. |
| Nurseries    | - There are currently 200 nurseries (unpublished data from Floriculture Association of Nepal) operating in Kathmandu;  
               - Nurseries comprise the second largest consumers for compost;  
               - Nurseries generally buy various fertilizers and compost raw materials and mix them together to produce compost as per their requirements;  
               - Nurseries are also involved in the selling of compost that they make, their customers primarily being households, offices, hotels and restaurants; |

---

\(^1\) Composting as an option in the Municipal solid waste management of Kathmandu Metropolitan City, Rupesh Udaha, 2004  
\(^2\) Market potential of Vermi-compost in Kathmandu, Akash Shrestha, 2005
- The average compost use per nursery is estimated at 2,358 kg per annum.

**Households**

- The total number of households in Kathmandu valley is 152,155 (CBS 2001);
- Secondary research data reveals that 29% of households surveyed (N=100) were found to be using compost, of which 10% purchased their compost (municipal compost, nursery compost, and cattle manure);
- Primary research data shows that while 82% of customers (visiting nurseries) surveyed (N=50) used organic compost, 67% purchased their compost;
- Compost is used in households for plantation of flowers and other decoration plants either in flower pots or gardens, and in vegetable gardens;
- As per secondary research, market demand for compost averages 10 kg per household per year;
- As per primary research, households consume on an average 12 – 24 kg of compost per year.

**Institutions**

- According to primary research conducted amongst 23 nurseries/agro-vets in Kathmandu valley, institutions comprise their second largest client base (24% of total client types);
- Anecdotal information suggests that institutions purchase their plants/seeds as well as fertilizers from nurseries;
- No formal research, primary and secondary, has been conducted with this target market.

### Key Conclusions

<table>
<thead>
<tr>
<th>Target Group</th>
<th>Priority</th>
<th>Justification</th>
</tr>
</thead>
</table>
| Farmers      | No       | - Though the agricultural sector is the largest consumer of compost in and around Kathmandu Valley, they;  
  ✓ Typically, make the compost themselves;  
  ✓ Have a sizable demand of 17.274 tons per hectare per year, which cannot be filled operationally by our vermi-composting capacity. |
| Nurseries    | No       | - While nurseries comprise the second largest consumers for compost, they: |
Produce compost as per their requirements;
- Have an annual consumption of 2,358 kg per annum per nursery, which cannot be filled operationally by our vermi-composting capacity.
- Given that major client flow is through nurseries, they comprise an excellent channel for our product distribution.

<table>
<thead>
<tr>
<th>Households</th>
<th>Yes</th>
</tr>
</thead>
</table>
| - Secondary research data reveals that 29% of households surveyed (N=100) were found to be using compost, of which 10% purchased their compost (municipal compost, nursery compost, and cattle manure);
- Primary research data shows that while 82% of customers (visiting nurseries) surveyed (N=50) used organic compost, 67% purchased their compost;
- As per secondary research, market demand for compost averages 10 kg per household per year, which can be filled by our production capacities;
- As per primary research, households consume on an average 12–24 kg of compost per year, which can be filled by our production capacities. |

<table>
<thead>
<tr>
<th>Institutions</th>
<th>Yes</th>
</tr>
</thead>
</table>
| - According to primary research conducted amongst 23 nurseries/agro-vets in Kathmandu valley, institutions comprise their second largest client base (24% of total client types);
- Anecdotal information suggests that institutions purchase their plants/seeds as well as fertilizers from nurseries;
- No formal research, primary and secondary, has been conducted with this target market. |

**Competitive Analysis**

Competition to our product is posed by the following:
- Households that make their own compost
  - Households practicing vermi-composting
  - Substitute organic fertilizers
  - Chemical fertilizers

**Households that make their own compost**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-sufficiency (composting needs are met by self)</td>
<td>Inconvenience (given time and effort involved)</td>
</tr>
<tr>
<td>Cheaper (since it involves household waste or cheap additives)</td>
<td>Lack of space for composting</td>
</tr>
</tbody>
</table>

**Households practicing vermi-composting**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-sufficiency (vermi-composting needs are met by self)</td>
<td>Inconvenience (given time and effort involved)</td>
</tr>
<tr>
<td>Cheaper (since it involves household waste additives)</td>
<td>Household practices do not assure uniform standards in quality</td>
</tr>
<tr>
<td></td>
<td>Lack of space for vermicomposting</td>
</tr>
</tbody>
</table>

**Substitute organic fertilizers**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Established product presence with established users</td>
<td>Absence of effective branding of products (which affects consumer assurance of quality standards, and adequate information dissemination)</td>
</tr>
<tr>
<td>Primary benefits associated include healthy plants, easy availability and easy usage</td>
<td>Reasonably priced at Rs. 15.00 – Rs. 25.00 per kg</td>
</tr>
</tbody>
</table>

**Chemical fertilizers**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary perceived benefits associated include easy availability, easy usage, warding off of insects, and accelerated growth</td>
<td>Detrimental to environment</td>
</tr>
<tr>
<td></td>
<td>Expensive (Rs. 20.00 – Rs. 100.00 per kg)</td>
</tr>
</tbody>
</table>
Key Conclusions

Household composting

- Lack of space, and inconvenience were the major deterrents towards its use. Hence, a packaged form of compost would help solve the above two issues, thereby attracting this market towards our product.
- While direct cost factors associated with household composting are low, the benefit of convenience through packaged compost would be a value addition. Furthermore, strategic pricing of our product whereby it is affordable to our target market is another key factor.
- Market introduction of vermicompost (packaged) would provide a more effective alternative to general household compost as well as a standardized product relative to household vermicomposting.

Substitute organic fertilizers

- Given the absence of branding of general organic fertilizers, the market introduction of a branded organic fertilizer would be a value addition in terms of assurance of standardized quality, and dissemination of product information (through marketing communications) thereby helping consumers make informed decisions on their purchase.
- Product-wise, vermicompost offers better quality than general compost. This second value addition will need to be tied to a strategic pricing move that is comparable to present prices of general compost thereby not making our product of too ‘premium’ a nature for our target market to afford.

Chemical fertilizers

- Rather than direct, chemical fertilizers pose an indirect competition to vermicompost and with a small user-base. Hence, one need not really bother about expending marketing effort in acquiring this market share.
Product/Price Analysis

Comparative pricing of products

<table>
<thead>
<tr>
<th>Fertilizer type</th>
<th>Min (per kg)</th>
<th>Max (per kg)</th>
<th>Average (per kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compost³</td>
<td>10.00</td>
<td>25.00</td>
<td>18.00</td>
</tr>
<tr>
<td>Chemical</td>
<td>15.00</td>
<td>40.00</td>
<td>26.00</td>
</tr>
<tr>
<td>Compost⁴</td>
<td>12.00</td>
<td>30.00</td>
<td>19.00</td>
</tr>
</tbody>
</table>

Compost types used in households and prices paid

<table>
<thead>
<tr>
<th>Compost type</th>
<th>Users (%)</th>
<th>Paying Users (%)</th>
<th>Average price/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compost from household waste</td>
<td>12</td>
<td>0</td>
<td>*</td>
</tr>
<tr>
<td>Compost from household waste + cattle manure</td>
<td>1</td>
<td>0</td>
<td>*</td>
</tr>
<tr>
<td>Municipal compost</td>
<td>3</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Compost from household waste + chicken manure</td>
<td>1</td>
<td>0</td>
<td>*</td>
</tr>
<tr>
<td>Compost from chicken manure</td>
<td>1</td>
<td>0</td>
<td>*</td>
</tr>
<tr>
<td>Compost from nursery</td>
<td>6</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>Compost from cattle manure</td>
<td>5</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Total users</strong></td>
<td><strong>29</strong></td>
<td><strong>10</strong></td>
<td><strong>Sample size: 100</strong></td>
</tr>
</tbody>
</table>

---

³ Composting as an option in the Municipal solid waste management of Kathmandu Metropolitan City, Rupesh Udaha, 2004
⁴ Market potential of Vermicompost in Kathmandu, Akash Shrestha, 2005
Key Conclusions

The above matrix presents market opportunities for vermicompost based on the available combination of price and product benefits for fertilizers available in the market. The following combinations can be derived:

a) **High price-High benefit segment**: This is by and large dominated by the chemical fertilizer category

b) **Low price-High benefit segment**: This is by and large dominated by the organic fertilizer segment sold through nurseries and agro-vets

Given the above scenarios, what we find is that the Low price-High benefit segment poses the best alternative for vermicompost as a market opportunity. Such a strategy makes our product price competitive to that of the organic substitutes and offers higher (if not equal) benefits to the consumer in terms of quality (as a distinct unique selling proposition for our product).
Distribution Analysis

This segment of the analysis section identifies the different distribution outlets available in Kathmandu valley, which are presently accessed by consumers for their buying needs. Each distribution outlet is in turn analyzed in terms of its relative strengths and weaknesses for the client to make an informed decision on choosing the most convenient and cost-effective outlet for vermi-compost.

<table>
<thead>
<tr>
<th>Outlet type</th>
<th>Size estimation</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurseries</td>
<td>200 (as per FPAN report)</td>
<td>Established channel for fertilizer sales</td>
<td>Presence of substitute products</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First choice of consumers to purchase fertilizers</td>
<td>Preference can be given by the nursery owner towards selling own product rather than our brand</td>
</tr>
<tr>
<td></td>
<td></td>
<td>One-stop shop for all gardening needs of consumers</td>
<td></td>
</tr>
<tr>
<td>Agro-vets</td>
<td>Numbers to be estimated</td>
<td>Established channel for fertilizer sales</td>
<td>Presence of substitute products</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Second choice of consumers to purchase fertilizers</td>
<td></td>
</tr>
<tr>
<td>Departmental stores</td>
<td>9 (large)</td>
<td>Large consumer flow given variety of consumer products stocked</td>
<td>Not a conscious buying point of consumers for fertilizers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Virgin outlet for fertilizers (hence could have availability appeal for consumers)</td>
<td>Store owners have strict policies (margins, credit, etc.) and limited space for stocking commodities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Third choice of consumers to purchase vermicompost</td>
<td></td>
</tr>
<tr>
<td>Grocery stores</td>
<td>50,000 – 70,000</td>
<td>Large consumer flow given variety of consumer products stocked</td>
<td>Not a conscious buying point of consumers for fertilizers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Virgin outlet for fertilizers (hence could have availability appeal for consumers)</td>
<td>Store owners have strict policies (margins, credit, etc.) and limited space for stocking commodities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Third choice of consumers to purchase vermicompost</td>
<td></td>
</tr>
</tbody>
</table>
Key Conclusions

Nurseries and agro-vet outlets will be the primary distribution outlets targeted for vermicompost during the product launch phase. The following benefits are identified through such a strategy:

- Both are established channels for fertilizer sales and are, in essence, ready outlets for our product,
- Both have a good knowledge base about vermicompost, which will help additionally in providing correct information to consumers on our product,
- A certain degree of flexibility can be expected with respect to credit, shelf space and in-store advertising given our informal networking with nurseries and agro-vet outlets

Using department stores as an alternate distribution outlet can be postponed to a later stage when our product has matured a bit. For a new product, a department store’s major hindrances would include:

- Relatively lesser degree of eagerness to stock the product
- Lack of adequate space for product stocking and in-store advertising (stores are already crowded by a host of consumer goods)
- Monetary commitments with regard to standard margin and credit practices of the store

Promotion Analysis

The fertilizer market is characterized by minimal investment in marketing communications. Brand presence is virtually non-existent for organic fertilizers; they are identified through the nursery/agro-vet outlet from which they are purchased. Advertising therefore is limited to word-of-mouth by the nursery/agro-vet outlet owner.

It can therefore be concluded from the above that the fertilizer market (organic) is characterized by the presence of generic (non-branded) products that follow generic communications through direct interactions with the nurseries/agro-vet outlet owners.

With respect to vermicompost, specifically, primary research shows that 50% of the respondents visiting nurseries (N=50) had heard of vermicompost. However, of this group, only 4% (1 respondent) had used vermicompost. Of the 96% non-users, majority of them (31%) felt that additional information on the product would affect their purchase decision for vermicompost.

Of the 50% respondents who had not heard of vermicompost, 60% responded (after receiving an informal briefing on the product by the interviewer) that they were interested to try the product. Of these respondents, 36% felt that additional information on the product would be a key factor in influencing their final purchasing decision.
Key Conclusions

Given the fact that vermicompost is predominantly a new product for our consumers, a sizable investment needs to be made in the ‘awareness’ stage of the marketing communications cycle.

The primary focus of all communications to this effect will need to center on:

- Product features
- Product benefits
- Product use
- Product availability channels
STRATEGIC IMPLEMENTATION PLAN

This section of the marketing plan is attributed to the development of a marketing strategy to launch a packaged form of vermicompost in the fertilizer market in Nepal. Key inputs for strategy development are derived from the Situational Analysis section above, in general, and the Key Conclusions sub-section, in particular.

The broad objective of this section is to develop a synergetic marketing mix viz. product, price, place (distribution), and promotion, so as to yield maximum marketing returns in a cost-effective manner.

Marketing Objectives

The strategic implementation plan has been developed for the marketing period 2005 – 2006. The primary objective of the strategic implementation plan is:

- To launch a packaged form of vermicompost with an initial focus in the Kathmandu valley market, which encompasses the following outputs:
  - Meeting a sales target of 72,000 kgs of vermicompost by the end of the marketing period;
  - Establishing a brand identity for the product with appropriate product benefit associations for the consumer;
  - Strategic pricing of the product covering the initial launch period and beyond;
  - Establishing synergetic distribution channels for the product with a focus on availability and accessibility for the consumer;
  - Developing and implementing an effective marketing communications mix incorporating both mass media and in-store advertising.
Marketing Strategy

This section outlines the specific activities that will be undertaken in order to achieve the marketing objectives as outlined in the earlier section.

Sales Targets

The annual sales target is estimated to be 72,000 kgs by the end of the marketing period.

Product

Product Feature Description

Vermicompost is a mixture of worm castings (the material deposited after it is moved through the digestive tract of an earthworm), decomposed bedding and organic waste. Worms of all ages, cocoons and associated organisms may also be found in vermicompost.

Vermicompost is the end product of a composting process (using earthworms as primary composting agents). Composting is a bio-chemical process in which organic material decomposes to a humus-like material. It involves a rapid and partial decomposition of moist, solid, organic waste by aerobic organisms. Specific to vermicomposting, the word vermicompost is derived from the Latin word, ‘vermin’ meaning worm; hence vermicomposting means a composting process by using earthworms.

Vermicompost is available in variants of 1 kg, 5 kg and 50 kg packs.

Product Benefit Description

Functional Benefits

Vermicompost is 100% organic, safe, non-toxic and odour-free. It helps plants to grow stronger and faster, and increases the size of flowers and fruits. Vermicompost does not burn or damage plants and lasts longer than any commercial fertilizer.

Vermicompost provides houseplants with ‘worm tea’, a natural liquid fertilizer and ‘nutritious castings’, an excellent soil conditioner for gardens and indoor plants.
Non-functional benefits

Vermicompost provides convenience to the consumer. It saves one’s time and effort in making his/her compost. It is also an assurance of quality for the consumer where our brand takes upon the responsibility of ensuring the healthy development of his/her plants.

Branding

Brand Name

The following is a list of brand names applicable to our product, vermicompost:

1. Sarvottam
2. HealthyGro
3. Vermi
4. Nature’s Best
5. Nature’s Blend
6. Nature’s Own
7. Simply Natural
8. Vermi Vita
9. Planters’
10. Gardeners’ Pride

Of the above, ‘Healthy Gro’ has been recommended to be used as the brand for our product following an informal pretest conducted on the above. The brand name combines the qualities of a healthy plant development (as in healthy grow) and its relationship to agriculture ((A)gro).

Product Positioning

A high quality, convenience, and low cost vermicompost which is the product of choice for gardeners who want to enhance the fertility of their soil for healthy and quicker growth of their plants

Brand Positioning

The smart choice for gardeners who are concerned about the overall productivity of their soil and healthy development of their plants
Price

Price Structure

This table summarizes the entire trade channel margins and structure to provide some insights on the profits/incentives provided to the distributors and retailers.

<table>
<thead>
<tr>
<th>Product</th>
<th>Prod. cost</th>
<th>Prod. Margin</th>
<th>Dist. price</th>
<th>Dist. Markup</th>
<th>Retail price</th>
<th>Retail Markup</th>
<th>Consumer price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vermicompost (1 kg pack)</td>
<td>7.5</td>
<td>60%</td>
<td>9.00</td>
<td>25%</td>
<td>11.00</td>
<td>33%</td>
<td>15.00</td>
</tr>
<tr>
<td>Vermicompost (5 kg pack)</td>
<td>40.00</td>
<td>25%</td>
<td>50.00</td>
<td>33%</td>
<td>68.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vermicompost (30 kg pack)</td>
<td>228.00</td>
<td>25%</td>
<td>285.00</td>
<td>33%</td>
<td>380.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Price Rationale

<table>
<thead>
<tr>
<th>Product</th>
<th>Consumer Price (per kg)</th>
<th>Rationale for consumer price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vermicompost (1 kg pack)</td>
<td>15.00</td>
<td>• To make our product affordable and in line with available general compost substitutes;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pricing was based on research.</td>
</tr>
<tr>
<td>Vermicompost (5 kg pack)</td>
<td>13.50</td>
<td>• To achieve economy of scale for the consumer with a saving of Rs. 1.5 per kg.</td>
</tr>
<tr>
<td>Vermicompost (30 kg pack)</td>
<td>12.50</td>
<td>• To cater to large quantity buyers;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• To achieve economy of scale for bulk buying consumers with a saving of Rs. 2.5 per kg.</td>
</tr>
</tbody>
</table>

Place

Distribution Structure

Considering the fact that our product is a new product for our target market, and our initial production capacity is 200 kg per day, it is recommended that our product be launched with a manageable, focused and controlled distribution function. This implies using a two-tier (distributor – retailer) distribution structure as outlined in the diagram below:
The marketing division will function as a distributor for our product. This marketing division will buy in bulk from the producer and sell in smaller quantities to the retail outlet network of nurseries and agro-vets. The basic logistic requirements of the marketing division include:

- **Warehousing facilities**: Maintenance of stock quantities for filling trade pipelines adequately and smoothly;
- **Transportation facilities**: Pick-up truck for loading/off-loading products from producers and to outlets;
- **Manpower**: Marketing Supervisor (1 No. for overseeing the entire marketing and sales function), Sales executives (4 Nos. for visiting and selling/reselling into outlets), Booth operators (2 Nos., temporary for one-month launch activity, responsible for managing booth in department store premises during the launch period).

Nurseries and agro-vet outlets will be the two primary outlets to be targeted at the retailer level. The target number of retail outlets for the marketing period (one year) will be 200: 150 nurseries and 50 agro-vet outlets.

Departmental stores will not be initially targeted for retail level sales. This is on account of the fact that in our primary research finding, (a) they were not willing to stock the products since it is a product different from the present product lines offered by the store, (b) there is no space available for stocking additional products from new producers. However, the stores have agreed to let out the outside premises for direct marketing activities during the launch/promotional period.

**Rationale**

The primary benefit of the two-tier controlled approach is the fact that it enables us to closely monitor brand performance. This launch phase will therefore, in essence, be a test
market for our brand, the results of which will help us plan future production capacities, pricing, and outlet expansion possibilities.

An additional benefit of this approach is that it will help us fill trade pipelines adequately with provisions for product re-supply if the product were to be well accepted by our consumers. The initial production capacity of 200 kg per day would therefore create this trade ‘comfort zone’ so that retailers do not face out-of-stock situations; spreading the retail base could give rise to this out-of-stock possibility. Of course, if consumer off-take is slow at the retail level, we always have the option of expanding the number of outlets so as to help us achieve our sales targets.

Promotion

Promotion Objective

The promotion objective for our product follows a two-pronged approach:

1. To create top-of-mind awareness of the brand among the target audience while simultaneously building the brand’s image;
2. To encourage product trial among the target audience while simultaneously encouraging product stocking among retailers.

In order to achieve the above objectives, separate strategies will be made use of: (a) Marketing Communications, and (b) Sales promotion.

Marketing Communications Strategy

The communications strategy makes use of two primary media for message dissemination purposes: (a) In-store advertising, and (b) Publicity. This media mix has been selected in order to make our marketing communication activities resonant (where our message appeals to our target audience), relevant (where our message content is correct, adequate and as per our target audience’s information needs), and cost effective.

In-store Advertising

Research data reveals that 75% of all purchase decisions happen in-store. It is therefore logical that a good portion of our advertising budget be allocated towards this avenue.

Vermicompost enjoys an average level of awareness amongst our target audience (while 50% of respondents were aware of vermicompost, 36% of them considered additional product information as an important condition for their purchase decision). An important component of in-store advertising would therefore include product leaflets (cum pocket calendar so as to provide a value addition) that clearly spell out:

5 Market potential of Vermicompost in Kathmandu, Akash Shrestha, 2005
A second in-store advertising component will include a point-of-purchase (POP) display. The display will be made of acrylic with an approximate size of 38 cm X 23 cm, which would have two slots: (a) a larger slot for inserting our brand poster (A4 size), (b) a smaller slot big enough to accommodate our product leaflets. This display can be designed to hang on an outlet wall or be placed on the outlet desk.

A sample design is provided below:

Publicity

Publicity will make use of mass media vehicles whereby we achieve maximum reach for our brand/product message. These will take the form of:

a) Advertorials in print, radio and television
   - An advertorial is, in essence, a brand advertisement designed in an editorial (write-up) form.
   - For print, brand/product write-ups will be published in Kantipur, Annapurna Post and Nepal Samacharpatra.
For radio, an interview (talk show focusing on brand/product features, use and benefits) will be arranged for our company representative in Image FM, ECR FM, and Star FM.

For television, a similar format as that of radio will be arranged for our company representative in Image Channel.

b) Brand Watch

Brand Watch is a section in the business page of The Himalayan Times (Annapurna Post) and Kantipur (Nepali version), which features a brand that has been launched during the week. This platform will be used during the launch of our brand.

Sales Promotion Strategy

Trade Promotion

Trade promotion utilizes the push strategy of the promotional mix to induce intermediaries (trade channels) to carry, promote and sell the product.

The objective of trade promotion is:

1. **Rapid penetration:** In the first phase of the launch period (two months), the objective would be to ensure that a large number of retailers stock and sell our product in the shortest time period.

**Trade Promotion Strategy**

<table>
<thead>
<tr>
<th>Trade Level</th>
<th>Purpose</th>
<th>Activity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distributor</td>
<td>To encourage product stocking</td>
<td>Introductory price-offs</td>
<td>This would be a % discount of list price which will be transferred by the distributor to the retailer.</td>
</tr>
<tr>
<td>Retail</td>
<td>To encourage product stocking</td>
<td>Introductory price-offs</td>
<td>This would be a % discount of list price which will be transferred by the distributor to the consumer.</td>
</tr>
<tr>
<td></td>
<td>To encourage displays</td>
<td>POP displays</td>
<td>Included in Section 2.2.5.2.1 (In-store advertising) above</td>
</tr>
</tbody>
</table>

**Price Strategy for Trade Promotions**
<table>
<thead>
<tr>
<th>Product</th>
<th>Quantity</th>
<th>Dist. price</th>
<th>Dist. Markup</th>
<th>Retail price</th>
<th>Retail Markup</th>
<th>Consumer price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vermicompost</td>
<td>1 kg pack</td>
<td>8.00</td>
<td>25%</td>
<td>10.00</td>
<td>33%</td>
<td>13.00</td>
</tr>
<tr>
<td>Vermicompost</td>
<td>5 kg pack</td>
<td>33.00</td>
<td>25%</td>
<td>41.00</td>
<td>33%</td>
<td>55.00</td>
</tr>
<tr>
<td>Vermicompost</td>
<td>30 kg pack</td>
<td>190.00</td>
<td>25%</td>
<td>237.00</td>
<td>33%</td>
<td>315.00</td>
</tr>
</tbody>
</table>

**Consumer Promotion**

Consumer promotion utilizes the *pull strategy* of the promotional mix to induce consumers to try and purchase the product.

The primary objective of consumer promotion during our launch phase is to encourage product trial among consumers.

**Consumer Promotion Strategy**

<table>
<thead>
<tr>
<th>Level</th>
<th>Purpose</th>
<th>Activity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer</td>
<td>To encourage product trial</td>
<td>Introductory price-offs</td>
<td>This would be a % discount of list price which will be transferred by the retailer to the consumer.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Booth activity</td>
<td>A branded kiosk (stall) will be placed in 5 departmental stores and managed by two booth attendants. The booth activity would be conducted during weekends, each weekend covering one store. Major booth activities include leaflet distribution, information dissemination, promotion and sales (price-offs).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leaflets/pocket calendar</td>
<td>These serve as excellent promotional items (and of utility value) tied to an effective information dissemination medium. These will be distributed through outlets and kiosks.</td>
</tr>
</tbody>
</table>
# PROMOTION BUDGET

<table>
<thead>
<tr>
<th>SN</th>
<th>Particulars</th>
<th>Units</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>In-store Advertising</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>POP display</td>
<td>250</td>
<td>400.00</td>
<td>100,000.00</td>
</tr>
<tr>
<td>1.2</td>
<td>Poster</td>
<td>250</td>
<td>10.00</td>
<td>2,500.00</td>
</tr>
<tr>
<td>2</td>
<td><strong>Publicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Write-up (Kantipur)</td>
<td>1</td>
<td>15,000.00</td>
<td>15,000.00</td>
</tr>
<tr>
<td>2.2</td>
<td>Write-up (Annapurna Post)</td>
<td>1</td>
<td>10,000.00</td>
<td>10,000.00</td>
</tr>
<tr>
<td>2.3</td>
<td>Write-up (Samacharpatra)</td>
<td>1</td>
<td>10,000.00</td>
<td>10,000.00</td>
</tr>
<tr>
<td>2.4</td>
<td>Talk show (Image FM, ECR FM, Star FM)</td>
<td>3</td>
<td>5,000.00</td>
<td>15,000.00</td>
</tr>
<tr>
<td>2.5</td>
<td>Brand Watch</td>
<td>2</td>
<td>-</td>
<td>Free of cost</td>
</tr>
<tr>
<td>3</td>
<td><strong>Consumer Promotion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Leaflet cum pocket calendar</td>
<td>10,000</td>
<td>5</td>
<td>50,000.00</td>
</tr>
<tr>
<td>3.2</td>
<td>Kiosk banner</td>
<td>1</td>
<td>2,000.00</td>
<td>2,000.00</td>
</tr>
<tr>
<td>3.3</td>
<td>T-shirt/caps</td>
<td>10</td>
<td>400.00</td>
<td>4,000.00</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>203,500.00</td>
</tr>
</tbody>
</table>
ANNEXES
## Annex 1: Name list of nurseries (Primary Research)

<table>
<thead>
<tr>
<th>SN</th>
<th>Name of the org.</th>
<th>Con. Person</th>
<th>Add.</th>
<th>Ph#</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kumari Nursery</td>
<td>Indra Maharjan</td>
<td>Paknajol</td>
<td>4269241</td>
</tr>
<tr>
<td>2</td>
<td>Chamunda Garden Services</td>
<td>Gopal P. Timilsena</td>
<td>Boudha</td>
<td>4460430</td>
</tr>
<tr>
<td>3</td>
<td>Khadka Nursery</td>
<td>Radhika Khadka</td>
<td>Maharajgunj</td>
<td>4373354</td>
</tr>
<tr>
<td>4</td>
<td>Basant Nursery</td>
<td>Keshav Khadka</td>
<td>Ratopul</td>
<td>4495343</td>
</tr>
<tr>
<td>5</td>
<td>Purnachand Garden Nursery</td>
<td>Binod Lama</td>
<td>Pulchowk</td>
<td>5544138</td>
</tr>
<tr>
<td>6</td>
<td>Sudeema Nursery</td>
<td>Dhirendra Sitling</td>
<td>Sainbu</td>
<td>5591267</td>
</tr>
<tr>
<td>7</td>
<td>Manakamana Seed Concern</td>
<td>Kavi Krishna Amatya</td>
<td>Kalimati</td>
<td>4273967</td>
</tr>
<tr>
<td>8</td>
<td>Rabindra Sharma Nursery</td>
<td>Khanal Sir</td>
<td>Sainbu</td>
<td>5591293</td>
</tr>
<tr>
<td>9</td>
<td>Buddha Nursery</td>
<td>Seeta Sapkota</td>
<td>Patan Dhoka</td>
<td>5533006</td>
</tr>
<tr>
<td>10</td>
<td>Samjhana Nursery</td>
<td>Tirtha Maharjan</td>
<td>Sanepa</td>
<td>5550154</td>
</tr>
<tr>
<td>11</td>
<td>Hem Mukteshwor Nursery</td>
<td>Raj Kumar Kunwar</td>
<td>Teku</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Green Nursery</td>
<td>Asha Kaji Dangol</td>
<td>Sanepa</td>
<td>5537453</td>
</tr>
<tr>
<td>13</td>
<td>Royal Nursery</td>
<td>Dipendra Maharjan</td>
<td>Chhauni</td>
<td>4276117</td>
</tr>
<tr>
<td>14</td>
<td>Sajha Fertilizer Depot</td>
<td></td>
<td>Bhadrakali</td>
<td>5554883</td>
</tr>
<tr>
<td>15</td>
<td>Bhadrakali Trade Concern</td>
<td>Ramchandra Wagle</td>
<td>Bhadrakali</td>
<td>4246565</td>
</tr>
<tr>
<td>16</td>
<td>GM Agro Services</td>
<td>RP Shrestha</td>
<td>Tripureshwor</td>
<td>4260660</td>
</tr>
<tr>
<td>17</td>
<td>Khanal Agro Services</td>
<td></td>
<td>Mahankal</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Swoyambhu Garden Services</td>
<td>Ramji P Timilsina</td>
<td>Swoyambhu</td>
<td>9851055804</td>
</tr>
<tr>
<td>19</td>
<td>Silwal Gardening Service</td>
<td>Krishna Bhandari</td>
<td>Godavari</td>
<td>5560677</td>
</tr>
<tr>
<td>20</td>
<td>Evergreen Nursery</td>
<td>Hari Ram Shrestha</td>
<td>Godavari</td>
<td>5560679</td>
</tr>
<tr>
<td>21</td>
<td>Chameli Nursery</td>
<td>Laxmi Pradhan</td>
<td>Pulchowk</td>
<td>5548385</td>
</tr>
<tr>
<td>22</td>
<td>Godavari Central Nursery</td>
<td>Deepak Chalise</td>
<td>Jawalakhel</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Jay Kishan Nursery</td>
<td>Dilip Ved</td>
<td>Battisputali</td>
<td>4490478</td>
</tr>
</tbody>
</table>
Annex 2: Name list of customers (Primary Research)

<table>
<thead>
<tr>
<th>SN</th>
<th>Name</th>
<th>Address</th>
<th>Phone</th>
<th>Occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Arjun KC</td>
<td>Kathmandu</td>
<td>4424341</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Rajina Maharjan</td>
<td>Pulchowk</td>
<td>5545859</td>
<td>Service</td>
</tr>
<tr>
<td>3</td>
<td>Shova Maharjan</td>
<td>Kathmandu</td>
<td></td>
<td>Service</td>
</tr>
<tr>
<td>4</td>
<td>Sita Thapa</td>
<td>Godavari</td>
<td></td>
<td>Housewife</td>
</tr>
<tr>
<td>5</td>
<td>Mukesh Shrestha</td>
<td>Godavari</td>
<td></td>
<td>Student</td>
</tr>
<tr>
<td>6</td>
<td>Mallika Sharma</td>
<td>Kumaripati</td>
<td>5546231</td>
<td>Housewife</td>
</tr>
<tr>
<td>7</td>
<td>Mamta Rai</td>
<td>Pulchowk</td>
<td></td>
<td>Service</td>
</tr>
<tr>
<td>8</td>
<td>Anil Rai</td>
<td>Pulchowk</td>
<td></td>
<td>Student</td>
</tr>
<tr>
<td>9</td>
<td>Medina Shrestha</td>
<td>Godavari</td>
<td>5560848</td>
<td>Student</td>
</tr>
<tr>
<td>10</td>
<td>Archana KC</td>
<td>Lazimpat</td>
<td>4411495</td>
<td>Service</td>
</tr>
<tr>
<td>11</td>
<td>Yograj Rajbhandari</td>
<td>Kathmandu</td>
<td>4700214</td>
<td>Service</td>
</tr>
<tr>
<td>12</td>
<td>Ravi</td>
<td>Kathmandu</td>
<td></td>
<td>Mali</td>
</tr>
<tr>
<td>13</td>
<td>Prashant Raj Tuladhar</td>
<td>Chhauni</td>
<td>4270170</td>
<td>Govt. Officer</td>
</tr>
<tr>
<td>14</td>
<td>Suresh Nepal</td>
<td>Sindhupalchowk</td>
<td>011-663320</td>
<td>Agriculture</td>
</tr>
<tr>
<td>15</td>
<td>Shankar Narayan Maharjan</td>
<td>Chhauni</td>
<td>4276184</td>
<td>Business</td>
</tr>
<tr>
<td>16</td>
<td>Pancha Narayan Maharjan</td>
<td>Chhauni</td>
<td>4301443</td>
<td>Driving</td>
</tr>
<tr>
<td>17</td>
<td>Niranjan Adhikari</td>
<td>Mahankal</td>
<td>4205128</td>
<td>Student</td>
</tr>
<tr>
<td>18</td>
<td>Surevi Acharya</td>
<td>Bhaisipati</td>
<td>5590087</td>
<td>Student</td>
</tr>
<tr>
<td>19</td>
<td>Shefali Aryal</td>
<td>Bhaisipati</td>
<td></td>
<td>Student/Business</td>
</tr>
<tr>
<td>20</td>
<td>Hari Shrestha</td>
<td>Baneshwor</td>
<td></td>
<td>Mali</td>
</tr>
<tr>
<td>21</td>
<td>Bir Lama</td>
<td>Sanepa</td>
<td></td>
<td>Mali</td>
</tr>
<tr>
<td>22</td>
<td>Ram Maharjan</td>
<td>Ason</td>
<td></td>
<td>Farmer</td>
</tr>
<tr>
<td>23</td>
<td>Navin Khanna</td>
<td>India</td>
<td></td>
<td>Business</td>
</tr>
<tr>
<td>24</td>
<td>Rashmi Khadka</td>
<td>Sanepa</td>
<td></td>
<td>Housewife</td>
</tr>
<tr>
<td>25</td>
<td>Heera Kaji Maharjan</td>
<td>Basantpur</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Basu Dev Adhikari</td>
<td>Baneshwor</td>
<td></td>
<td>Mali</td>
</tr>
<tr>
<td>27</td>
<td>Hari Bhatta</td>
<td>Sifal</td>
<td>9851021376</td>
<td>Business</td>
</tr>
<tr>
<td>28</td>
<td>Radhe Sundar</td>
<td>Gabahal</td>
<td>5527733</td>
<td>Service</td>
</tr>
<tr>
<td>29</td>
<td>Krishna Shrestha</td>
<td>Patan Dhoka</td>
<td></td>
<td>Farmer</td>
</tr>
<tr>
<td>30</td>
<td>Kanchhi Maya</td>
<td>Kuleshwar</td>
<td></td>
<td>Housewife</td>
</tr>
<tr>
<td>31</td>
<td>Ram Prasad Pokhrel</td>
<td>Chakrapath</td>
<td>4373553</td>
<td>Mali</td>
</tr>
<tr>
<td>32</td>
<td>Indra Thapa</td>
<td>Maharajgunj</td>
<td>4720222</td>
<td>Ex-army</td>
</tr>
<tr>
<td>33</td>
<td>Laxmi Narayan Prajapati</td>
<td>Gongabu</td>
<td>4362300</td>
<td>Service</td>
</tr>
<tr>
<td>34</td>
<td>Gyanu Lama</td>
<td>Chabahil</td>
<td>4480505</td>
<td>Teaching</td>
</tr>
<tr>
<td>35</td>
<td>Kalpana Lama</td>
<td>Bouddha</td>
<td></td>
<td>Housewife</td>
</tr>
<tr>
<td>36</td>
<td>Samita</td>
<td>Bouddha</td>
<td></td>
<td>Student</td>
</tr>
<tr>
<td>37</td>
<td>Deepak Nepal</td>
<td>Bouddha</td>
<td></td>
<td>Student</td>
</tr>
<tr>
<td>38</td>
<td>Krishna Prasad Parajuli</td>
<td>Ratopul</td>
<td></td>
<td>Mali</td>
</tr>
<tr>
<td>39</td>
<td>Nima Lama</td>
<td>Balaju</td>
<td>2170240</td>
<td>Business</td>
</tr>
<tr>
<td>40</td>
<td>Jeet Bahadur Khadka</td>
<td>Jorpati</td>
<td></td>
<td>Gardening</td>
</tr>
<tr>
<td>41</td>
<td>Ramesh Chaudhary</td>
<td>Ratopul</td>
<td></td>
<td>Mali</td>
</tr>
<tr>
<td>42</td>
<td>Binda Budathoki</td>
<td>Ratopul</td>
<td></td>
<td>Housewife</td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Address</td>
<td>Phone</td>
<td>Occupation</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------</td>
<td>---------------</td>
<td>-----------</td>
<td>--------------</td>
</tr>
<tr>
<td>43</td>
<td>Ram Pukar Yadav</td>
<td>Bouddha</td>
<td></td>
<td>Business</td>
</tr>
<tr>
<td>44</td>
<td>Sita Ram Timilsina</td>
<td>Dhumbarahi</td>
<td>4375298</td>
<td>Mali</td>
</tr>
<tr>
<td>45</td>
<td>Ram Krishna Maharjan</td>
<td>Hattigauda</td>
<td>4432964</td>
<td>Business</td>
</tr>
<tr>
<td>46</td>
<td>Gelgen Sherpa</td>
<td>Bouddha</td>
<td>4460069</td>
<td>Service</td>
</tr>
<tr>
<td>47</td>
<td>Shri Krishna Lama</td>
<td>Balaju</td>
<td>2170240</td>
<td>Business</td>
</tr>
<tr>
<td>48</td>
<td>Uttar Kumar Tamang</td>
<td>Baneshwor</td>
<td>4476141</td>
<td>Mali</td>
</tr>
<tr>
<td>49</td>
<td>Ram Bahadur Thapa</td>
<td>Ratopul</td>
<td></td>
<td>Mali</td>
</tr>
<tr>
<td>50</td>
<td>Dipak Lama Titung</td>
<td>Sano Gaucharan</td>
<td>4418836</td>
<td>Student</td>
</tr>
</tbody>
</table>
Annex 3: Research Findings – Nurseries/Agro-vets

General Information

Services provided by the Nurseries.

<table>
<thead>
<tr>
<th>Service</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants/seeds</td>
<td>24%</td>
</tr>
<tr>
<td>Gardening tools</td>
<td>24%</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>6%</td>
</tr>
<tr>
<td>Advice</td>
<td>14%</td>
</tr>
<tr>
<td>Landscaping</td>
<td>24%</td>
</tr>
<tr>
<td>Maintenance</td>
<td>14%</td>
</tr>
</tbody>
</table>

The types of customers the Nurseries cater to.

<table>
<thead>
<tr>
<th>Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nepali H/H</td>
<td>34%</td>
</tr>
<tr>
<td>Expats</td>
<td>21%</td>
</tr>
<tr>
<td>Institutions</td>
<td>21%</td>
</tr>
<tr>
<td>Others</td>
<td>24%</td>
</tr>
</tbody>
</table>

Customer Gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>51%</td>
</tr>
<tr>
<td>Female</td>
<td>49%</td>
</tr>
</tbody>
</table>

Average Customer/Day

<table>
<thead>
<tr>
<th>Customer/Day</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 10</td>
<td>22%</td>
</tr>
<tr>
<td>11 -- 20</td>
<td>39%</td>
</tr>
<tr>
<td>More than 20</td>
<td>39%</td>
</tr>
</tbody>
</table>

Preferred Customer Service

<table>
<thead>
<tr>
<th>Service</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants/seeds</td>
<td>26%</td>
</tr>
<tr>
<td>Gardening tools</td>
<td>16%</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>15%</td>
</tr>
<tr>
<td>Advice</td>
<td>21%</td>
</tr>
<tr>
<td>Landscaping</td>
<td>13%</td>
</tr>
<tr>
<td>Maintenance</td>
<td>9%</td>
</tr>
</tbody>
</table>
Fertilizer Information

Do the Nurseries sell Fertilizers?

- Yes: 91%
- No: 9%

Do the Nurseries Make or Purchase the fertilizer they are selling?

- Make and sell: 35%
- Purchase and sell: 65%

The Price Range for Fertilizer the Nurseries Make and Sell.

- Low: 6
- Average: 20
- High: 25

The Type of Fertilizer the Nursery Purchase and Sell.

- Chemical: 75%
- Organic: 25%

The Chemical Fertilizer Quantities (Kg) sold in a month.

- Low: 300
- Average: 30
- High: 127

The Chemical Fertilizer Price per Kg.

- Low: 15
- Average: 26
- High: 40

Organic Fertilizer Quantities Sold Per Month.

- Low: 25
- Average: 140
- High: 600

Organic Fertilizer Price/ Kg.

- Low: 12
- Average: 19
- High: 30
Vermicompost Information

Vermi-Compost Awareness.

- Yes: 82%
- No: 18%

Product Perception

- Good product: 40%
- Interested to sell: 40%
- Don't know: 20%

Interested Price of Vermi Compost.

- Less than 10: 20%
- Rs. 10 - 15: 40%
- Rs. 16 - 20: 20%
- Rs. 21 - 30: 15%
- Rs. 31 - 40: 5%
- Above 40: 0%

Interested Margin.

- Less than 10: 14%
- 10 - 15%: 36%
- 16 - 20%: 14%
- 21 - 25%: 7%
- Above 25%: 29%

Factors to Consider.

- Additional product info: 15%
- Customer demand: 31%
- Price/margins: 29%
- Others: 25%
Annex 4: Research Findings – Customers

Behavioral Information

The Types of Garden Maintained.

- Flower Pots: 44%
- Small Garden: 36%
- M. Garden: 14%
- Large: 6%

Frequency of visiting the Nursery.

- 1-2 times a week: 44%
- 1-2 times a month: 14%
- Once in two months: 22%
- Once in six months: 8%
- Others: 12%

The main reason for Visiting the Nurseries.

- Purchasing Plants: 34%
- Advice/counselling: 16%
- Purchasing Fertilizer: 14%
- Landscaping: 1%
- Others: 1%

- 1-2 times a week: 48%
- 1-2 times a month: 14%
- Once in two months: 34%
- Others: 48%
Fertilizer Information

Do the Customers Use Fertilizer for their Plants.

- Yes: 92%
- No: 8%

What kind of Fertilizer do they use for their Plants?

- Chemical: 28%
- Organic/Compost: 72%

Why do they use Chemical Fertilizer?

- Easily Available than organic: 32%
- Easier to use: 20%
- Less expensive: 4%
- Ward off Insects: 8%
- Healthier plants: 4%
- Others: 13%

The Frequency of Purchasing Chemical Fertilizer.

- 1-2 times a week: 37%
- 1-2 times a month: 25%
- Once in two months: 6%
- Once in six months: 19%
- Others: 13%

The Purchase Quantity, Kg/Month (Chemical)

- min: 1
- Ave: 1.65
- Max: 3

The Amount Paid for Chemical Fertilizer per Kg.

- min: 20
- Ave: 32.6
- Max: 100
Do they make or purchase the organic fertilizer?

- Make: 67%
- Purchase: 33%

Purchase point of Organic Fertilizer.

- Nurseries: 76%
- Agrovet: 3%
- Others: 21%

The Frequency of Purchasing Organic Fertilizer.

- 1-2 times a week: 14%
- 1-2 times a month: 4%
- Once in two months: 43%
- Once in six months: 39%
- Others: 0%

Quantity of Purchasing Organic Fertilizer.

- Less than 1 Kg: 21%
- 1 to 2 Kg: 3%
- 3 to 5 Kg: 38%
- More than 5 Kg: 38%

Price/Kg of Organic Fertilizer.

- Min: 15
- Ave: 25.88
- Max: 75

The reason for using Organic Fertilizer.

- Easily Avai.: 40%
- Easier to use: 40%
- Less expensive: 0%
- More echo friendly: 20%
- Healthier: 20%
- Others: 13%
- 7%
Vermicompost Information

Awareness of Vermi-Compost.

Initial Reaction about Vermi-Compost.

Prefered Purchasing Point for Vermi-Compost.

Other aspects which they will look for before buying Vermi-Compost.
Pilot Project: Medium Scale Vermicomposting of Vegetable Market Waste in Kathmandu Metropolitan City

Manual for Medium Scale Vermicomposting

Submitted by

Pesticide Monitor Nepal (PEMON)

&

Kathmandu Metropolitan City (KMC)

June 30, 2005
# TABLE OF CONTENTS

1. **INTRODUCTION**
   - Why is Vermi culture becoming popular? ........................................... 1
   - Earthworm species for compost production ........................................ 1

2. **Process of Vermicomposting**
   - Preparation ......................................................................................... 2
   - Aerobic digestion ................................................................................ 3
     - Honey Comb Box .............................................................................. 4
     - Barrel .............................................................................................. 5
     - Chamber House ................................................................................ 5
   - Vermicomposting .................................................................................. 6
     - Selection of Container ...................................................................... 6
     - Bedding Materials ............................................................................ 7
     - Feeding materials ............................................................................ 8
     - Earthworm inoculation .................................................................... 9
     - Maturation ...................................................................................... 10
     - Harvesting the worms and Compost ................................................. 10
     - Screening ...................................................................................... 11

3. **Multiple uses of vermicompost** ......................................................... 12
4. **Multiple uses of earthworm** ............................................................... 12
5. **Some biological information about earthworm** ................................. 13
6. **Some precautions** .............................................................................. 13
7. **Enemies of Worms** ........................................................................... 14
8. **Equipments for Vermicomposting** ...................................................... 16
List of photographs

Plate 1: Organic waste collection 3
Plate 2: Sorting and chopping of vegetable wastes 3
Plate 3: Honey Comb Box 4
Plate 4: Barrel composting 5
Plate 5: Chamber House 6
Plate 6: Cemented vermi tank 7
Plate 7: Bedding Material for worms (Coconut coir) 7
Plate 8: Bedding with activator (Cow dung) in tank 8
Plate 9: Weighing of vermi for inoculation in tank 9
Plate 10: water spraying in vermi tank 9

List of Figures

Figure 1: Dimension of cemented vermi tank 6
Figure 2: Feeding materials for worms 8
Figure 3: Separation of Worms from Vermicompost in Cemented Vermi tank 10
Figure 4: Separation of Worms from Vermicompost 11
1. Introduction:

Our country produces massive amount of organic waste, which has high economic value if it is harnessed properly by means of vermicomposting. Vermicomposting (Latin Vermes=Worm) is a process of composting where certain species of earthworm is used to enhance the process of organic waste conversion and produce nutrient rich humus which is called vermicompost. It is of high quality manure and has manifold advantages over chemical fertilizer. It is popular throughout the world. Many institutions and countries are now promoting vermicomposting for economic and environmental reasons. Cuba has developed 170 vermicomposting centers that use cow manure, sugarcane, pulp and coffee pulp.

Why is Vermiculture becoming popular?

- Vermiculture does not require sophisticated equipments.
- It does not need heavy capital investment.
- It is made from eco-friendly technology using organic wastes and biotechnology process.
- It does not require skilled and technical person.

Earthworm species for compost production

There are about 4000 species of earthworm but only half of dozen species are used world wide for waste management. They are:

1) Eisenia foetida
2) Lampito mauritti
3) Lumbricus rubellus
4) Eudrillus euginea
5) Perionyx excavatus
6) Perionyx favatus

The earthworm Eisenia foetida i.e red worm is the most suitable species for the use of vermicomposting. It has very good efficiency with high reproductive rates. The culturing process of this species is quite easy due to its feeding adjustment to organic matter. They can live on the wide variety of decomposable waste. It can consume organic material equal to their body weight per day. Moreover, it can consume food more than 3 to 4 times to their body weight if the environmental condition is favorable for them.
2. **Process of Vermicomposting**

1. **Preparation**
   - Waste collection
   - Sorting
   - Size reduction
   - Mixing

2. **Aerobic Degradation**
   - Honey comb box, Barrel, Chamber house
   - Aeration
   - Activator (EM, Cow dung, Surface soil, old compost)
   - Moisture control

3. **Vermicomposting**
   - Inoculation of Worms
   - Monitoring
   - Harvesting

4. **Maturation**
   - Hatching of cocoon
   - Separation of worms

5. **Screening**
   - 8mm & 4 mm screens
**Preparation**

For vermicomposting the basic needs are food i.e., organic waste, space or house for earthworm and water for moisture control.

For the preparation of food for earthworm, following steps should be carried out:

1) Collect the organic waste and sorting is must.
2) Cut the large pieces of organic waste to about 1 cubic inch in size.
3) Mix the waste with other materials if necessary. (The vegetable waste is rich in Nitrogen so mix it with waste that is rich in Carbon such as sawdust, rice husk, paper, etc. The mixing percentage of carbonaceous material should be 10 %.)

Plate 1: Organic waste collection

Plate 2: Sorting and chopping of vegetable wastes
2.1 Aerobic digestion:

The earthworm prefers partially degraded organic waste rather than fresh waste. Aerobic degradation in medium scale vermicomposting has higher significance. Too much fresh vegetable wastes can generate maximum temperature that can kill the worms, so it is better to digest aerobically. The aerobic digestion can be done in different composting units such as:

i) Honey comb box  
ii) Barrel  
iii) Chamber house  
iv) Pile, etc

2.1.1 Honey Comb Box

The box made from brick walls with holes in between and bottom has a grill made from iron rod to allow drainage and aeration. A box having volume 1.14 cubic meters can hold about 800 kg of fresh vegetable waste that means its specific weight is 700.28 Kg/m³.

Plate 3: Honey Comb Box
2.1.2 Barrel

A barrel having 200 liter capacity can accommodate about 100 Kg of fresh vegetable waste. It has number of holes around its wall for the circulation of air.

![Barrel composting](image)

Plate 4: Barrel composting

2.1.3 Chamber House

This type of composting unit is also used for aerobic digestion. It has three partitions i.e., top, middle and bottom which are separated by bamboo sticks. It can accommodate about 900-1000 Kg of vegetable waste having volume of 1.31 cubic meter in the top most chamber.

The procedure of aerobic digestion in Chamber house involves;

a) Put the organic waste (maintaining with C:N ratio) in the top of the chamber.

b) After about 10 days, remove the bamboo sticks at the bottom of the first chamber to drop the partially decomposed waste into the second or middle portion of the chamber.

c) Similarly the waste in the middle portion is dropped after 10 days to the bottom portion which remains there for 10 days. This waste is now ready for vermi as a food.
2.2 Vermicomposting:

For vermicomposting following steps should be carried out;

2.2.1 Selection of Container:

Size of cement tank or container depends on the amount of waste and the number of earthworms to be introduced. The container/ tank should not be too deep. The base of the tank should be inclined about 3-5° to maintain the flow of produced vermiwash and minimize water logging. The vermiwash outlet should be constructed at the inclined position of the tank. The volume of the tank having 1.8 cubic meter require about 10,000 worms.

Fig 1: Dimension of cemented of vermi tank
2.2.2 Bedding Materials:

i) Select bedding materials, which is resistant to fast decomposition.
ii) Soak the bedding material by chlorine free water.
iii) Spread the material for about 4 to 6 inch in a tank/container.
iv) Spread half inch of dried cow dung.

(Bedding for worms can be made from coconut husk, sawdust, hay, straw, shredded leaves or compost. Coconut husk is an excellent material for bedding. The bedding materials should be thoroughly moistened before adding the worms. The bedding should be loosely packed in order to create air space for the worms to breathe and to control odors. Varying the bedding materials provides a richer source of nutrients).
2.2.3 Feeding materials:
The food of earthworms include admixture of cow-dung, green foliage, vegetable wastes, discarded parts of fruit, paper or scarp of cardboards. The organic wastes i.e biodegradable waste can be partially composted in different composting unit such as containers, honeycomb box, Barrel, Chamber house etc. Such partially decomposed waste can be good source of nutrient / food for them. They can easily feed on those materials. A size of tank having 3x1x0.6 cubic meter is sufficient to accommodate partially digested waste if 100 kg of waste is added per week for 2 months.
Food to be avoided

Bones, dairy products, meats that may attract pests and garlic, onions and spicy foods should be avoided. Limited amounts of citrus can be added but too much can make compost too acidic and earthworms do not prefer acidic foods.

2.2.4 Earthworm inoculation:

The most suitable types of earthworms used for vermicomposting is tiger worm (*Eisenia fetida*). It can consume organic material equal to their body weight per day.

- Release about 5000-6000 earthworms per sq. m on the top of the partially decomposed waste. These earthworms will start penetrating to the bottom. Once all these earthworms disappear, cover the surface with jute bags and keep them moist by sprinkling water in a judicious way.

Plate 9: Weighing of vermi for inoculation in tank

Plate 10: water spraying in vermi tank.
2.2.5 Maturation:
After 45 to 60 days, harvest the vermicompost manually and store it inside the jute bags for about two weeks to allow cocoon to hatch. The jute bags soak the excess of moisture.

2.2.6 Harvesting the worms and Compost:
It is important to separate the earthworms from their castings; otherwise the worms will begin to die. So harvesting is must. After 2 months, it is ready to harvest. There are mainly two basic ways to separate the worms from the finished product i.e., vermicompost.

Procedure 1:

i) Move the finished compost and worms over to one side of the tank.

ii) Add new bedding material and food waste to the other side of the tank. Worms in the finished compost should move over to the new bedding for searching fresh food.

iii) Then the finished compost can be removed.

Fig 3: Separation of Worms from Vermicompost in Cemented Vermi tank.

Procedure 2 (heap method):

i) Spread a plastic sheet on the ground and empty the contents of the tank in sunlight making a pyramid like heap.

ii) Let this heap remain in daylight for about half to one hour, which will induce the earthworms to penetrate deep and reach the bottom.
iii) The upper layer of organic manure can be lifted slowly.
iv) Later the earthworms at the bottom may be separated from one another and deposited in the refilled tank.

![Fig 4: Separation of Worms from Vermicompost](image)

### 2.2.7 Screening

The vermicompost might need screening if rough stuff (sticks) is used in the bedding that takes time to break down. The compost can be screened manually using inclined screens with mesh size of 8mm and 4mm.

### 3. Multiple uses of vermicompost:

The vermicompost can be used in
a) Agriculture
b) Floriculture
c) Horticulture
d) Silviculture
e) Mushroom culture
f) Bio gas production
g) Fish pond

### 4. Multiple uses of earthworm:

The earthworm can be used as
a) Fish food
5. **Some biological information about earthworm:**

1. Earthworm has one brain and five hearts.
2. They have neither eyes nor ears.
3. They breathe through its moist skin.
4. They have no teeth but it has gizzard for grinding its food.
5. Worms are hermaphrodic animals i.e each worm has both male and female reproductive organ and each produce cocoon. Reproductive rate is very fast.
6. Mature worms have a swollen with a glandular thickening of the skin in the anterior region of the worm called clitellum.
7. Locomotion takes place with the help of setae.
8. Earthworms have the power to regenerate. Regeneration takes place at the posterior end more easily than it does at the anterior end. It it is accidentally cut, it can grow again its lost part of the body.
9. Cocoon or egg case of redworm is round or oval shaped and small. They change color during their development, first white, becoming yellow, later brown. When new worms are ready to emerge, the cocoons are turning red. It takes at least 3 weeks for the worms to develop in the cocoon.
10. Redworms reproduce very rapidly. A healthy, adult redworm can produce an egg capsule every seven to ten days under optimum condition. In one year, a breeder (earthworm) can produce 50 capsules.

6. **Some precautions**

- Compost making worm tolerate a wide range of temperatures. Survival of earthworm is even upto 38 °C. However, the requirement for optimal temperature is 10-25 °C. Greater than 30 °C is however unfavorable for them.
  - Keep the vermiobox / container from direct heat and strong sunlight.
  - Protect from freezing temperatures.
(A straw or dried leaves covering is good method to keep the vermibox/container from drying out during hot summer weather. Moreover, this straw in the winter work as an insulating material to keep the worms from freezing).

- Earthworms need a moist environment. They breathe through their skin. Skin must be moist in order to breathe. They suffocate if the water moisture is very high.
  - Moisture content should be 50-60%
  - Protect from heavy rain
  - If moisture content is high, mix dry cow dung/leaf litter/paper with substrate.

- Worms need Oxygen to survive and produce Carbon dioxide like human.
  - Air circulation is a must in and around a worm container.
  - Do not cover container by plastic material tightly.
    - Jute bag is a good covering material that can pass oxygen and hold moisture content.

- Worms need food to survive i.e bio- degradable wastes. Heavy load of food can kill them and give foul odour as well as generate high temperature.
  
  Add decomposed waste after loosing its heat as possible while doing in medium and large scale Vermicomposting.

- Although they have no ears, but they are very sensitive to vibrations. They do not like disturbance by anybody. Further construction on vermi tank or container should be avoided.
  - Do not disturb/ observed frequently.
  - Observation once a week is sufficient.

The less you disturb worms, the better off they are however, regular observations should be done to know what is going on in the tank or container. The best time to do this is at feeding time.

7. Enemies of Worms:

Rat/moles, Frog, Birds, Flatworms, Red ant, Ferficula, Centipedes,

Protection from Rat

- Use of Trap, Net, Cat and Rodenticides
Protection from Frog/Toad

➢ Pick up manually

Protection from Birds

➢ Cover by Jute bags at vermi tank/container

Protection from Flatworms

➢ Pick up manually, and kill

Protection from Red ant/Ferficula/Centipedes

➢ Use of Neem and Bakaino

Protection from Fly larvae:

➢ Cover with soaked newspaper and jute bags in container.
8. Equipments for Vermicomposting

- Different types of Rake
- Water Sprayers
- Hand cart
- Net
- EM Sprayer
- Waste collecting Rickshaw