STUDENT STUDY PROJECT
ON

"A Study on Establishing Vermicompost Unit for treating organic waste and its cost effectiveness"

Department of Zoology

Dr.BRR Government College, Jadcherla

Dist:Mahabubnagar-509001

(Accredited by NAAC with "B^{++}" Grade
An ISO 9001-2015 Institution
Affiliated to Palamuru University)

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DEPT. OF ZOOLOGY
Dr. B.R.R. GOVT. COLLEGE
JADCHERLA

PRINCIPAL
Dr.B.R.R. Govt. Degree College
Jadcherla

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CERTIFICATE

This is to certify that the project work **of "A Study on Establishing Vermicompost Unit for treating organic waste and its cost effectiveness"** is a bonafide work done **by A.Mahesh, Nagamani, M.Mounika, B.Mounika, K.Anitha** and **A.Srikanth** the students of B.Sc. (BZC)T/M, VI semester students under my supervision in Zoology at the Department of Zoology Dr.BRR Government College Jadcherla during 2022-23 and the work has not been submitted in any other college or University either part or full for the award of any degree.

Place:

Date:

B.Ravinder Rao

Assistant Professor of Zoology

Signature of External examiner

Signature of Internal examiner

DECLARATION

We hereby declare that the project work entitled with **vermicompost of Dr. Burgula Ramakrishna Rao Govt.Degree College,JadcherlaTown of Mahabubnagar District,Telangana,India"** is a genuine work done by us under the supervision **of Sri B.Ravinder Rao**, Assistant .Professor, Department of Zoology,Dr.BRR Govt.degree College,and it has not been under the submission to any other Institute /University either in part or in full, for the award of any degree.

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CONTENTS

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Finally thanks are also due to K.Neeraja, lecturer in Zoology for guiding the team to during period the project.

ABSTRACT

Vermicompost is organic waste converted into manure with the help of worms. Vermicomposting can be done for self use, alternate income or commercial purpose. Farmers' best friend, earthworm has been existent at least since the past 20 million years. Needless to say, they have been faithfully releasing the organic nutrients from the dead tissues back into the soil and thus making it available to the living organisms. They have an important role in organic farming. The present study is an internet based data collection and compiling on Establishing Vermicomposting Units and their cost effectiveness. The study is conducted from September 2022 to May 2023 and found that one kilogram of earth worms (1000 No.s) can convert 25-45 Kgs of wet waste on weekly basis and under favourable conditions one Kg of worms can be reproduced in 20Kgs. Financial analysis indicated, Capital Cost of Vermi-Composting (200 TPA)Total operational cost for one year with 7 cycles of 65-75 days is Rs.11,83,300/-, Vermi-Composting unit (200 TPA),Total Operational cost for one year with 7 cycles of 65-75 days is Rs.1,86,040/- and Cost-Benefit analysis for Vermi-Composting units (200 TPA) indicated First Year, Rs.8,74,340/- and Second Year, Rs.6,47,920/-.The Loan repayment can be done within 6 years from the year of establishment.

Key words: Vermicompost, Earthworms,Organic Fertilizer,Operational Cost, Cost Benefit.

Introduction:

Earthworms feed on the decaying organic matter and survive in soil. During digestion in the alimentary canal, all the organic waste gets transformed into natural fertilizer. The pH is neutral and it is an odorless organic matter. After digestion, the undigested food is excreted. There is a thin oily layer on the excreted material or casting which takes as much as two months to erode. In other words, the castings that are rich in plant nutrients are made available gradually since they are released slowly into the soil. Hence they last longer. These castings also contain microbes and hence the process of decomposition is continued through microbial action outside the body of the earthworms.

Biologically, Vermicomposting is defined as the process of turning organic debris into worm castings that play a crucial role in increasing the fertility of soil. These castings contain seven times more potash, five times more nitrogen and 1.5 times more calcium than what is found in the topsoil. In addition they have better moisture retention capacity, aeration, porosity and structure than the topsoil. The water absorption capacity of the soil is enhanced thanks to the burrowing action of the earthworm, and the organic content in the castings. Research has shown the castings to hold nine times their weight in water.

Vermicomposting is basically a managed process of worms digesting organic matter to transform the material into a beneficial soil amendment. As per the USDA guidelines for compost practices (with effect from Oct 21, 2002), vermicomposts are defined as organic matter of plant and/or animal origin consisting mainly of finely-divided earthworm castings, produced non- thermophilically with biooxidation and stabilization of the organic material, due to interactions between aerobic microorganism and earthworms, as the materialspass through the earthworm gut.

Good quality compost production in ambient temperature can be accomplishedin shorter time by the process of vermicomposting that involves use of proper species of earthworms. The native cellulase activity of earthworms and microorganisms in earthworm gut promote faster decomposition of ingested organic material. The combined effect of enzymatic activity and grinding of organic materials to fineness by earthworms produces the vermicomposting and this is not observed in compost pits without earthworm.

The earthworms being voracious eaters consume the biodegradable matter andgive out a part of the matter as excreta or vermi-castings. The vermi-casting containing nutrients is a rich manure for the plants. Vermicompost, apart from supplying nutrients and growth enhancing hormones to plants, improves the soil structure leading to increase in water and nutrient holding capacities of soil. Fruits, flowers and vegetables and other plant products grown using vermi- compost are reported to have better keeping quality. A growing number of individuals and institutions are taking interest in the production of vermicompost utilising earthworm activity. As the operational cost of production of this compost works out to less than ` 2.0/Kg., it is quite profitable to sell the compost even at` 4.00 to ` 4.50/Kg.

Objectives:

The main objective of vermicomposting project is to produce organic manure of exceptional quality for the organically starved soil. Agricultural wastes, wastes from dairy and animal farms are usually dumped into at places resulting in a foul mess. By vermicomposting these wastes, they are not only utilized efficiently but also help in making a value-added product.

To promote interest in research aptitude among students

To promote the use of good and safety fertilizers

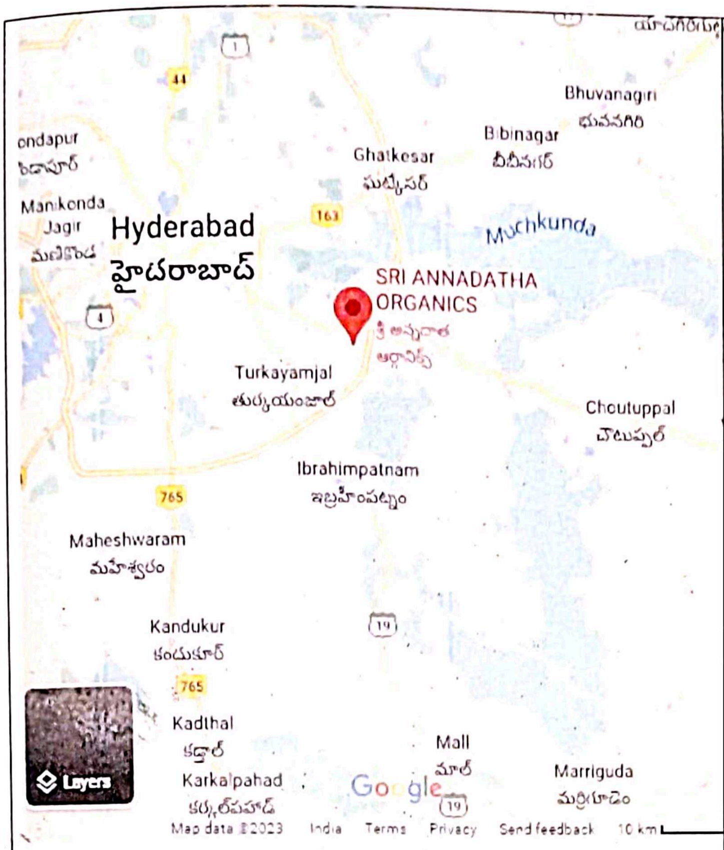
To preserve the natural composition of agricultural lands

To bring awareness on Vermicomposting

Material and Methods:

As a part of Project work, the team members have selected few Vermicomposting Units located in surrounding areas. The Department of zoology at Dr.BRR Government Degree College is also maintaining a small vermicomposting Unit. To understand the procedure of vermicomposting process, this unit at the Department of Zoology, Dr.BRR Government Degree College is regularly visited.

Vermicomposting firms VIZ, 1.Sri Annadatha Organics, located at Sy.No.294, Radhakrishna Temple Road, Sanghi Road, Pedda amberpet, Hyderabad,2.Pudami Organics and Naturals located at Sanghi Road, Pedda amberpet, Hyderabad units were visited on weekend days to collect the necessary information. The members of the team shared the work of collecting the data related to Manure preparation, Types of Earthworms to be used for vermicomposting, Capital Cost of the project,Operational cost of one Year with cycles, Cost and Benefit of the unit, Loan opportunities and Repayment schedule etc. Finalcial analysis and the data are compiled and analysed to draw conclusions.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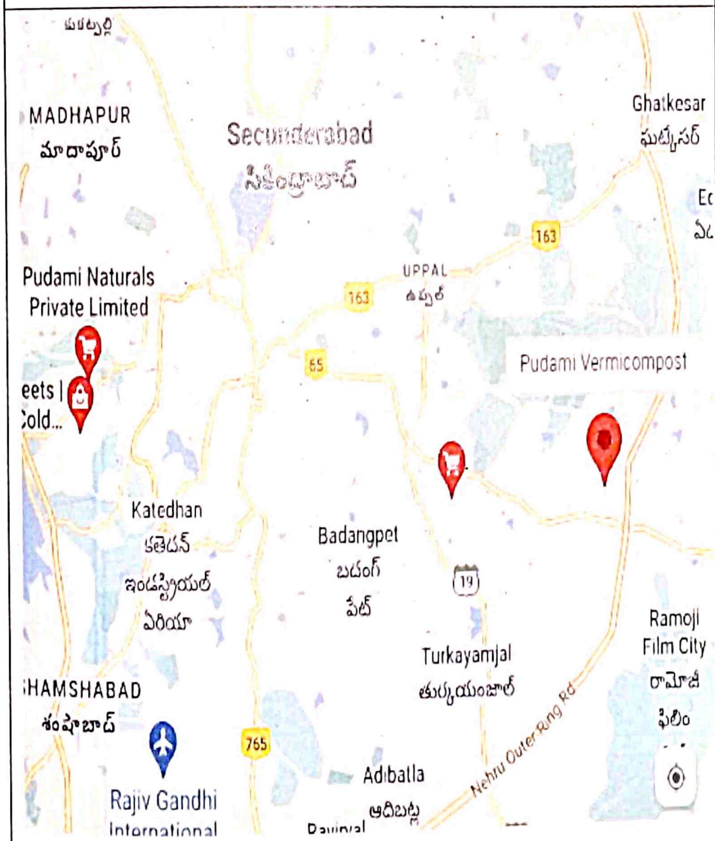
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Adibatla
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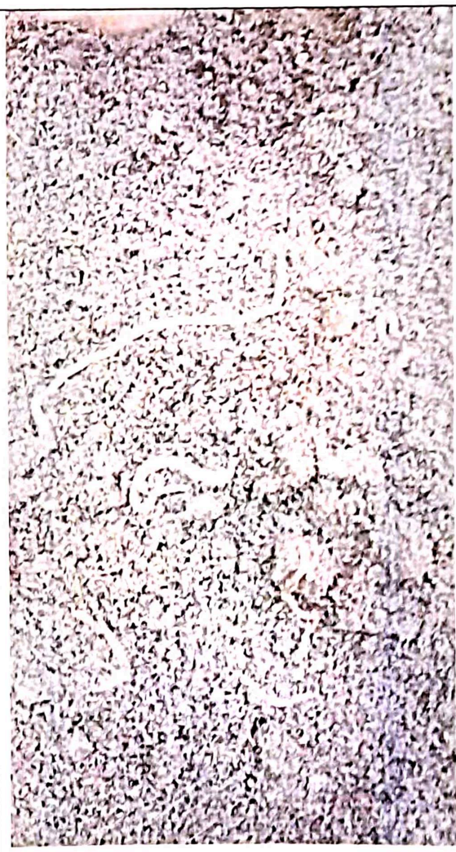
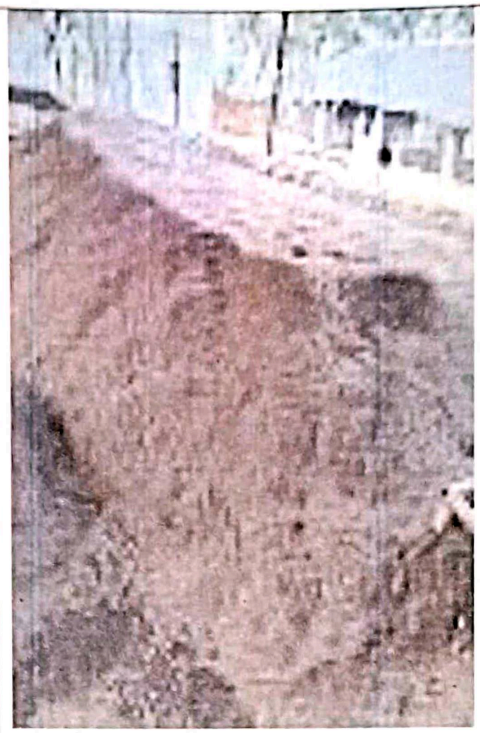


Pudami Vermicomposting Unit

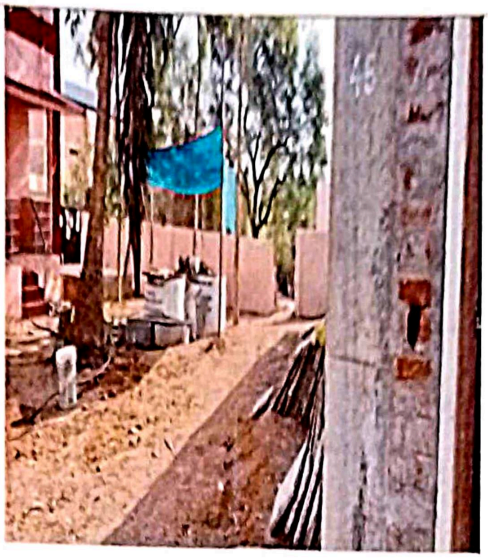


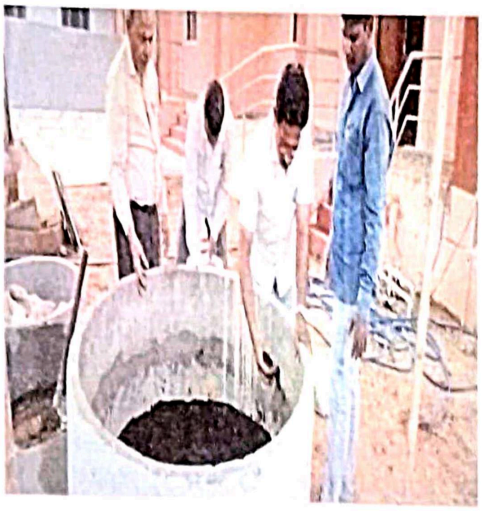
Pudami Vermicomposting Unit

Sri Annadatha Organics Hyderabad

Sri Annadatha Organics Hyderabad

Vermicomposting unit of the Department of Zoology, Dr.BRR Govt.Degree College





Types of Earthworm and Classification:

Study of earthworms was pioneered by Charles Darwin. Taking the cue, Barrett and George Oliver carried out an extensive study and demonstrated the benefits of earthworms in agriculture. Barrett was the first person to grow earthworms on a commercial scale.

Totally there are 386 different varieties of earthworms that have been identified that are broadly classified into 3 categories, viz. epigeic, endogeic and diageic. This classification is based on their feeding habits, habitat in soil strata, response to the soil conditions and defecation activities.

Epigeic:

Thriving on soil surface, they convert the organic waste into humus very quickly.

They have a high metabolic activity but it lasts only for a limited period.

- They need a huge amount of organic content as a part of their feed and thus ideal for commercial vermicompost project.
- Although they have a short life span, their rate of reproduction is very high.
- Some of the commercially grown species belonging to this group are *Eisenia foetida, Eudrilus euginae, Perionyx excavatus, Lumbricus rubellus* and *P.arborjcola.*

Endogeic:

Species belonging to this category live just below the topsoil surface where mineralized aluminum oxide, iron oxide and clay occur.

- They burrow into the soil making tunnels horizontally as well as obliquely thus increasing the aeration.
- They feed on organic matter that are undergoing degradation at different levels.
- They improve the soil texture and structure.

Diageic:

Diageic worms make permanent burrows and are deep dwelling in the soil.

The organic litter is collected from the soil surface and stored in the burrows which are fed upon by the earthworms.

- The excrements are disposed on the outside of the burrows.
- Thus these are worms help in mixing the surface organic matter into the sub-terranian soil.
- They also help loosen the soil.

Vermicompost Production Requirements:

The most essential production requirements in vermicomposting project are the base material and the right species of earthworm.

Base Material:

The base materials needed for vermicomposting must be organic and biodegradable. They include:

- Cow dung from dairy farm
- Goat and sheep dung
- Organic sludge
- Tree leaves
- Crop residues
- Saw dust
- Sugarcane trash
- Weeds
- Cow waste
- Slurry from the biogas plant
- Poultry droppings from poultry farming
- Vegetables wastes

Vermicompost preparation in cemented pits

In the pit method, cemented pits of 5ft * 5ft * 3ft are used for composting. They are covered with local materials like thatched grass, dry leaves, twigs, etc. However, aeration and water logging is a major problem in this method. Therefore, most farmers do not prefer this method of composting.

When tanks are prepared, there must be enough holes to aid excess water drainage. The bedding for the earthworms generally comprise of saw dust, sand, broken pieces of bricks and soil. The worms are first released into the bedding followed by the feed material. The depth of the feed material must not be more than 2 feet deep. For the initial 2 months, the tank must be sprinkled with water from time to time and it should be well-aerated. The weight, size and cocoon producing capacity of the worms increase and is at optimal level when the temperature, moisture and organic matter content are at optimum.

Conversion Ability:

It has been observed that a kilogram of worms can convert 25-45 Kg of wet waste on weekly basis. In other words, there can be a compost recovery of at least 25 Kg per week with a kilogram of worms that number to about 1000 worms. They can produce 2000-5000 cocoons on weekly basis. The incubation period of the cocoons is 2 weeks and their rate of survival is 60%. They are sexually mature within 6-8 weeks. In case of optimal growth conditions, the rate of growth is very high. The mature worms lay eggs at an interval of 7-10 days. They produce 247 worms annually. It is observed that 1 Kg of earthworms multiplies to 20 Kg within 4 months!

Precautionary Measures in Vermicomposting:

During vermicomposting, there are certain points that must be taken care of. This is especially because the earthworms are highly sensitive organisms. Any small change in the thriving conditions would affect their conversion ability. The caution points are as below:

- ***Compost Material:*** The compost material must be purely organic. It must be devoid of materials like glass pieces, stones, ceramic pieces, plastic, etc.

- ***Loading:*** The vermicompost heap must be filled to the right quantity. It should not be overloaded as overloading causes accumulation of gases and increase in temperature. This would affect their growth and population.
- ***Drainage Channel:*** There should be a provision for drainage around the vermicompost heap so that there is no water accumulation. This is especially important during the rainy season.
- ***Addition of Acidic Substances:*** Acidic substances like citrus must be avoided. If added they should be added only in small quantities as these acidic substances affect the pH balance of the compost.
- ***Water Stress:*** Both dry spell as well as too much water can kill the worms. Therefore, the compost heap must be sprinkled with water daily during summer. The beds must be moisture every alternate day during winter.
- ***Covering the Beds:*** The vermicompost beds must not be covered with plastic sheets or tarpaulin. This would lead to accumulation of gases and also increase the heat inside the bed which can be detrimental to the earthworms.
- ***Protection from Pests:*** No specific diseases can affect the earthworms. However, they must be protected from pests like rats, termites, birds, ants, etc. For protection from ants, termites and rats, the vermicompost site is sprayed with 5% neem based insecticide before the heap is filled and worms are introduced. The heap ca be covered with a net to protect the worms from predators like birds and pigs

Harvesting the Compost

Vermicomposting method

The complete decomposition of the compost takes about 100 days in case of ideal conditions. On an average, a single tank can be used for composting at least 4 times a year. Once the compost is ready, the residue is black in color. Few days before harvesting, stop watering the tank. This helps the worms to migrate to the bottom of the bed. Then the compost is removed and heaped outside on a plain surface. Worms if any in the collected heap, gather at the center of the heap. These can be picked and transferred to the tank. The compost is then sieved through a 3mm mesh and spread for sun drying. These are later packed. The sieving process helps retrieve unhatched cocoons that can be transferred to the tank. The worms that are retrieved can be used in a new tank. Some farmers dry them under the sun and make vermi-protein. On an average about 1700 Kg of compost can be obtained.

Alternate Income from Vermicompost Project:

Vermicomposting is an excellent source of alternate income for farmers. The compost after drying can be sold. Similarly, the worms can be sold to other farmers who are looking to start vermicomposting in their farms. It is a good thriving, all-season business for entrepreneurs that involves minimum investment and labor but maximum benefits.

1. Process

The process of composting crop residues / agri wastes using earthworms comprise spreading the agricultural wastes and cow dung in gradually built up shallow layers. The pits are kept shallow to avoid heat built-up that could kill earthworms. To enable earthworms to transform the material relatively faster a temperature of around 30^0C is

maintained. The final product generated by this process is called vermicompost which essentially consist of the casts made by earthworms eating the raw organic materials. The process consists of constructing brick lined beds generally of 0.9 to 1.5 m width and 0.25 to 0.3 m height are constructed inside a shed open from all sides. For commercial production, the beds can be prepared with 15 m length, 1.5 m width and 0.6 m height spread equally below and above the ground. While the length of the beds can be made as per convenience, the width and height cannot be increased as an increased width affects the ease of operation and an increased height on conversion rate due to heat built up.

Cow dung and farm waste can be placed in layers to make a heap of about 0.6 to 0.9 m height. Earthworms are introduced in between the layers @ 350 worms per m^3 of bed volume that weighs nearly 1 Kg. The beds are maintained at about 40-50% moisture content and a temperature of 20–30° C by sprinkling water over the beds.

When the commercial scale production is aimed at, in addition to the cost of production, considerable amount has to be invested initially on capital items. The capital cost may work out to about `5000 to `6000 for every tonne of vermicompost production capacity. The high unit capital cost is due to the fact that large units require considerable expenditure on preparation of vermi beds, shed to provide shelter to these beds and machinery. However these expenditures are incurred only once.

Under the operational cost, transportation of raw materials as also the finished product are the key activities. When the source organic wastes and dung are away from the production facility and the finished product requires transportation to far off places before being marketed, the operational cost wouldincrease.

However, in most of the cases, the activity is viable and bankable. Following are the items required to be considered while setting up a unit for production of vermi-compost.

2. About the worms

Of about 350 species of earth worms in India with various food and burrowing habits *Eisenia fetida, Eudrilus eugeniae* and *Perionyx excavatus* are some of the species that are reared to convert organic wastes into manure. A combination of epigeic species that form no permanent burrows and live on the surface, anecic that form semi-permanent and vertical burrows extending from the surface and endogeic that typically live throughout the deeper layers may be considered.

The worms feed on any biodegradable matter and vermicomposting units are ideally suited for locations / units with generation of considerable quantities of organic wastes. One earthworm reaching reproductive age of about six weeks lays one egg capsule (containing 7 embryos) every 7-10 days. Three to seven worms emerge out of each capsule. Thus, the multiplication of worms under optimum growth conditions is very fast. The worms live for about 2 years. Fully grown worms could be separated and dried in an oven to make 'worm

meal' which is arich source of protein (70%) for use in animal feed.

3. Location

Rural areas with predominance of agriculture, suburbs of cities and peri urban villages are considered ideal locations for setting up of vermicomposting units on a larger scale from the view point of availability of raw material and marketing of the produce. As use of the compost is said to have ameliorative effect more particularly on fruit, vegetable, plantation and ornamental crops, vermi- composting units may be located in areas with concentration of fruit and vegetable growers and floriculture units. Further, the nearness to a commercial dairy unit or large concentration of cattle population will have an added advantage of cheap raw material i.e. cow dung.

4.Components of a Commercial Unit

Commercial units have to be developed based on availability of cow dung locally. If some big dairy is functioning then such unit will be an associated activity. Commercial units must not be designed based on imported cow dung. The philosophy is in-situ development using "Natural Resources".

Sheds

For a vermi-composting unit, whether small or big, this is an essential item and is required for securing the vermi beds. They could be of thatched roof supported by bamboo rafters and purlins, wooden or steel trusses and stone/ RCC pillars. Locally available roofing materials or HDPE sheet may also be used in roofing to keep the capital investment at reasonably lower level. If the size is so chosen as toprevent wetting of beds due to rain on a windy day, they could be open sheds. While designing the sheds adequate room/pathways has to be left around the beds for easy movement of the labourers attending to the filling and harvesting the beds.

Vermi-beds

Normally the beds have 0.3 to 0.6 m height depending on the provision for drainage of excess water. Care should be taken to make the bed with uniform height over the entire width to avoid low production owing to low bed volumes. The bed width should not be more that 1.5 m to allow easy access to the centre ofthe bed.

Land

About 0.5-0.6 acre of land will be needed to set up a vermiculture production. Thecentre will have at least 6-8 sheds for convenience and a dedicated area for finished products. It should also have a bore well and pump set or watering arrangement and other equipments as described in the scheme economics. The land can be taken on lease for at least 10-15 years.

Buildings

When the activity is taken up on a large scale on commercial lines, considerable amount may have to be spent on buildings to house the office, store the raw

material and finished product, provide minimum accommodation to the Manager and workers. The cost of the buildings along with the electrification of these buildings and the vermi-sheds may be included under this item.

Seed Stock

This is an important item requiring considerable expenditure. Though the worms multiply fast to give the required numbers over a period of 6 months to a year, it may not be wise to wait till such a time having invested on the infrastructure heavily. Thus, worms @ 1 kg per m^3 of bed volume should be adequate to start with and to build up the required population in about two or three cycles without unduly affecting the estimated production.

Fencing and Roads/Paths

The site area needs development for construction of structures and development of roads and pathways for easy movement of hand-drawn trolleys/wheel barrows for conveying the raw material and the finished products to and from the vermi- sheds. The entire area has to be fenced to prevent trespass by animals and other unwanted elements. These could be estimated based on the length of the periphery of the farm and the length and type of roads/paths required. The costs on fencing and formation of roads should be kept low as these investments are essential for a production unit, yet would not lead to increase in production.

Water Supply System

As the beds have to be kept moist always with about 50% moisture content, there is a need to plan for a water source, lifting mechanism and a system of conveying and applying the water to the vermi-beds. Drippers with round the clock flow arrangement would be quite handy for continuous supply and saving on water. Such a water supply system requires considerable initial investment. However, it reduces the operational cost on hand watering and proves economical in the long run. The cost of these items would depend on the capacity of the unit and thetype of water supply chosen.

Machinery

Farm machinery and implements are required for cutting (shredding) the raw material into small pieces, conveying shredded raw material to the vermi-sheds, loading, unloading, collection of compost, loosening of beds for aeration, shifting of the compost before packing and for air drying of the compost, automatic packing and stitching for efficient running of the unit.

Transportation

For any vermi-composting unit transport arrangement is a must. When the source of raw material is away from the production unit, an off-site transport becomes major item of investment. A large sized unit with about 1000 tonnes per annum capacity may require a three tonne capacity mini-truck. With small units particularly with the availability of raw material near the site, expending on transport facility may become infructuous. On-site transport facilities like manually drawn trolleys to convey raw material and finished products between the storage point and the vermi-compost sheds could also be included in the project cost.

Furniture

A reasonable amount could also be considered for furnishing the office-cum-stores including the storage racks and other office equipments. This will enhance the efficiency of operations.

5. Financial aspects

Benefits

It is assumed that there will be around 2-3 cycles of production in the first year and 5 – 6 cycles in the subsequent years with a duration of each cycle at around 65-70 days. Further, taking into account various limitations and operational problems, the capacity utilization is further assumed at 50% in the 1st year and 90% from 2nd year onwards. Benefits include the income from sale of vermi- compost @ `4500 per MT and worm @ `200/- per kg. The net income from the 2nd year onwards would be about Rs.6,48,000 annually.

Project Cost

Vermi-composting could be taken up on any scale starting from 10 MT per annum (TPA) to 1000 TPA and above. As the production is proportional to the vermi-bed space, it is advantageous to start with less capacities and later expand the unit after gaining production experience and developing assured market for the product.

A bed volume of 324 m^3 spread over 24 beds - 15 m long, 1.5 m wide and 0.6 m high is estimated to produce vermi-compost of 200 TPA over 6 cycles/crops of 65- 70 days each annually. Total of 24 such beds may be housed under 2 to 4 different open sheds.

The particulars of capitalised costs including mother stock of earthworms, cost of machinery and tools and operational cost/production cost of compost are set out in Annexure I and II. The costs and benefits of the unit are set out in Annexure III. As can be seen, the investment cost is `13,50,000/-, operational cost `3,42,000. Operational cost of two cycles amounting to `1,24,800/- has been capitalised.

Margin

The margin money/down payment has been considered at 25% in the present model, which works out to `3.375 lakh.

Bank loan

Bank loan considered in the model is 75% which works out to `10.125 lakh.

Rate of interest

Banks are free to decide the rate of interest within the overall RBI guidelines issued from time to time. While the interest rate may vary from 13 to 15%, for the purpose of financial analysis and bankability of the project, the ultimate lending rate has been assumed at 13%.

Security

Banks are guided by RBI guidelines issued from time to time in this regard.

Financial analysis

The financial analysis are shown in Annexure. It indicates that

the model isviable. The major financial indicators are given below:

NPV :
`7.62
1 lakh
BCR
: 1.23
: 1
IRR : 34 %

Repayment

Based on the cash flow the detailed repayment schedule has been worked out andfurnished in Annexure V. The loan outstanding can be repaid in 6 years.

Capital Cost

Annexure I

Vermi-Composting (200 TPA)

Total operational cost for one year with 7 cycles of 65-75 days

Bed volume 324 m^3Recovery : 30 %

Sr	Particulars of item	Amt (`)	
		Year 1 Rs.	Year 2 onwards
A.	**Land and Building**		
1.	Land (On lease)	----	----
2.	Levelling and earth filling for vermicompost sheds	7500	----
3.	Fencing and gate	25000	----
4.	Open Shed with brick lined bed bottom & platform with RCC / MS pipe post & truss and thatch /HDPE / locally available roof (@ 1000/m^2) for :		
a.	Vermicompost beds (15 m*1.5 m*24 nos = 540 m^2 + 20 m^2 pathways/utility = 560 m^2)	560000	
b.	For finished products 30 m^2	30000	----
5.	Godown / Store cum office 50 m^2 @ 5000/-per m^2	250000	----
	Sub total	**872500**	----
B.	**Implements and machinery**		----
1	Shovels, spades, crowbars, iron baskets, dung fork, buckets, bamboo baskets, trowel,	5000	----
2	Plumbing and fitting tools	1500	----
3	Power operated shredder	25000	----
4	Sieving machine with 3 wire mesh sieves- 0.6 m x 0.9 m size - power operated with motor	45000	----
5	Weighing scale (100 kg capacity)	2500	----
6	Weighing machine (platform type)	6000	----
7	Bag sealing machine	5000	----
8	Culture trays (plastic) (35 cm x 45 cm) - 4 Nos	1600	----
9	Wheel barrows - 2 Nos.	12000	----
	Sub total	**103600**	----
C.	**Water provision – Borewell with hand pump, pipe, dripper**	**75000**	----
D.	**Electrical installation**	**10000**	----
E.	**Furniture & fixtures**	**25000**	----
F.	**Earthworms (@1 Kg per m^3 and @`300/Kg, total utilized bed volume = 324 m^3)**	**97200**	----
	TOTAL CAPITAL COST	**1183300**	

Vermi-Composting unit (200 TPA)

Total operational cost for one year with 7 cycles of 65-75 days

Operational Cost

Sr	Particulars of item	Amt (`)	
		Year 1	Year 2 onwards
1.	Agricultural wastes (cost, collection and transportation) @ 320 kg per m^3 and Rs.200/MT (15*1.5*0.6*24*5*320*200/1000) [at 50% in 1st year]	51840	103680
2.	Cow dung (cost, collection and transportation) @80 kg/m3 and Rs.250/MT (15*1.5*0.6*24*5*80*250/1000) [at 50% in 1st year]	16200	32400
3.	Salary wages for 2 permanent skilled labourers @ Rs.6000/month	12000	12000
4.	Labour wages on day to day basis in formation of vermibed with agro-waste, cow dung and worms, watering, stirring, harvesting, sieving, packing, etc., including cost of bags (250 mds[@ Rs.200/md) [at 50% in 1st year]	25000	50000
5.	Electrical charges for pump, machinery, lighting etc. [at 50% in 1st year]	12000	24000
6.	Repair and maintenance [at 50% in 1st year]	30000	60000
7.	Cost of bags and marketing cost [at 50% in 1st year]	15000	30000
	Sub Total	**156040**	**312080**
8.	Lease rent, Miscellaneous etc.	30000	30000
	Total Operational Cost	**186040**	**342080**

Vermi-Composting units (200 TPA)

Costs and Benefits

Sr	Cost	Amt (`Rs.)	
		Year 1	Year 2 onwards
1.	Total Capital cost	1183300	---
2.	Total Operational cost	186040	342080
3.	Total cost	1369340	342080
4.	Benefit		
4a.	Sale of vermicompost (200 MT @ 30% conversion) [@ Rs.4500/MT at 60% in 1st year and 90% in 2nd year onwards]	405000	810000
4b.	Sale of worms [@ 5 Kg/MT of compost and @ Rs.200/Kg.]	90000	180000
4c.	Total benefit	495000	990000
5.	Net benefit	(874340)	647920

Vermi-Composting unit (200 TPA)

Financial Analysis

Sr	Cost	Amt (`)	
		Year 1	Year 2 onwards
1.	Total Capital cost	1183300	---
2.	Total Operational cost	186040	342080
3.	Total cost	1369340	342080
4.	Benefit		
4a.	Vermicompost	405000	810000
4b.	Sale of worms	90000	180000
4c.	Total benefit	495000	990000
5.	Net benefit	(874340)	647920
6.	Discounting rate – 15%		
7.	PVC - `2893538		
8.	PVB - `3655654		
9.	NPV - `762116		
10.	BCR - `1.226		
11.	IRR – 34%		

Vermi-Composting (200 TPA)

Repayment Schedule

TFO (`.) = 1338132 (Say `13.50 lakh)

(Capital cost + Operational cost for two cycles + lease rent for 1st year)Bank Loan (`.) = 1012500 337500

Rate of Interest =

13%

Year	Loan O/s	Net Income*	Principal	Interest	Total outgo	Net surplus
1	1012500	456584	75000	131625	206625	249959
2	937500	647920	160000	121875	281875	366045
3	777500	647920	180000	101075	281075	366845
4	597500	647920	200000	77675	277675	370245
5	397500	647920	220000	51675	271675	376245
6	177500	647920	177500	23075	200575	447345

** 1st year net income = 1st year total income -operational cost of 1 cycle + insurance andlease [As 2 operational cycle and lease rent are capitalized].*

Results:

Financial analysis indicated, Capital Cost of Vermi-Composting (200 TPA)Total operational cost for one year with 7 cycles of 65-75 days is Rs.11,83,300/-, Vermi-Composting unit (200 TPA),Total Operational cost for one year with 7 cycles of 65-75 days is Rs.1,86,040/- and Cost-Benefit analysis for Vermi-Composting units (200 TPA) indicated First Year, Rs.8,74,340/- and Second Year, Rs.6,47,920/-.The Loan repayment can be done within 6 years from the year of establishment.

Conclusion;

The results from the casting analysis had revealed that the organic waste of plant debris, cattle dung and paper waste can be converted into usable form with its excellent nutrient release. Though there may not be a great increase in nutrient, the small change in nutrient value and the reduction in C:N ratio make the plant to uptake. The castings which are rich in microorganism enhance the plant growth hormones. The result showed the increase in three types of Earthworm population in three substrate of paper waste, cattle dung and plant debris. The vermicompost is a eco friendly and cost effective methods. It is an ideal method for the management and development of solid waste. To conclude hold promise to play a significant role in protecting environment as it uses waste as raw material and in building up of soil fertility and improving soil health for sustainable agriculture practices.

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