

Waste Management through Vermin-culture

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Introduction

Environment is the source of life and it not only directs but also determines the existence, growth and development of mankind and all its activities. Primitive man ate wild fruits, hunted and fished and relied heavily on nature for his very existence. As society developed, man's impact on environment grew in scope and strength. Man is a user of the environment for his developmental activities and he always disrupts this natural system and creates a background for environmental degradation.

In India, the rapid growth of population, poverty, industrialization and several related factors are responsible for the rapid degradation of the environment. The environmental problems in India, particularly in the metropolitan and industrial zones, affect the people adversely due to the degradation of life-support systems, threat to biodiversity and an inadequate system of soil waste disposal and sanitation with their corresponding adverse impact on health, birth rate and infant mortality. The degradation of natural resources imposes several ecological problems. Moreover, due to uncontrolled urbanization in India, environmental degradation has been occurring very rapidly and causing shortages of housing, worsening water quality, dust and heat and the problems of disposal of solid waste and hazardous wastes. The cities which are growing fast and the rapid growth of urban population are responsible for the lower quality of life, growth of slums and other associated problems. Human activities in these places produce a lot of wastes and waste disposal, both municipal and other types, cause a great problem for the modern cities.

The waste products act as pollutants, thus affecting the environment and man adversely. Therefore, a proper waste disposal system, including the recycling of waste, is an immediate need. Our ecological balance is being disturbed mainly because of two types of wastes: a) industrial wastes, usually being disposed in big rivers or sea; and b) kitchen or garden wastes, accumulated in homes, institutions and farms. The disposal of the garbage from the kitchen and garden is becoming an attention drawing problem in the urban areas. Garbage heaps in many street corners and on road sides create unsanitary conditions, resulting in an unhealthy environment.

A clean and green city is bound to be free of environmental degradation. Hence, an eco-friendly way of disposing the garbage must be given a serious thought in order to clean the cities. There are various ways through which the kitchen and garden wastes can be

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disposed off, like the burning of the garbage or utilizing the garbage for producing gas for domestic purposes. But these methods also have disadvantages. The burning of the garbage creates air pollution or the production of gas using the garbage is costly. One of the handy solutions to deal with this problem of garbage disposal at the level of the household or the farm is by adopting vermin-culture bio-technology for manure production.

Vermin-culture Bio-technology

Vermin-culture technique is a beneficial activity for an environment. It is a technique to convert the garbage or the waste material into organic manure. It is a recycling process of wastes, which is done by the vermin. This manure is very helpful to make the environment green. It is a method of converting the organic wastes, like the garden waste, farm waste, school waste, or a kitchen waste, with the help of cow dung and earthworms or vermin in a scientific way, into organic manure, which is nutrient-rich and very effective or useful.

Vermin-culture is an end product of the breakdown of the organic wastes by some species of earthworms. It is also known as nutrient-rich natural fertilizer and soil conditioner. The process of producing this is called vermin-composting. Though vermin-compost cannot be described as being nutritionally superior to other organic manure, the unique way in which it is produced, even right in the field and at a low cost makes it very attractive for practical application. The methods followed by different workers vary a great deal and steps taken are sometimes arbitrary resulting in a variation in the quality of the product.

The popularization of vermin-culture bio-technology will not only increase the production of low cost earthworm proteins but also play a significant role in pollution control. The use of vermin-compost promotes soil aggregation and stabilizes the soil structure. This improves the air-water relationships of the soil, thus increasing the water retention capacity and encouraging extensive development of the root system of the plants.

For the vermin-culture bio-technology the materials required are those which are disposed off by individuals on a daily basis. These easily degradable materials for vermin-culture bio-technology are the following: a) Kitchen waste — peels of fruits and vegetables, decayed fruits and vegetables, shells of dry fruits or eggs; b) Garden waste: weeds and hedge cuttings, dry leaves and flowers; c) Farm waste — seeds of the cereals and pulse, dry leaves, glowers of the plants; d) Wood scrapings. The process of manure production requires the addition of other materials available at a low cost.

The Process of Vermin-Composting

The process of vermin-composting is easy and it is useful and cheap, making it affordable to any individual. This process requires the individual to collect the kitchen wastes and the garden wastes in a container. An individual does not need to dispose off the wastes. Instead, the wastes can be collected in different types of containers, like brick tank, clay pot, bamboo basket, plastic tub, wooden box with holes or even a pit in the garden.

The process of vermin-composting is as follows:

- Step one: Prepare a layer of coconut coir or broken bricks, about three inches thick and pour water so that it settles down.
- Step two: Prepare a three-inch layer of garden soil along with cow dung manure. This acts as the initial food for the worms.
- Step three: Prepare a six to eight inch-thick layer of leaves, kitchen waste or environment wastes and mix the waste with cow dung slurry.
- Step four: Add about three-inch thick cow dung manure around the waste and prepare a layer.
- Step five: After a week introduce about 500 gms of earthworms and sprinkle water on the layer.
- Step six: Prepare a layer of leaves on it and cover it with jute gunny bag.
- Step seven: Always sprinkle water on the top of the jute cloth to keep it moist.
- Step eight: Add cow dung slurry at regular intervals to fasten the process.
- Step nine: After fifty to sixty days the manure can be harvested from the unit. When the processing takes place, the following needs to be taken care of:
 - Maintain the humidity by sprinkling water in the container.
 - Always sprinkle water on the jute sack and avoid adding water directly in the container, as it is harmful to the worms.
 - Check the worms to ensure that they are not affected due to the high PH level of the garbage, which may affect the recycling of the worms.
 - Protect the worms from dogs, cats, red-ants, monkeys, snakes and other insects.

Role of Earthworms in Vermin-culture

Earthworms are important part of vermin-composting technique. These worms recycle the waste and convert it into manure which is useful for garden, farms, etc. The earthworms are the friends of the farmers. They speed up the recycling process and help in changing the nutrients into forms that plants can use. Hence, the earthworms are referred to as environmental bio-indicators, waste controllers, compost manufacturers and protein producers. Earthworms also provide nutrients to the plants. They come up to the upper layer of the soil for getting food and sunlight for this they make a hole. Through this hole, they get water, air and sunlight. Earthworms have the capacity to make the soil

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or the waste in the form of powder, which they eat.

The different earthworm species used are: *Elsenia Foetida*, *Eudrilus Eageniae*, *Perioxy*, etc. These are easily available in the market with those who sell vermin-compost. Earthworms eat tea leaves, egg shells, left-over food, vegetables, fruit peels, etc. So, one can use this type of things or waste material in vermin-composting. However, earthworms do not like very spicy, oily food. Hence, such wastes should not be added to the compost. Nor should one add any non-degradable matter, such as, plastic, glass, metal, etc., which is harmful and not easy to eat for the earthworms.

Justification of the Project

The human environment, i.e., the earth we live in, includes all the physical parts of the earth, such as, air, soil, minerals, rocks and water and all its living organisms, such as, animals and plants. When the degradation is less, nature recovers it by its own system of recovery, but whenever its quantity is more it creates an imbalance in nature. Today, the environment has become an issue of serious concern for all. The polluted air, the contaminated water, land polluted with biocides used in fertilizers, etc., are acting as slow poison and give rise to major health hazards.

The human impact on natural environment is one of the most pressing issues of contemporary times and a subject of discussion in geographical literature. The ways in which human beings have changed and are changing the face of the earth and the human role in the natural process and systems have drawn the attention not only of natural scientists but also of social scientists as well as of planners and policy-makers. The basic law of ecology is that everything is connected to everything else and that one cannot change just one thing in nature.

Environmental science provides an approach towards understanding the environment of our planet and the impact of human life upon that environment. A proper understanding of the various factors of environment, ecology and its management is necessary to improve human well-being and mitigate or prevent further damage to the earth and its organisms.

The growth of industries and ever-increasing human population are changing the structure and the function of the soil. This also results in the accumulation of waste materials. In turn, it reduces the fertility of soils. Vermin-culture bio-technology is a technique in which the transformation of agricultural and environmental wastes turns into beneficial products, i.e., manure. In this technique earthworms play an important role.

The broken product of waste materials of the degraded organic matter, by the activity of earthworms, is known as vermin-compost. In this technique, the waste materials can be processed under the vermin-composting programme, which involves the harnessing of the earthworms for the stabilization of a variety of organic wastes. This is the most important aspect of vermin-culture bio-technology. Different types of earthworms such

as *Eudrilus eugeniae*, *Esieniafetida* and *Perionyx excavatus* are easily adaptable to agricultural wastes like sugarcane thrash, paper pulp, and waste matter of cow, sheep, horse, activated sludge and biogas sludge of poultry dropping, etc.

Today, environmental issues are seriously taken into consideration and steps to clear the environment are given much importance. Vermin-culture is an old manure production technique but it has not been taken up by a large number of people. There are some areas where this technique is actually in use and natural manure is being obtained by the effective utilization of household and garden wastes. On the other hand, there are many families who face a problem of garbage management because of lack of proper knowledge about the systematic use of this technique for their benefit. So, a project to create and promote the adoption of vermin-culture bio-technology by families in Baroda has been taken up.

Usually, it is a practice to throw the garbage a little away from one's own home. It is assumed by the people that garbage disposal in a city is the duty of the civil authorities. This attitude needs to be changed from the mind set of the people, as the problem of environmental degradation is a social problem, which has to be solved by the people themselves. Hence, awareness regarding environmental issues needs to be created among the residents of a city. They should be motivated to adopt environmentally friendly techniques. This present project is meant to play a significant role in this effort.

Growing pollution has drawn the attention to the need for a solution to garbage disposal. Nowadays, various agencies are trying to deal with garbage management problem in different ways. The Vadodara Municipal Corporation (VMC) has introduced a new programme to collect the garbage from home to home, and has also installed garbage containers. But, still irregularity in the garbage collection and the over-filling of the garbage containers calls for a better solution to the garbage disposal problem.

The Department of Home Science Extension and Communication focuses on various thrust areas, where environment education is one of them. In the past also, many projects have been undertaken by this Department in the areas of environment. The review of literature shows that very few projects have been undertaken by the Department for garbage management. Therefore, taking up this project justifies the need to create awareness regarding environment problem and also the need to involve women in the management of waste disposal.

Though various researches have established the benefits of vermin-composting method, many people are still not sufficiently aware of the reprocessing and recycling techniques of garbage for its proper disposal. It is hoped that this project will be of help in creating the required awareness about the vermin-composting technique and in enabling the people to manage their household or kitchen waste by getting a good quantity of manure.

A Brief Description of the Project

This is a vermin-composting project at the household and farm level, carried out in Baroda in 2007. Its major objective was to encourage families and farmers to manage their garbage at the household and farm level by adopting vermin-composting. The following were the specific objectives: a) To motivate families and farmers to segregate the garbage into degradable and non-degradable waste; b) To motivate and guide the families and farmers to adopt the system of vermin-composting for garbage management; c) To prepare a pamphlet on vermin-culture as a technique for garbage management at the levels of households and farms. However, this project was limited to the families and farmers, who consider garbage disposal as a problem or those who are interested in adopting vermin-culture technique for garbage management or those who have a garden or a farm.

Plan of the Project

The planning stage involves the following steps: a) Understanding of the action plans on garbage management by various organizations; b) Collection of information on vermin-culture bio-technology; c) Preparation of the pamphlet; d) Training of the project worker.

a) Understanding of the Action Plan on Garbage Management:

To get oriented about the plans and activities of vermin-culture bio-technology, the project worker visited the following local organizations in October 2006, to know and understand their action plans in the areas of garbage management — Shroff Foundation Trust (SFT); Society for Clean Environment (SOCLEEN) and Nature CARE (Nature Conservation and Renewable Energies). Information about each of these organizations was gathered by meeting and talking to the personnel in charge of the projects on garbage management and also by reviewing various project reports of these institutions. The information collected from these organizations was as follows:

- **Shroff Foundation Trust (SFT):** The Shroff Foundation Trust deals with utilizing natural resources, and in the light of that it promotes organic farming by providing training to the interested group of farmers to fruitfully utilize the organic wastes of the farm.
- **Society for Clean Environment (SOCLEEN):** SOCLEEN deals with the problems at individual level for managing the industrial wastes. Its recent efforts include developing environment consciousness among the school children. It organizes seminars and lectures to create awareness regarding the promotion of environment. Its reports were referred to by the project worker.
- **Nature CARE (Nature Conservation and Renewable Energies):** Nature CARE deals with the problems at the levels of the household and agriculture by adopting organic farming. It organizes lectures for creating awareness regarding vermin-culture technology as well as about the promotion of healthy food. Its activ-

ity reports and literature were also referred to by the project worker. It also provides training to the people who were interested in vermin-culture bio-technology methods.

Besides these, the project worker also visited the houses of close relatives. The main aim behind these visits was to observe and understand their garbage disposal technique. These visits and observations helped the project worker to understand the usual and most common methods of disposal of household and kitchen garbage. The most common methods of disposal of household and kitchen garbage were: Dumping the garbage outside their home at the road sides and/or burning of the garbage. So, it was clear that a proper garbage disposal system was really needed.

b) Collection of information on vermin-culture bio-technology:

The project worker also visited Shroff Foundation Trust, which has its farms and demonstration plot in Ekalbara near Padara village. The project worker obtained information from the resource persons present in the field and collected some literature. During the visit to Nature CARE, the project worker met Mr. Keyur Gala, an active member of the organization. From him, the project worker gained detailed information about the vermin-culture technology as a garbage management tool at the household level. He helped the project worker by giving informative materials and pictures along with the explanation on vermin-culture bio-technology. The project worker also got a booklet and literature on vermin-composting during her meeting with some experts. From this organization, the project worker got information about earthworms, its proper use and also about the places of its availability in Vadodara city.

c) The Preparation of the Pamphlet

After collecting and reviewing information on vermin-culture bio-technology, the project worker found that no material was available with simple and direct instructions. The literature collected from various sources was too technical in language and in the use of different terms, which made it difficult for the people to understand. Besides, most of the materials were in English language. The project worker felt that the local people may have problem in using these materials as a practical guide to adopt this technique in their home. Therefore, the project worker decided to prepare a pamphlet in a simple and easily understandable language and style.

Thus, a pamphlet vermin-culture bio-technology was prepared in Gujarati with extensive information along with pictures. The project worker consulted Mr. Keyur Gala to check the content of the pamphlet. This pamphlet contained the following information: a) Type of garbage; b) Problems of waste management; c) Vermin-culture as a waste management technique; d) Type of container to be used in vermin-composting; e) The process of vermin-composting; f) The points to be kept in mind in the selection of materials and the execution; g) The vermin-composting process.

d) Training of the Project Worker

While planning to promote vermin-culture as a garbage management technique, the project worker adopted this technique first in her home. This was necessary so that the project worker knows the steps to be taken, the problem to be faced while carrying out the project and their solutions, and also to identify the precautions to be taken during the implementation of the project. For this, the project worker trained her family members and the domestic servant to segregate the waste and collect it in a container which is used in the project. The project worker also monitored the sprinkling of water and the maintenance of humidity in the collected garbage in the container, so as to protect the earth-worms by maintaining the right atmosphere.

The Execution of the Project

The project was implemented in the following manner: a) Contacting individual families and farmers who viewed garbage as a problem; b) Convincing the people to adopt vermin-culture bio-technology; c) Guiding the participants in the production of manure; d) Monitoring the execution; e) Testing of nutrient value in the manure; f) Testing the reactions of the participants.

a) Contacting individual families and farmers:

In December 2006, the project worker started approaching people known to her. This included: neighbours, relatives, friends and farmers. In the first meeting with these people, the project worker tried to bring to the attention of the people the fact that garbage was a daily problem. The main focus of the discussion was on: a) the necessity of waste management at the level of individual households; b) the difficulties of waste management, when the servants are absent or due to irregularities in collecting the waste; c) the contribution of home-makers and the involvement of women in the process of waste management; d) Vermin-culture bio-technology as a feasible method of garbage management at the level of the household and the farm.

b) Convincing people to adopt vermin-culture bio-technology:

Initially, only the close relatives of project worker were ready to adopt the project after the first meeting. Then, they suggested names and addresses of other persons in the same area who might be interested in adopting this technique. As recommended by the relatives and friends, the project worker approached those other families and the number of project households expanded with the help extended by the relatives and friends.

During the second and the third visits, the project worker explained how the garbage can be converted into manure. After a few visits many families showed interest in adopting this technique of waste management. Finally, fifteen individual families showed their readiness to adopt this technique.

Further, a family friend of the project worker owns farms near Baroda. He had a lot of garden waste at his farms and wanted to utilize it fruitfully. He showed keen interest and also motivated his friends in adopting this project for their farms. The total number of households and farms in which the project was started is shown in the following table.

Table 1: Number of people approached and convinced to adopt the project

Project sample	People approached	People convinced
Families	20	15
Farms	05	05
Total	25	20

In all, 20 project participants, i.e., fifteen individual families and at the household level and five farmers at the agricultural level were convinced about this project and expressed their readiness to adopt this technique.

c) Guiding Participants for Manure Production

After creating awareness and convincing the people, the project worker inspired them to implement the project systematically on their own. Those families residing in flats or having no garden around their houses, started the project in a container, i.e. bamboo basket. The farmers and a few of the families started the project in a pit.

Table 2: Type of container used by the family members and farms

Type of container used	Number of families	Number of farms
Pit in the garden	03	-
Bamboo baskets	12	-
Preparing beds	-	05
Total	15	05

This was the initial phase of the project where the families had to select a container and collect their kitchen and garden waste. The project worker instructed the families to collect and segregate the organic waste in the container. The project participants were also informed of the harm that can be caused to the earthworms by non-biodegradable wastes. They were requested to separate the following types of waste before collecting the garbage in the containers: plastic bags and wrappers, wrappers of medicine and aluminum foils or glass. It was difficult for the project worker to convince the families to segregate the wastes. However, after repeated explanations, the families started collecting the organic wastes in the container.

In the second phase of the project, cow dung manure and red earthworms were added into the collected waste. Before introducing the earthworms into the pit or the container, the PH level of the collected materials in terms of the mixture of garbage and cow dung was measured by the project worker. It was necessary to maintain the PH level of the collected garbage within the range of 6.5 to 7.5 as it is the only suitable level for the earthworms. A high acidic or alkaline medium could harm the earthworms. It also re-

duces their growth rate. So, the project worker measured the PH level of the collected waste at each project site. In three households the PH level was higher than the required range, which was due to a lesser amount of water. It was found that the collected garbage contained a large amount of orange and lemon peels resulting in high acidic level of the collected garbage. They were instructed to add more garden waste to bring down the high acidic level.

In all the families, the project worker explained the process of vermin-culture bio-technology with the help of her servant. Similarly, the project worker visited all the farms and explained the process and gave necessary instructions regarding the vermin-culture bio-technology to the farmers.

In the third phase of the project, the project worker instructed the families and farm participants to cover their container with a jute sack and sprinkle water in the container to maintain the humid atmosphere.

d) Monitoring the Execution

The project worker monitored each phase of the project implementation — garbage segregation, collection of garbage and maintenance of soil humidity — by communicating with the project participants either by personal visit or through telephonic conversation. The monitoring was done to check for: problems faced in the project implementation; the collection of the required amount of garbage; the maintenance of the humidity in the container; the growth of the earthworms; and the production of manure. After every week, the participants were instructed to stir the mixture of the garbage for proper air circulation so as to promote the growth of the earthworms and speed up the process of manure production. It took almost two and a half months to convert the garbage in to fine granules. Each household and the farms had their own garbage converted into nutrient-rich manure. The project worker instructed the participants to sprinkle water for two days, so that the earthworms go deep into the soil. This would facilitate the collection of the manure. The project participants were helped to sieve the granules to get good manure. This manure was dried in the sun light for future use or directly applied to the plants.

e) Testing of nutrient value in the manure:

To check the effectiveness of the manure in terms of its nutrients, the project worker approached the person in charge in the Agriculture Department of Gujarat State Fertilizer and Chemical Limited (GSFC). Here the sample manure of different household and farm participants was tested and matched with the ideal requirement of nutrient in the fertile soil. It was found that all the samples had shown its richness in nutrients.

Table 3:- Nutrient Values contained in the manure

Sr. no	Property	value
1.	PH	7.0-7.5
2.	Carbon: nitrogen (C.N.Ratio)	12-15.1
3.	Nitrogen	1.75-2.5%
4.	Phosphorus	1.5-2.25%
5.	Potassium	1.25-2
6.	Calcium, magnesium	3.0-5.0
7.	Iron, zinc, copper	200-700ppm

So, all the manure contained the required PH level, carbon, nitrogen, phosphorus, potassium and other minerals, which helps to provide more fertility to the soil or is helpful for the growth of the earthworms.

f) Testing the reactions of the participants:

To know the reaction of the participants to the benefits of the vermin-composting technique, the success of the project and the problems encountered, a reaction scale was used by the project worker to gather the feedback of the participants. This reaction scale was given to each participant and the reactions were noted. The reaction given by the participants to this project helped the project worker to know the effectiveness of vermin-culture bio-technology as a waste management technique at the level of households and farms. The details of these reactions of the fifteen family-participants and five farm-participants have been presented below:

Table 4:- Awareness regarding vermin-culture bio-technology.

Awareness about vermin-culture biotechnology	Family-participants N=15 (%)	Farm-participants N=05 (%)
Yes	90.3	100
No	09.7	-
Total	100	100

Table 4 reveals that the vast majority (90.3%) of the family-participants and all the farm-participants were already aware about the vermin-culture bio-technology, while only a few were not aware of this.

Table 5:- The adoption of vermin-culture biotechnology at their household and farm levels

Readiness to adopt vermin-culture biotechnology	Family- participants N=15 (%)	Farm-participants N=05 (%)
Yes	86.7	100
No	13.3	-
Total	100	100

Table 5 reveals that the vast majority (86.7) of the family-participants and all the farm-participants were ready to adopt vermin-culture bio-technology at their household and farm level whereas some (13.3%) of them were not ready to do so.

Table 6:- The usefulness of vermin-culture bio-technology for garden and farm

The usefulness of the vermin-culture technique	Family-participants N=15 (%)	Farm-participants N=05 (%)
Yes	97.6%	100%
No	02.4%	
Total	100	100

According to Table 6, the vast number of the family-participants felt that vermin-culture bio-technology is useful for the garden and the farm, while just a negligible percentage (2.4%) of them found this technology not useful.

Table 7:- Problems faced

Problems	Family-participants N=15 (%)	Farm-participants N=5 (%)
Not faced	60	100
Faced	40	
Flies / snails/ other insects	(18%)	
Mouse/ cats/ snack/red ants	(22%)	
Total	100	100

Table 7 shows that the majority (60%) of the family-participants and all the farm participants did not face any problem while adopting this project on waste management through vermin-composting, whereas some (40%) of the project participants faced difficulties/problems, due to red ants and insects.

Table 8:- The type of help taken for the execution of the project

Help taken	Family-participants N=15(%)	Farm-participants N=5 (%)
Helped	96.67	100
Helped by Gardener	(73.47)	
Helped by Servants	(26.57)	
Purpose of hiring		
Adding and mixing the cow dung in container	(73.47)	(100)
Digging a pit /trench	(54.28)	(100)
Remove manure	(50.61)	(100)
Sprinkling water	(17.82)	(100)
Checking earthworms and collecting waste	(07.17)	(100)
Not hired	3.40	-
Total	100	100

As shown in Table 8, the vast majority of the family-participants and all the farm-participants hired help mainly from the gardeners for the tasks like adding and mixing cow dung in container, sprinkling water, digging trench/pit, removing the manure, adding earthworms. Very few family-participants took help for sprinkling water and segregating and collecting waste.

Table 9:- The reaction of the family members /friends/ relatives towards vermin-culture bio-technology as a waste management technique.

Reaction of family members/ friends/ relatives	Family-participants N=15(%)
Positive Showed enthusiasm in adopting this project. Recommended names of the people in adopting this project.	95.33 (75.00) (40.85)
Negative Fear of earth worms	04.67 (02.33)
Total	100

Table 9 shows that the vast majority of the family-participants reported that their family members/friends/relatives showed positive reaction towards vermin-culture bio-technology as a waste management technique by showing enthusiasm in adopting this technique. A little more than forty percent of the participants reported that their friends/relatives recommended names of families who will take interest in adopting this project.

Table 10:- Help provided by the family members

Help from the family members	Family-participants N=15 (%)
Helped Putting waste in to container and sprinkling water Segregating waste Digging a pit	66.67 (65.00) (45.00) (25.00)
Not helped	33.33
Total	100

As seen from Table 10, the majority of the family-participants reported that they got help from their family members mainly for tasks like collecting the segregated waste into the container and sprinkling water. One third of the family-participants reported that they did not get help from their family members for any stage of the project implementation.

Table 11:- Views regarding the continuation of the project.

Views on the continuation of the project.	Family-participants N=15(%)	Farm-participants N=5 (%)
Continue	80	100
Discontinue	20	-
Total	100	100

According to Table 11, 80% of the family-participants and all the farm-participants reported that they will continue the garbage management project through the vermin-culture technique.

Table 12:- Reaction towards vermin-culture biotechnology as a solution to garbage management.

Vermin-culture biotechnology as a solution to garbage management technique	Family-participants N=15 (%)	Farm-participants N=5 (%)
Advantages		
Gives cheaper manure	(90.00)	(100)
Clears day to day household garbage	(70.00)	(100)
Keeps streets and road sides clean	(46.67)	-
Partially decreases dependence on sweepers and solves the problems of cattle on the roads	(33.33)	-
Limitations		
Irregularity of hired helper	(13.33)	-
Difficulty in getting earthworms	(10.00)	-
Too time-consuming	(05.67)	-
Difficulty in getting cow dung and segregating the waste.	(04.33)	-
Total	100	100

All the family-participants and farm-participants reported that vermin-culture bio-technology is a solution to garbage management. Table 12 shows that the vast majority of the family-participants and all the farm-participants reported this technique as advantageous as it gives cheaper manure. A big majority of the family-participants reported that this also helps to clear day to day household garbage. Very few of them reported certain limitations to adopt this technique for garbage management as it was time-consuming or there was difficulty in getting earthworms on their own.

Problems Faced by the Project Worker

- a) While carrying out this project, the project worker faced the following problems: Difficulty in carrying earthworms and cow dung from one project site to the other;
- b) Difficulty in convincing some families against their fear of the earthworms which were coming out of the container;
- c) Carelessness on the part of the families and their gardeners in following important instructions about the segregation of garbage as well as the quantity of water to be sprinkled from time to time.
- d) Lack of extra care in winter season by the participants, even after repeated instructions by the project worker.

Conclusion

Over all, the project results were quite encouraging. The participants used the manure and achieved much better results from their plants and farms. Hence, it can be concluded that merely providing environment education is not enough to save the environment. In addition to such education, there is also a need to inculcate actual practice to as many people as possible. However, the adoption of such practices only by a handful people will not serve the purpose. This has to be done in a massive scale, in order to see the real effect or impact. More and more NGOs can take up such practical projects in their localities and they can also make the people aware of the possibility of producing organic manure through vermin-culture bio-technology as an income generating activity.

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