

Turning garbage into gold-sharing experience from Gujarat

VARSHA PARIKH* AND MOUSUMI PHUKON

Department of Extension and Communication, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda, VADODARA (GUJARAT) INDIA

ABSTRACT

Today, environment degradation has become a matter of concern and it cries locally and world over. Further, with the increasing population, changing life styles and access to powerful technologies farming can easily become a major source of damage to the environment. Therefore, it is essential that the extension system make special efforts to build the sensitivity and capacity of the farming communities with regard to eco friendly farming alternatives as opposed to exploitative systems. The present study gives a real-life example of how recycling through vermicompost can be done which provide beneficiaries not only personal and economical gain but also in a long term help environment to sustain. It reviews the concepts of vermicompost particularly in the selected rural areas of Vadodara district of Gujarat in India. The contribution of this paper is to provide evidence, from a sample of 44 participants. Further, trainers prepared by project worker could provide training to the 90 other beneficiaries located in different urban and rural places. In all, the present paper highlights how beneficiaries of farming community can enhance the values of environment by using eco friendly technique of vermicompost. Further, it also focus on recycling of waste by farm participants in generating most useful and nutritive production of manure through vermicompost, which helped them to use in their own farms and also to supplement income at the household level.

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INTRODUCTION

Environmental Status in India:

Today, environment degradation has become a matter of concern because of the systematic approach of viewing the earth and man as one of its many sub-systems. There is a growing realization of the constant interaction between the subsystems with each other and with the environment. These issues revolve around the central concept of quality of life with reference to the environment quality, depletion of natural resources and growing pressures of population. Environment cries locally and world over. Hence, environment requires, ecological balance, which leads to sustainability.

Exploitative land use practices in rural India:

Human communities are an integral part of the eco system. In farming by far the largest human activity, people make use of the natural resources like soil, water and bio diversity in a given climatic situation for making a living and lately for making money as well. Some of these resources are renewable, within limits and others are not. The manner in which these natural resources are utilized may amount to 'exploitation' or 'conservation' of these resources. It is necessary in the larger interest that our resource use pattern in farming requires to be more

conservational rather than exploitative. But, the Indian farming patterns from several instances have been witnessing the exploitation, in all its severity. In this regard country with huge population seems to be the worst sufferers. Further, modern agriculture based on chemicals also does not allow sustainability. The concept of soil, as a living system, is central to alternative farming systems as opposed to chemical farming. It is essential to establish and maintain an active and abundant soil life in order to produce healthy plants. Therefore, the soil must be 'fed' in a way that the activities of beneficial soil organisms, necessary for recycling nutrients and producing humus, are not inhibited. But use of present chemical fertilizers in agriculture, leads to many problems such as loss of soil productivity from excessive erosion and associated plant nutrient losses, surface and ground water pollution from pesticides, fertilizers and sediment, impending shortages of non-renewable resources and low farm income from high production costs. So, need for an alternative agricultural system arises. It requires such a system, which should integrate traditional practices with modern understanding of life science. These viewpoints conclude that agricultural extension is essentially a means to improve over all manipulative ability of the farmers. Also, with the increasing population, changing life styles and access to powerful technologies farming can easily

* Author for correspondence.

become a major source of damage to the environment. Therefore, it is essential that the extension system make special efforts to build the sensitivity and capacity of the farming communities with regard to eco friendly farming alternatives as opposed to exploitative systems.

Organic recycling through composting- The environmentally and economically sustainable solution:

Organic production systems are based on specific standard precisely formulated for food production. It aims at achieving agro eco system, which is socially and ecologically sustainable. Now a days organic farming is gaining wide attention among farmers, entrepreneurs, policy makers and agricultural scientist for varied reasons such as it minimizes the dependence on chemical inputs like fertilizers, pesticides and other agro chemicals. This safeguards and improves quality of resources and environment. It is labour intensive and provides an opportunity to increase rural employment and achieve long-term improvement in the quality of resources by using organic manure.

Vermicomposting:

The term “vermi-composting” means the use of earthworms for composting organic residues. Earthworms can consume practically all kinds of organic matter. It is produced by using clean, environment friendly, pathogen free raw materials, in turn making the plants healthy. It is an organic manure produced as the vermicast by earthworm feeding on biological waste material and plant residues. This compost is an odourless, clean, organic material containing adequate quantities of N (Nitrogen), P (Phosphorus), K (Potassium) and several micronutrients essential for plant growth. Vermicompost is a preferred balanced nutrient source for organic farming. It is eco-friendly, non-toxic, consumes low energy input for composting and is a recycled biological product. Vermicompost is beneficial for soil in many ways like - (1) It is aneco-friendly natural manure prepared from biodegradable organic wastes and is free from chemical inputs. (2) It does not have any adverse effect on soil, plant and environment. (3) It improves the physical structure of the soil. (4)It attracts deep-burrowing earthworms already present in the soil. (5) It improves water-holding capacity.(6) It enhances germination, plant growth and crop yield. (7)It improves nutrient status of soil, both macro and micro nutrients. (8)It promotes better root growth and nutrient absorption.

Today, use of earthworms for degradation of organic wastes and production of vermicompost is becoming

popular and is being commercialized. Thousands of farmers, in the different agro-climatic regions of India are switching over to sustainable agriculture in their farms for crops, by adopting vermicomposting.

Rational behind the project:

There are several reasons evolved while thinking up this project. There are successful experiment instances of vermicomposting by several private and government organization conducted at household and farm level in India. Kheti Virasat Mission (KVM) (2007) a farmer membership organization took up a project on vermicomposting at farm level in Mehta village of Bhatinda district, Punjab, with formal and informal members of Jaitu town. The results of the project showed that farmers have become concerned about the use of manure. After project experiment they were using only the natural manure of vermicompost, as they could get better result in production with fewer amount of problems. The result achieved through vermicomposting was so effective that some of the farmers of this project had stopped purchasing urea, dry ammonium phosphate (DAP) and other pesticides. Bharatiya Agro Industries Foundation (BAIF) (2005) which is Development Research Foundation, based at Pune, India, has taken up a project on “Improving livelihoods through vermicomposting”. Project results highlighted that among all the methods of composting practiced at BAIF, vermicomposting has proved to be the most popular method among the participants. Lila Agrotech (2000) in different areas of West Bengal carried out project on vermicomposting for checking the effectiveness of vermicompost in 235 plots, on different vegetables and flowers. In this project test was made in laboratory with product using vermicompost in one plot and only chemical fertilizer in another plot. Results showed that the product from the plot using vermicompost has a greater improvement in overall quality and quantity. From various reviewed articles in research journals project worker came to know that vermicompost is a potential source. So, the project on promotion of vermicomposting among farm men and women from the selected villages of Vadodara district was taken up by the project worker in the Department of Extension and Communication, Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat which was aimed to promote vermicomposting for small and marginal farmers of Gohilpura and Kotna villages of Vadodara district, of Gujarat thinking it may be beneficial to the village farmers in many ways. Firstly, to grow fruits, vegetables, and crops in the marginal land they require good quality manure, which also strengthens

soil. So, manure obtained through vermicomposting can play vital role, may be by contributing to sustainable farming at local level. Secondly, this project may allow farmers to manage their on-farm organic waste, like agricultural waste, animal waste from their own farm or farms of neighborhood. Thirdly, by producing the vermicompost in large scale using earthworms give chemical free manure to the farmers, which is not harmful for the health of neither users (farmers) nor consumers (people). Finally, farmers may visualize the produce of vermicompost manure and worms for commercial purpose. Vermicomposting can be lucrative economic activity for farm men and women. As markets for these eco-friendly products are gaining wide popularity. Earthworms multiplied by vermicompost process can be served directly as animal feed, directly for poultry, fishery, and dairy farms. Hence, the earthworms or even the manure obtained through this process can be sold. Hence, through this project, efforts have been made to revive skills and knowledge of small and marginal farmers from selected villages of Vadodara district of Gujarat. In Department of Extension and Communication, Faculty of Family and Community Sciences, the Maharaja Sayajirao University of Baroda, Vadodara, Gujarat, extension is one of the major component. It is working hand in hand with the community people by harnessing the utilized or unutilized manpower or resources of rural community. It plays a critical role in transforming rural community manpower into empowered and trained manpower and has improved the quality of life for them. This way the department is actively serving as an agent of social change through extension education. The department is actively involved in teaching, training and conducting research as well as extension. Hence, efforts through this project was sought to contribute in this direction.

Objectives of the project:

- To develop understanding among the farm men and women of selected villages of Vadodara district regarding segregating garbage into degradable and non-degradable waste.
- To develop skills among the farm men and women to implement vermicomposting as a technique of waste management.
- To guide the farm men and women to utilize vermicompost in their farm/garden or sale.
- To promote vermicomposting among farm men and women from the selected villages of Vadodara district.

MATERIALS AND METHODS

To promote vermicomposting as waste management technique and implement the project systematically and successfully, it was designed in following three main stages. (1) Planning of the project (2) Execution of the project (3) Monitoring and evaluation of the project

Stage – 1 planning of the project:

To make an effective implementation of any programme the foremost step is to plan the activities to be executed in the programme. Planning is required to carryout the work systematically and within a calculated period of time. The plan of activities provide framework within which the predetermined activity has to be completed. Planning answers the questions like what to do, where to do, when to do and how a particular activity needs to be carried out in the programme. The project undertaken with the farm men and women to promote vermicomposting from the selected villages of Vadodara district was planned in an order to make it successful. Planning of the project was based on training and visits concept of extension. Following steps were followed in this phase-I.

- Identification of environment action plans by various agencies
 - Collection of information on vermicomposting
 - Collaboration with existing organization
 - Selection of villages
 - Training of the project worker
 - Learning materials under the project
 - Identification of environment action plans by various agencies To explore possible areas for planning an action project relating to environment prevention, the project worker visited many agencies and voluntary organizations of Vadodara district. Following agencies and voluntary organizations were visited by the project worker which involved in working with the area of organic farming, vermicomposting, and sustainable environment to understand their action plans in the areas of waste management.
 - Naturopathy Centre (Gotri)
 - Nature Conservation and Renewable Energies (Nature CARE)
 - Society of village Development in Petrochemicals Areas (SVADES)
 - Deepak Charitable Trust (DCT)
- The meetings, visits and observation strengthen above facts and helped the project worker to know that:
- There are various types of waste in rural areas namely community waste, waste from agricultural and

agro based industries, animals wastes and oil bearing seeds etc.

– Lots of unutilized agricultural wastes are available easily in the villages. These leaves, litter of farms, animal and bio waste are found littered in rural areas.

It was supported by the census report 1991 that, the rural population of 629 million is distributed over nearly half a million villages. The community wastes from rural area are estimated at five million tonnes of soil and 10 million tonnes of refuse. (Source: <http://info.lut.ac.uk/departments/cv/wedc/papers/jain.html>)

It was also observed by the project worker that the usual and most common methods of disposal of the waste in these villages were dumping the waste outside their homes/outskirts/farms, laying as it is on the fields or burning wastes. Hence, project worker thought to make rural people realize about the quantity of biodegradable waste in their villages and farms and also potential of unused biodegradable waste when used for vermicomposting project. Vermicomposting can be adopted in the fields easily and effectively. But being a new concept it requires wide publicity among the different sections of the society. So far this technique has been introduced in few nearby villages namely Bodeli, Nimeta and Aklau of Vadodara district. Keeping these points in mind, the project worker planned to promote vermicomposting for farm people in selected villages of Vadodara district.

Collection of information on vermicomposting:

The project worker carried out this step by meeting experts. In her meeting with a vermicompost expert Mr. Keyur Gala, an active member of the Nature CARE organisation, Vadodara, Gujarat the project worker gained information about vermicomposting as a manure production and waste management technique. The expert helped the project worker by providing explanation as well as giving informative materials on vermicomposting. To get an idea about actual onsite work, the project worker also visited Nimeta village, Vadodara of vermicompost unit, run by a farmer. He has adopted vermicomposting from last one year at his farm and producing manure for domestic and commercial purpose. He explained the project worker the implementation of the vermicomposting process of his unit. The project worker came to know about successful vermicompost unit at Bodeli village, Vadodara district from SVADES. By meeting resource persons the project worker gained information about developing vermicomposting in the small and large units. The project worker also visited the vermicompost units running in agricultural colony of Karbianglong district near

her hometown of Assam. Here, the residents of the colony have adopted the vermicomposting at their household level. From this place, the project worker also collected the information regarding how to develop large vermicompost unit.

Collaboration with existing organization:

Surveying and studying environment action plans of various organizations/agencies and collection as well as reviewing of information on vermicomposting helped project worker to visualize and further design different dimensions of the project. For instance, cooperative participation, decision making ability of individuals, effective utilization of human and non-human resources, its sustainability and replicability. Hence, the project worker decided to seek collaboration of existing working organizations to execute project activities. In this context, the project worker approached SVADES and discussed about the project with its chief executive where he asked to submit a proposal. The proposal was prepared by the project worker in the month of March 2007 and submitted. It got sanctioned on 1st April 2007 and finally the project was initiated in collaboration with SVADES. In the subsequent meetings, with SVADES officials, the role of the project worker and support from SVADES for the project was discussed. It was decided that project worker would plan, execute and monitor the project and SVADES would provide its working areas to execute the project activities and other human and non-human resources as per the requirement of the project.

Selection of villages:

Before finalizing project sites, visits to different adopted villages of SVADES namely Koyal, Angadh, Dhanora, Kotna, Gohilpura and Ranoli were made by the project worker. It was observed that Gohilpura one of the adopted village of SVADES, situated 18 km away from Vadodara city, having 75 per cent of farm population consisted large amount of agro and animal waste in comparison to other villages. Villagers used to dispose the waste in the outskirts or waste laid as it is on the field/farm. It was also observed that the villagers were unaware about using waste for some useful purpose. So, Gohilpura village was selected by the project worker for executing project activities.

Kotna the another adopted village of SVADES, 22 km away from Vadodara city, having 80 per cent of farm population was also visited by the project worker. Agriculture is the main occupation of this village. SVADES had already put efforts to develop Kotna as a model village and had showed keen interest to start vermicompost

project. During project worker's visit to the village, key leaders and some active farmers showed their willingness to participate in the project. Hence, the project worker decided to take up Kotna village also to execute the project activities.

Training of the project worker:

Before planning and executing the project to promote vermicomposting, project worker adopted this technique first at her home during the month of May-June, 2007. This was necessary so that the project worker could get experience about the process and can understand– the differences between preparing vermicompost in small unit and large unit, actual steps involved in the process of manure production, precautions to be taken during the project implementation stage, problems faced and solutions that can be worked out. For this, the project worker took help of her family members and helper to segregate waste and collect it in the container. The project worker monitored the sprinkling of water, so as to protect the earthworms by maintaining the right atmosphere. At the end of 20 days, the project worker obtained manure.

Learning materials under the project:

The most effective learning is a combination of seeing, hearing, and doing. The audio-visual materials facilitate, make experiences concrete and meaningful, which provide quicker and greater understanding to the learners. While collecting and reviewing information on vermicomposting the project worker found that there were no materials available with many illustrations having simple, direct instructions for easy comprehension. The literatures collected from the various sources had much use of technical language, which were difficult to understand by rural people. Hence, it was felt by the project worker that people with low literacy level in villages might have problems in using these materials as a practical guide. Therefore, the project worker prepared a set of charts and flex in Gujarati covering the topics mainly on process of preparing the vermicomposting unit, points to be kept in mind while adding waste in the unit, care to be taken during vermicomposting process and benefits of adopting vermicomposting project. Care was taken that the language and visuals used were easy to understand. The project worker also distributed the copies of pamphlet which was prepared and used by ex-student on similar kind of project from the same department to the participants to take home as a source of reference.

Stage – II Execution of the project:

Following steps were executed to implement the

project successfully:

- Approaching and attracting attention of the people for vermicomposting
- Arousing interest, convincing people and promoting awareness about vermicomposting
- Leading to action and guiding to manure production
- Monitoring the execution of the project
- Field visit
- Testing the nutritive value of manure
- Evaluation of the project
- Achievement of the project at a glance
- Conclusion
- Recommendations
- Approaching and attracting attention of the people for vermicomposting

With the help of SVADES project officers and field workers; the project worker started approaching people in both the selected villages namely Gohilpura and Kotna during the month of June 2007. In this context, she approached farm men and farm women. In the first meeting, the project worker tried to bring attention of the village people towards vermicomposting as a waste management technique, its advantages and agro waste as a major useful source to obtain manure. This step was carried out by explaining from learning materials prepared by the project worker about the-

- benefits of vermicomposting as a feasible method of waste management.
- deterioration of land quality due to increasing use of chemical manure.
- contribution of the farm men and women in the use and adoption of vermicompost manure.

Arousing interest, convincing people and promoting awareness about vermicomposting:

In the initial meetings, the project worker convinced people by talking to them personally and showing benefits of adopting this technique with the help of learning materials. The project worker also approached aanganwadi workers and primary school teachers of both the villages, assuming that they provide mid-day meal and might have kitchen waste in big amount which can be utilized for manure production. The project worker also distributed pamphlets for better understanding. After initial meetings, the project worker convinced ten women in Gohilpura village. In Kotna village with the help of key leaders, ten farm men were convinced who had showed their interest in initiating these project activities. In all, thirty-seven household/farm people were approached among which twenty household/farm people got convinced

to start project in the first round. It was assured to each of the individual participants that all the needed help will be provided to them by the project worker and SVADES especially in preparation of vermicompost units, obtaining required materials for preparing the units (like bamboo basket, bricks, plastic etc), bringing and adding waste, cow dung and earthworm, taking care during the process of vermicomposting.

Leading to action and guiding to manure production:

The project was carried out in two phases. (1) Execution of action plan with first group of participants. (2) Execution of action plan with second group of participants.

PHASE I - Execution of action plan with first group of participants

In this phase following steps were carried out by the project worker with first group of twenty participants.

- Demonstration of vermicomposting
- Guiding and leading participants to adopt following steps of vermicomposting process
 - Collection and segregation of garbage and preparation of vermicompost units
 - Preparation of waste layer in vermicompost units
 - Checking of pH level and introduction of earthworms in the units
 - Maintenance of humidity in vermicompost units
 - Taking care of vermicompost units

Demonstration of vermicomposting:

After convincing people, the project worker inspired project participants to implement the project systematically. Demonstration can illustrate and explain a new production method, new tool or can show result in a convincing manner. Hence, the project worker organized demonstration in both the villages separately at key leader's place at a time convenient to all the participants. The assistant project officers (A.P.O) of SVADES also attended demonstration in both the villages given by project worker. The demonstration was followed by discussion.

Guiding and leading participants to adopt vermicomposting process:

Collection and segregation of garbage and preparation of vermicompost units:

The session of practical work was held by the project worker with participants to actualize operations shown in demonstration. So, in this step participants were instructed to select either a container for small unit or a site/open place to start vermicomposting in large unit. In Gohilpura

village, the farm women showed their interest to initiate the project on smaller scale by using container. A kit containing Bamboo basket (2feet height, 2feet area), hand gloves (1 pair), litmus paper (1 strip), along with informative reading pamphlet in Gujarati on vermicomposting, was provided from SVADES to each of the ten participants of small unit of Gohilpura village. The participants collected other required materials on their own like wastes (garden waste, agro waste, kitchen waste), animal waste (10 – 15 days old), gunny bags (to cover the basket, to prepare the base) and bricks (2 in numbers for one unit). In Kotna village, the project participants had their own farms, where large amount of agro and garden waste comes out on regular basis. The farm men had large open space at the backside of the home, adjoining to almost every household. Hence, project worker and the participants decided to use bedding technique to obtain vermicompost manure in their unused plot. A kit containing bricks (110 in numbers), thick plastic sheet (12feet x 4feet), hand gloves (1 pair), litmus paper (1 strip), along with informative reading pamphlet in Gujarati on vermicomposting, was provided from SVADES to each of the ten participants to develop bedding for large unit. The participants were instructed to collect other required materials like wastes (garden waste, agro waste, kitchen waste), animal waste (10 – 15 days old) and gunny bags (to cover the unit).

Preparing shade in large vermicompost unit was essential, as it requires to be protected from the sun and heavy rain for breeding process. Hence, a shade of 15feet x 10feet using bamboo, jute and sticks accommodating two beds consisting each of 10feet x 4feet were prepared by project participants as per the guidance of project worker. The participants were explained that according to the amount of waste materials length of bed can be increased, but height and width has to be kept 2feet and 4feet, respectively. Project worker consulted the expert to check the sizes of the shades for large vermicompost units. After deciding small and large units, project worker informed participants to collect and segregate the quantity of organic waste required in their units. The participants were instructed to collect their kitchen, agro, garden and animal waste as per size of the unit. The family members of the participants also helped during waste collection process. The project participants were explained the harmful effects by adding non-biodegradable wastes on earthworms. They were instructed to separate the following types of waste before collecting garbage for the units. These wastes were plastic bags and wrappers, metal / Stones / rubber, oily and spicy foods waste, wrappers of medicine and aluminum foils /glass

Preparation of waste layer in vermicompost units:

The participants got convinced by the instructions given by the project worker and collected only degradable waste like dry leaves, peels of vegetable and fruits, left over foods from the kitchen, farms, and animal waste. Project participants laid these degradable wastes in their selected containers / beddings. In the small units a layer of 2 inches was prepared at the base of the basket with materials like coconut coir and dry leaves. Second layer of 4-5 inches was prepared with the collected degradable wastes by the project participants under the guidance of the project worker. For large units also two layers were prepared of about 4 inches thickness of bedding materials like coconut fibers, sugarcane trash, grasses, or dry banana leaves by cutting it into smaller size by project participants under the guidance of the project worker. This layer served as a home for the earthworms during days and during compost preparation. Then the project worker guided project participants to prepare the second layer of 6-8 inches thickness on the bedding, of old dry cow dung and dried sludge from the biogas plant. This second layer being partially digested waste serves as food for earthworms. These two layers of 1 feet thickness from the ground were prepared within one month by participants of large unit. These layers were prepared to help the earthworms to settle them under temporary adverse conditions like excessive heat in the afternoon, or temporary water shortage occurring for short periods. Project worker also took experts help in checking thickness of layers in the first phase of large units.

Checking of pH level and introduction of earthworms in the units:

After preparing base layers in small and large units, animal waste and red earthworms (*Eudrilus eugeniae*) were added. Before introducing, earthworms in the units, the pH (Hydrogenic Concentration) level in the bedding waste mixtures were measured by the project worker, in both the units. It was necessary to maintain pH level of the collected waste within the range of 6.5 to 7.5, as that is the only suitable level for the earthworms. A high acidic or alkaline medium could harm the earthworms. It may also affect by reducing their growth rates. While checking pH level, the project worker found that out of twenty in three small units, the pH level was higher than the required range, which may be due to less amount of water. The project worker suggested participants to add required amount of waste and water in the unit to bring it into a balanced level. However, in the large unit the project worker was satisfied with the observation. After checking the environmental condition of both the units, *Eudrilus*

eugeniae earthworms were introduced in the required amounts. Each small units of ten members received 250g of earthworms worth about Rs.75, whereas each large unit of ten members received 5kg of earthworms worth about Rs.1500 from SVADES. The project worker explained and demonstrated the introduction of earthworms on the units to the participants. Earthworms were lightly placed on the second layer in a uniformly distributed manner on the surface by the participants. Inoculation of the earthworms was carried out carefully so as not to crush or harm the earthworms. Initially, some of the women participants were very reluctant to touch the earthworms, but the project worker again motivated and interacted with them. Those interactions helped the women to get over their aversion in handling earthworms.

Maintenance of humidity in vermicompost units:

The participants were explained that the second layer should be sprinkled with water mixed preferably with cow urine, keeping the surface of the second layer slightly moist. The project worker visited every alternate day to each of the small and large vermicompost units and guided participants by providing necessary instructions while following stepwise vermicomposting process. The process of garbage conversion into manure was faster in small units compared to large units due to small quantity of waste.

Taking care of vermicompost units:

The project worker instructed the participants to cover their baskets/bedding with jute sack and sprinkle water regularly in the units to maintain the humid atmosphere. The temperature was measured and pH level of the compost was again checked after one week by the project participants under the guidance of the project worker.

Execution of different steps of vermicomposting process by project participants influenced other villagers and the project worker came to know about second emerging group, which was taking shape in both the villages. The new emerging group encouraged the project worker to think about benefits of the project in long run. Hence, the project worker decided to develop trainer's group from both the villages to carry out action plan of phase II with second group of participants from their local areas.

Phase II – Execution of action plan with second group of participants:

The steps followed by project worker in this phase are:

- Selection of trainers
- Imparting training to trainers on vermicomposting
- Approaching second group of participants
- Execution of vermicomposting process with second group of participants by trainers

Selection of trainers:

To strengthen replication of project activities within and outside the villages, project worker decided to prepare trainers from the first round of participants who had already executed different steps of vermicomposting process successfully. Project worker selected four leaders from each of the two villages. Leaders were selected on the basis of their abilities and capacities in terms of clarity of the content, communicating skills and successful results of their projects.

Imparting training to trainers on vermicomposting:

These key leaders were charged with the responsibilities of conducting training with new upcoming groups. So they were given in-depth information on the subject by project worker providing IEC materials used in the project. In interactive sessions of the training, participants were taught to discuss about vermicomposting at length, answer the questions and guide the practical work for the new participants. This boosted their confidence and ability for action.

Approaching second group of participants:

Project worker approached motivated groups of participants, which emerged as a result of Phase-I in both the villages. There were fourteen participants from Gohilpura and ten participants from Kotna village. Trainers along with project worker discussed about the options of unit selection. Like first group here also fourteen participants from Gohilpura village selected small units whereas ten farmers from Kotna village selected large unit to execute vermicomposting project. SVADES was informed and asked to provide kit to small and large units participants of second group too, except earthworms. As earthworms are costly, to understand its importance among the participants, project worker developed a strategy of “pay an interest” by providing at least fifty per cent of earthworms to the new recipients of the project, after first round of manure production.

Execution of vermicomposting process with second group of participants by trainers:

The second groups of twenty-four participants were guided by trained leaders with the help of project worker in respective villages. Trainers in respective villages were

guided to follow steps of Phase-I, gave demonstration and explained vermicomposting process to second group of participants. Project worker summarized whole session and directed trainers to adopt practical work.

Project overview :

In all, there were forty-four participants adopted vermicomposting in first and second phase of the project.

Table 1 describes types of project units prepared by project participants in Phase-I and Phase-II.

Table 1 : Types of units adopted by the farm men and women from Gohilpura and Kotna village

| Sr. No. | Project unit | Project participants | |
|---------|-----------------------------|----------------------|-------|
| | | Gohilpura | Kotna |
| 1. | Small (using bamboo basket) | 20 | - |
| 2. | Large (preparing bedding) | 4 | 20 |
| | Total | 44 | |

Stage – III Monitoring and evaluation of the project:

The project worker monitored each phase of the project execution namely waste segregation, collection of garbage and maintenance of soil humidity for the first group participants, by personal visits. The monitoring was done to check for collection of required amount of garbage, growth of the earthworms, maintenance of the humidity in the vermicompost unit, production of manure and problems faced in a project execution. After every week, the participants were instructed to stir the mixture of the garbage for proper air circulation so as to promote growth of earthworms and speed up the process of manure production. It took almost one month, in the small units and two months in the large units to convert garbage in to fine granules. The participants could convert waste into nutrient rich manure. The project worker instructed participants to stop sprinkling water for two days, so that earthworms go deep into the unit. This would facilitate the collection of manure. The project participants were helped to sieve the granules to get good manure. This produced manure was ready to directly use in the farms. For second group of participants, on every alternate day, selected trainers of Gohilpura and Kotna were instructed by the project worker to guide and supervise the vermicomposting process by making personal visit at second group of participants' place. Every week visit to both the villages were made by the project worker to check and understand progress of first and second group of participants and also to interact with the trainers regarding vermicomposting process. Total production of vermicompost manure in small and large units by project

participants within the project duration of September 2007-April 2008 was as follows:

Table 2 : Total production of manure under the project

| Sr. No. | Production unit | No. of units | Production of manure (in kg) |
|---------|-----------------|--------------|------------------------------|
| 1. | Small | 20 | 1132 |
| 2. | Large | 24 | 6162 |
| | Total | 44 | 7294 |

Field visit:

Field visit/excursion provides opportunities for the participants to see production methods and conditions of farmers in other places. It brings local innovators into contact with each other. Keeping all these in mind the project worker thought that experiments and manufacturing of vermicompost manure was not sufficient to communicate vermicomposting process to the participants. Hence, the project worker arranged field visit to the "Sarjan Vermicomposting unit". It is situated at Aklau village of Vadodara district, which is 35 km away from Vadodara city. From 2004, this unit is run jointly by three farmers. The farmers of this unit are monthly producing around 100 tones of compost manure and commercially it is being supplied to different states of Maharashtra, Rajasthan, Utter Pradesh and some places of Gujarat and also use it at their own "Sarjan farm" to grow vegetables.

During this visit, owners of "Sarjan Vermicomposting unit" discussed vermicomposting process with the participants in detail, disclosing all technical details. The owners emphasized that this particular technology will have to be used patiently, the change in soil and plant should be observed with open eyes. It will help the farmers to achieve success not only in earthworm farming, but also in soil flora and fauna increase, in sufficient numbers. This will help the farmers to lead organic farming. The owners also focused on the usage of manure for domestic and commercial purpose. The project participants were amused by seeing the response of the activity they were doing. The visit was found to be encouraging and interesting. The project participants who could not join the field visit with project worker, visited on their own the nearby vermicomposting units at Naturopathy centre and Koyli village farm.

Testing the nutritive value of the manure:

To check the effectiveness of the manure in terms of its nutrients, project worker with the help of SVADES officials approached person in charge in the agriculture department of Gujarat State Fertilizer and Chemical

Limited (GSFC). Here, the sample of participants' manure was tested. Nutrient value of manure was checked and matched with ideal requirement of nutrient in fertile soil. It was found that all the samples had shown its richness in nutrients.

Table 3 : Nutrient profile of vermicompost manure

| Sr. No. | Property | Value Sample A* | Value Sample B* |
|---------|--|-----------------|-----------------|
| 1. | Carbon: nitrogen (C. N. Ratio) % | 1.55 | 1.52 |
| 2. | Phosphorus (P ₂ O ₅ , Kg/Ac) | 98.00 | 16.00 |
| 3. | Potassium (K ₂ O, Kg/Ac) | 280.00 | 300.00 |
| 4. | Liquid starch (EC 1:2) | 0.77 | 1.60 |

*(Sample A – Gohilpura village, Sample B – Kotna village)

To check the effectiveness of the project, project worker constructed a reaction scale to evaluate the project after its completion. Frequency and percentages were calculated to understand reaction of the participants. The results are reported under four categories of (1) Background Information (2) Opinions of the project participants regarding vermicomposting project (3) Trainer's opinion (4) Benefits of the project

Background information:

Background information revealed that; high majority (81.81 per cent) of the participants were young, in the age group of 15 – 40 years, living in joint families. Equal percentages (50.00 per cent) of the participants were male and female. Nearly forty one per cent (40.90 per cent) of the participants had obtained education upto higher secondary level. Almost fifty five per cent (54.54 per cent) of the participants were also doing business like running own shops; as car drivers and forty-five per cent (45.45 per cent) of them were occupied in service as aanganwadi worker, nursery labourer, private company labourer. Majority of the participants (70.45 per cent) had their monthly family income ranging between Rs.1001 to Rs.2000. All the participants (100 per cent) possessed their own farm, were using animal waste as natural manure and high majority of the participants (97.72 per cent) were using chemical manure in their farm. High majority (88.37 per cent) of the participants spend Rs.100 to Rs.500 monthly to buy manure whereas few per cent (11.62 per cent) of the participants spend between Rs.501 to Rs.1000.

Opinions of the project participants regarding vermicomposting project :

Regarding content and teaching learning materials

all the participants (100 per cent) felt that it was complete and easy to understand. Regarding instruction and procedures of teaching methods used by project worker, demonstration and discussion both the methods were found most suitable, appropriate and easy to understand by all the (100 per cent) participants. Field visit as a method was found by high majority (90.90 per cent) of the participants effective and remaining nine per cent (9.09 per cent) of the participants did not react to it, as they did not go for visit due to their personal reasons. All the participants (100 per cent) felt that vermicomposting is useful as a waste management technique and were ready to continue vermicomposting project. With regard to reasons for participation in the project, high majority (95.45 per cent) of the participants participated in the project to develop cheaper manure, followed by management of biodegradable waste (90.90 per cent). More than three fourth (77.27 per cent) of the participants participated in the project to generate a source of income, as well as to learn a new thing (72.72 per cent). With regard to assistance in the project activities, all the participants (100 per cent) took help for execution of the project. High majority of the participants (77.27 per cent) had taken help from family members followed by neighbours and friends (72.72 per cent). A very few per cent of the participants also had taken help from the labour (18.18 per cent) to execute the project. With regard to type of help sought during project activities, participants reported that more than half (56.81 per cent) of them had taken help for introducing earthworms in the unit and taking care of the units, whereas half of the participants (50.00 per cent) had taken help for using manure in farm/kitchen garden. Almost forty one per cent (40.90 per cent) of the participants had taken help for collecting waste, putting waste into the unit and in selling the manure. With regard to problems faced by the participants in the project, high majority (86.36 per cent) of the participants did not face any problem during execution of this project. Few per cent (13.63 per cent) of them faced problem of flies/mosquitoes/ants/snails/other insects. With regard to the participants' opinions regarding promotion of vermicomposting to others, all the participants (100 per cent) that they would like to promote vermicomposting to others. High majority (81.81 per cent) of the participants would like to promote this technique to their relatives and neighbours. Almost seventy-seven per cent (77.27 per cent) of the participants reported to promote this technique to their friends followed by family member.

Trainer's opinion:

All the trainers (100 per cent) provided training to

other groups within and outside villages. With regard to the problems faced while imparting training to others on vermicomposting by trainers prepared under the project, finding revealed that majority (62.50 per cent) of the trainers didn't face any problem whereas almost thirty seven per cent (37.5 per cent) of the trainers had faced problems during giving instructions to others.

Benefits of the project:

With regard to the reasons of adoption of vermicompost by others in their villages, all the participants (100 per cent) felt that other people should adopt vermicomposting. More than half of the participants (54.54 per cent) felt that other people should adopt vermicomposting, as it is a technique of producing cheaper manure. Little more than thirty per cent (31.81 per cent) of the participants reported that this technique could be adopted to generate income of the family. With regard to vermicomposting as a useful technique, findings revealed that, all the participants (100.00 per cent) felt vermicomposting as economically, ecologically and socially helpful technique. Further, it revealed that in terms of economic benefits, high majority of the participants (95.45 per cent) felt that this technique is useful to obtain cheaper manure. Almost ninety-one per cent (90.90 per cent) of the participants reported that this technique is helpful to promote income of the family. Almost seventy three per cent (72.72 per cent) of the participants felt that this technique could reduce the use of chemical fertilizer. Regarding ecological benefits high majority (93.18 per cent) of the participants felt that, it saves land degradation and provides long life to the products. Participants also felt that vermicomposting technique is helpful by getting nutrient rich manure (90.90 per cent) followed by management of biodegradable waste (81.81 per cent) and rehabilitation of soil (79.54 per cent), respectively. Majority (63.63 per cent) of the participants felt that vermicomposting leads to sustainable environment. In terms of social benefits high majority (90.90 per cent) of the participants felt that, this type of project help them to raise their status as an organic farmer, followed by feeling of making social bonds more stronger, by bringing like minded people of the community more closer as well as becoming a responsible citizen by keeping environment clean (88.63 per cent and 86.36 per cent, respectively).

Achievement of the project at a glance:

The visualized effect and progress achieved in community-centered project of vermicomposting was also checked, measuring following three main goals of capacity building namely; A) Replicability, B) Effective use, C)

Sustainability

Replicability:

This goal was visualized and measured by checking project worker, participants and collaborative organization's ability to communicate to expand the project.

Efforts of project participants:

It was found that one-third women of Gohilpura have expanded their vermicomposting units from small to large without seeking any assistance from the collaborative organization.

Efforts of project worker:

Efforts of project worker on vermicomposting project were published by local print media namely The Times of India, Gujarat Samachar, Sandesh and Loksatta-Jansatta. As a result seven different individuals/organizations have contacted project worker and asked to demonstrate this technique for adoption. Further, new group of participants in both the villages are ready and hence trainers are guided to follow same steps.

Efforts of collaborative organization:

To expand project, collaborative organization under the project has offered trainer's visit package for new-interested groups. Through this trainers will developed their potentials and will be given chance to replicate project work.

Effective use:

This goal was visualized and measured, keeping in mind optimal use of manure for domestic and commercial purpose as well as its consistent use by project participants. In all, 7294 kg manure was produced in the project, by forty-four participants. Out of that, 7107 kg worth cost of Rs.35,535.00 (1 kg = Rs.5) was used by project participants for their own farms on regular base whereas rest was sold to earn profit. Commercialization of the vermicompost manure was done as per participant's demand. SVADES provided a platform, where with the help of the project worker participants sold produced manure. Manure was sold at two major outlets as exhibition of Reliance Ladies Club and in United Way Mela, 2008 in Vadodara city. Few of the participants explored their own avenues to sale manure. In all, through different outlets, total 187 kg vermicompost manure was sold and earned Rs.1445.00. The profits were distributed among participants according to their share of manure.

Sustainability:

This goal was achieved by strengthening individual project participants as well as through management of resources.

Strengthening individuals' capacity:

During project execution at the end of phase-I, the second group of participants in both the villages were ready to adopt project activities, which were later on trained. Total eight leaders were selected and trained to sustain project activities for future. Trainers conducted four training programmes, from which two within the village Gohilpura and Kotna and two in outside communities like Reliance ladies club of Vadodara and farmers of Moti Koral village, Nareshwar, Vadodara. Two more new groups are ready within two selected villages to adopt vermicomposting.

Management of resources:

To make availability of earthworms easy within the villages, management of resources under sustainability goal was visualized. Project worker emphasized importance of earthworms and asked project participants to "pay an interest" by providing at least 50 per cent of earthworms to the new recipients of the project after first round of manure production.

Conclusion:

Over all, project results were quite encouraging. Vermicompost manure was used by the participants on regular basis to achieve better results in their plants and farms. It indicates that, adoption of such practice needs to be promoted to the large number of people in society. As it not only practically solves the problem of garbage management, but also develops sustainability of soil nutrients and yet provides better natural manure. However, adoption of such practice by handful people will not serve much purpose, but united efforts of all the people in promotion and adoption of vermicompost manure helps to serve for the better environment in long run.

Recommendations:

- A research can be carried out to check the effectiveness of the vermicompost manure on crop production.
- Similar project with below poverty line (BPL) families in various villages of different districts and states can be carried out for promotion of income.
- A similar type of project can be taken up to create awareness and promote vermicomposting in urban areas.

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