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Vermicompost Production: A Successful Agro Enterprise by a Group of Women Farmer in Moriga on District of Assam

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A B S T R A C T

Vermicompost is mainly the worm cast along with decayed organic matter which is rich in essential plant nutrients and various plant growth promoting substances. During the vermicomposting process brown coloured coelomic fluid of the earthworm is released, known as vermiwash, which is also considered as a liquid fertilizer. In recent years, demand of organic inputs for crop production has increased due to the growing concern on negative impact of chemical fertilizers on soil health. There is a huge scope for establishment of a vermicompost producing enterprise involving farm women which will help them in increasing their farm income. A group of women farmer trained by Krishi Vigyan Kendra, Morigaon in collaboration with a Non-Governmental Organization named Rastriya Gramin Vikash Nidhi for low cost vermicompost production leading to formation of a Farmers' Producer Company in Morigaon district of Assam.

Introduction

In recent years, due to the increasing demand of food grains to feed the growing population, use of chemical fertilizers to increase the productivity has significantly been increased leading to the deterioration in soil quality.

In the state of Assam, declining trend of factor productivity of rice shows the evidence of un-sustainability in rice based cropping system (Singh, 2011). Deterioration in soil quality is mainly caused by the imbalanced use of chemical fertilizer. Due to the growing concern of negative impact of injudicious use of chemical fertilizers on soil health among the farmers, demand of organic inputs for crop production has increased. Hence, there exist a huge potential for establishment of an enterprise involve in vermicompost production.

Vermicomposting is a process of making compost using earthworms. In the process, earthworms pass

the organic wastes through their digestive system and convert them into vermicompost which is mainly composed of worm cast along with decayed organic matter (Yangchan *et al.,* 2019).

The earthworm cast is rich in beneficial soil microorganisms along with macro and micro nutrients, vitamins, growth regulators, enzymes like protease, amylase, lipase, cellulose and chitinase (Olle, 2019). Vermicompost when added to the soil improves the soil aeration status.

It improves the water holding capacity of the soil due to the hygroscopic nature of the mucus associated with it. In general, vermicompost helps in formation of stable soil aggregates, enhances soil organic matter level, nutrient content, cation exchange capacity, microbial activity, microbial biomass carbon and enzymatic activities which helps in maintaining the sustainability in the crop production system (Kumar *et al.,* 2018).

During the process of vermicompost preparation, a brown coloured liquid extract known as vermiwash is released. It is the coelomic fluid of the earthworms.

The wash is considered as a liquid fertilizer which is collected after passage of water through the different layers of vermicomposting unit (Jayabhaye and Bhalerao, 2015).

Several studies revealed that the wash is rich in enzymes, plant growth hormones, vitamins, micro and macro nutrients (Bucker field *et al.,* 1999). The wash is often used as foliar spray in standing crops. There were reports of improvement in soil physico-chemical properties treated with vermicompost and vermiwash mixture (Tharmaraj *et al.,* 2011).

It has also been observed that vermiwash has bio-pesticidal properties against leaf eaters (Samadhiya *et al.,* 2013) and its effectiveness increases when used with bio-pesticides to control *Lucinodes orbanalis* infestation in Brinjal crop (Mishra *et al.,* 2014). Considering the above facts, vermicompost production with locally available material provides an opportunity of self-employment for the farmers through marketing of the compost.

A group of women farmer from Morigaon district of Assam, trained by Krishi Vigyan Kendra (KVK) Morigaon, came forward and adopted low cost vermicomposting technology as an income generating avenue.

Materials and Methods

Success story of a group of farm women

KVK Morigaon, since its establishment organized several self-employment activities for upliftment of socio-economic standard of the rural people. One of such initiative is promotion of low cost vermicompost production. Several training and demonstration programmes on low cost vermicomposting are being conducted at farmers' field.

At the same time, a national level Non-Governmental Organization (NGO) named, Rastriya Gramin Vikash Nidhi was also working in the district for livelihood improvement of rural people.

The NGO had implemented a project entitled "Promoting Farmer Collectives & Improving Resilience of Vulnerable Communities" in June 2019.

Among the various operational domain of the NGO, vermicompost production is one of them and as such they came in contact with KVK Morigaon for technological support.

KVK Morigaon conducted several training programmes for the Field Facilitators and Local Service Providers working under the NGO and also for the farm women working under their operational area. A 25 days skill development training programme on Job Role Vermicompost Producer sponsored by Agriculture Skill Council of India was

also organized during 2020-21. After the training programmes, demonstration on low cost vermicomposting technology was also conducted by KVK, Morigaon.

The technology was spread among the farm women of 15 villages by the Field Facilitators and Local Service Providers working under the NGO.

The technology was found suitable and very much accepted by the women farmers. On account of continuous effort of KVK, Morigaon and in collaboration with NGO RGVN, there is a boost in adoption of low cost vermicompost production technology by the farm women.

Farmers' Interested Groups (FIG) had been identified by the NGO from the operational villages and on 3rd May 2021, a Farmers' Producer Company (FPC) named "Yangli Farmer Producer Company Limited" was formed comprising of 102 numbers of FIGs.

At present a total of 1022 numbers of farm women (shareholders) of the FPC are involved in vermicompost production. They are now able to harvest 8 to 9 quintals of vermicompost from each tank in each cycle which helps them in earning an annual income Rs. 70000.00 to Rs. 90000.00 per annum. Marketing of vermicompost and vermiwash is streamlined by the FPC.

They have collection points in each village where processing, packaging and storage of vermicompost produced by the shareholders are being done.

Packaging has been made in 1kg, 5kg and 50 kg packets. 1kg and 5 kg packaging are in high demand among urban people for their terrace gardens as well as kitchen gardens and are sold in retail at a price of Rs 32.00/kg and Rs. 14.00/kg respectively. 50 kg packaging are sold in whole sale at a price of Rs. 8.00/kg within the district as well to the other districts and other neighbouring states. FPC is also selling vermiwash in half litre bottle at a price of Rs. 50/bottle.

Farm women involved in processing and packaging of vermicompost at the collection centres earn Rs. 2.00/kg of packaging.

To attract the customer's interest, the nutrient analysis of vermicompost has also been done by the FPC at North Eastern Regional Institute of Water and Land Management (NERIWALM), Tezpur, Assam and the analysis report has been printed in the packets.

Till now the FPC has sold 388.88 tonnes of vermicompost with a monetary benefit of Rs. 35,00,000.00. The excess of production, produced by the shareholders, which could not be marketed was utilized in their own farm which in turn reduces the cost of purchasing chemical fertilizer for crop production.

Earthworm species

Based on the feeding habit earthworms are categorized into three different types: Epegeic, Endogeic and Anecic. Among them, Epigeic species are used for vermicomposting. They lives in the surface litter and feed on decaying organic matter.

Among the Epigeic species, *Eisenia foetida* is used in vermicompost preparation due to its rapid reproduction ability and is highly efficient in recycling of organic materials. It also has capacity to withstand a wide temperature range of 0ºC to 35ºC, however optimum temperature ranges between 20ºC to 30ºC.

Production technology of vermicompost

Pit Method

Composting is done in low cost vermicomposting units of size 2.5 m(L) X 0.91 m (B) X 0.91 m(D) using locally available materials such as bamboo and polythene sheet.

A PVC pipe (1.27 cm diameter) was used for connecting the vermicomposting unit with an

earthen pit (0.31 m x 0.31 m x 0.31 m) for collection of vermiwash (All India Coordinated Research Project for Dryland Agriculture, Biswanath College of Agriculture, AAU, 2015). The tank was established in a cool, moist and shady area.

A shed over the tank was provided to prevent the entry of rainy water and direct sunshine. Before filling the tank, organic wastes were collected and heaped under sun for about 7-10 days.

Chopping of larger size organic waste like banana pseudo stem into 2-3 mm size was carried out. The organic material used for vermicompost preparation should be partially decomposed. To fasten the decomposition process sprinkling of cowdung slurry was done over the heap. At the bottom of the tank, a thin layer of sand (1-2 inch) was placed.

Tank was filled with partially decomposed organic waste and cowdung layer wise (10-20 cm thick). The bio waste and cowdung ratio should be 60:40 on dry weight basis. After filling the tank, 750 gm of earthworms spp (*Eisenia foetida*) was released. Gunny bags were placed over the compost.

The moisture level of the pit was maintained at 70-80% and hence sprinkling of water was done as and when necessary. The compost gets prepared within 2.5 to 3 months.

Harvesting

The maturity of the compost was judged when the organic materials were completely decomposed and turns into granular structure. Sprinkling of water was stopped and the compost was heaped so that earthworms could move downward. The compost was then sieved after two days in a 2 mm sieve.

Results and Discussion

From the present study it was clear that a community effort could bring a revolution in farming sector. In this case, a group of farm women motivated by KVK, Morigaon and the NGO (Rastriya Gramin Vikash Nidhi) created an enterprise which was registered as Farmers' Producer Company comprising of 1022 numbers of shareholders involved in vermicompost production with locally available resources.

KVK, Morigaon played a major role in providing technical support through training and demonstration programme to the share holders. The successful implementation of low cost vermicomposting enterprise by the group of farm women was popularized by different print and electronic media leading to easy marketing of the compost which was streamlined by the FPC.

The excess produce which could not be marketed is utilized in their own farms which in turn reduce the cost of chemical fertilizer. The demonstration programme conducted by KVK, Morigaon during 2021 recorded a cost benefit ratio of 2.5:1 and the results are shown below:

Average vermicompost production per tank in one cycle: 8.30 q

Average earthworm production per tank in one cycle: 2.7 kg

Average vermiwash production in one cycle: 45 Ltr

Average vermicompost production per tank in one year: 23.88 q

Average earthworm production per tank in one year:7.2 kg

Average vermiwash production in one year:156 Ltr

Net Return: Rs 26,045.00/tank/year

B:C ratio: 2.50

Note: Time required to produce vermicompost is 2.5 to 3 months in summer season and 3 to 3.5 months in winter season. Total 3 times vermicompost can be produced from one tank in one year from the low cost vermicompost units.

Table.1 Cost of production

(A) Fixed cost (for construction of one no. of tank)

Sl. No.	Particulars	Quantity	Rate (Rs.)	Amount
01	Bamboo	8 nos	200.00/no.	1600.00
02	Labour	6 nos	300.00/mandays	1800.00
03	Plastic	LS	LS	400.00
04	Sand and Gravel	LS	LS	200.00
05	Earthworm	750 gm	2500.00/kg	1875.00
Total				**5875.00**

(B) Operational cost for one year

Sl. No.	Particulars	Quantity	Rate (Rs.)	Amount
01	Labour	24 nos	300.00/Mandays	7200.00
02	Cowdung	1440 kg	1.5/kg	4320.00
Total				**11520.00**

(C) Total Cost: (A + B): Rs. 17,395.00/tank/year

Table.2 Gross return per year per tank: Rs. 43,440.00/tank/year

Sl. No.	Particulars	Quantity	Rate (Rs)	Amount (Rs)
01	Vermicompost	23.88 q	10.00/kg	23880.00
02	Earthworm	7.2 kg	2500.00/kg	18000.00
03	Vermiwash	156 Ltr	10.00/Ltr	1560.00
Total				**43,440.00**

Fig.1 Training on Vermicompost Producer sponsored by ASCI

Fig.2 Low cost vermicomposting unit

Fig.3 Director of Research (Assam Agricultural University, Jorhat) addressing farm women enrolled under training programme

Fig.4 Director of Extension (Assam Agricultural University, Jorhat) visited the packaging site of Yangli FPC

Fig.5 Vice Chancellor (Assam Agricultural University, Jorhat) visited the packaging site of Yangli FPC

Fig.6 Demonstration on low cost vermicomposting by Krishi Vigyan Kendra, Morigaon covered by DD News.

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