

International Journal of Agriculture Extension and Social Development

Volume 8; Issue 5; May 2025; Page No. 335-338

Received: 16-02-2025
Accepted: 25-03-2025

Indexed Journal
Peer Reviewed Journal

A case study of Ladakh: Black gold (Vermicompost) change farm women livelihood

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DOI: <https://www.doi.org/10.33545/26180723.2025.v8.i5e.1906>

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Abstract

This study carried on Latsal Lukh ar Tsogspa SHG in Sumoor Nubra in Ladakh seeing the facts and properties of vermicompost, 14th ladies SHG group started Vermicompost producer start up and set an example for the village. First time they harvest around 3600 Kgs and sold at the rate of Rs 35 /kg and earned 126000 rupees in 4 month, in a year Rs 252000 earned. Ladies are very happy with this technology and decided to sail worms @ 300 per Kg. The B.C ratio of this technology is (1:2.60) which played significant role in uplifting of socioeconomic status of farm women to uplift the socio- economic status of all farm women/farmers of Ladakh and boost organic farming which is the main mandate of nation. Beside that this black gold is rich in micro nutrients, macro nutrients, income generation and source of livelihood.

Keywords: Vermicompost, micro-nutrients, macro-nutrients, revenue generation, livelihood

Introduction

Vermicompost has adequate amount of micro-nutrient and macro-nutrients depending on sources of earthworm's feedstock. Vermicompost has at least four times more plant nutrients than conventional cattle dung compost. Vermicomposting is a source of creating self employment and revenue generation. Vermicompost is becoming popular day by day as it provides quality products through major component of organic farming system (Yadav *et al.*, 2013) [10]. It is an organic fertilizer produced by the earthworms when we put that earthworm in the organic wastes through the digestive systems. The process of preparation and convert this organic waste into organic fertilizer is called as vermicomposting. This Earthworm enhance and restores soil fertility and boost up crop productivity and its yield by the use of their excretory products known as vermicast. Vermicast products of microbial activities is also known which promote plant growth, disease antagonists and growth influencing substance like hormones. Black gold is a safe, non-polluting and one of the most economical and convenient way of solving the waste disposal problems and recycling of organic waste. It is an excellent form of natural manure which is cost effective, easy to make, handling and contain high nutrients with growth hormones and are 4-5 times powerful growth promoter than all other organic fertilizers and over 30- 40% higher than the chemical fertilizer (Narkhede *et al.*, 2011, Attarde *et al.*, 2012) [5, 1]. Various researchers reported that Vermicompost contain 17-36% Humic acid and 13-30% Fulvic acid of total concentration of organic matter. Besides, Vermicompost has an adequate amount of micronutrient and macronutrients depend on sources of feedstock. (Sinha *et al.*, 2010) [9] state that earthworms and vermi-compost can promote growth 50-100 per cent than compost and 30-40 per cent over chemical fertilizers. Keeping in view the above facts and

properties of Vermicompost, A women SHG's of 14 farm ladies took initiative as vermicompost producer and there group name is known as Latsal Lukhar from Sumoor Nubra, block Leh art up unit in Nubra once they received skill development training on Vermicompost producers under NABARD project for 10 days. SHG's change their life and livelihood, this SHG's play significant roles for rest of the block farm women especially in generated employment and to make herself independent. Now, they became a role model and farmers community took them as master trainer in entire Nubra village for their personal production of black gold.

Materials and Methods

This story was conducted in Nubra block in Leh district of UT Ladakh. Latsal Lukh ar Tsogspa SHG in Sumoor Nubra, 14th ladies group started Vermicompost producer start up and set an example for the village Sumoor Nubra district Leh UT- Ladakh, India. Agriculture is the main source of livelihood since 50years in this field. In 2020 ten days skill development training programme on vermicompost producer under NABARD were help were SHG's came in contact with HMAARI SKUAST-K Leh. This training was new for them. Before this training all of them doing traditional practices and using normal compost and crops like wheat, barley and some vegetable on a usual pattern and applied chemical fertilizer. This training play game changer contact with Dr Jigmet Yangchan (Training Instructor/ PI of this NABARD Project) in HMAARI scientists. SHG took initiative and started their own vermicompost unit at large scale on scientific basis. In the meantime under NABARD project on Dissemination of Vermicompost technology in Ladakh region they provide 2 bags of plastic vermicompost to each and worms to SHG's farm women to encourage their work and for start up their business. During this training

SHG'S got the benefit to make good linkages with other department. Agriculture department provided three unit of large size cemented structure of 30 x 8ft sizes for Vermicompost production on subside bases. SHG's was known as vermicompost producer, due to this technology they are receiving more demand of vermicompost not only from line departments but also from farmers and hotel owners. Within three cemented structure and two bag they earned Rs 94500/ and Rs 31500 from Vermicompost bag= in four months they harvest twice in year. After getting training and vermibags from HMAARI SKUAST-K Leh they earned around Rs 252000/=per year. Now they spread their business to large scale.

aSHG's having own agriculture land and a dairy unit with each group member. SHG'S also interested in raising crops in an organic way after successful capacity building through this training programme. Sumoor village is tourist spot and plenty of hotels and guest houses. Farm women get good return from this technology and very satisfied with this technology because SHG is not only securing their livelihood but also sets an example for coming generation as well as for farmers community of Summor and Nubra region. Through this training SHG's got various training on different cash crop cultivation through Vermicompost manure. SHG's developed their farm by knowing organic farming through vermicompost in watermelon production, cucumber, mulching technology branjal, cucumber etc for army supply. Today Latsal Lukh ar Tsogspa SHG has become a role model cum master trainers for farm women's of Sumoor as well as entire Nubra region in the field of Agriculture

Method transferred to SHG for vermicompost preparation

Teaching and demonstration were tough during 10 days skill programme. Various factor affecting while preparing vermicompost especially in Ladakh when temperature variation from -35 degree to +34 degree. After three years of deep research (2015 to 2018) on vermicompost techniques and its procedure we are able to reduce the length period of decomposition of manure from 2 years to three to 4 month in places like Ladakh. Following affecting factors are mention below.

1. Factor affecting lengths period of Vermicomposting process in Ladakh

In vermicompost process total six situation is very important for the length of time for complete the process.

- C:N Ratio
- Site selection
- Rotation/ Aeration
- Appropriate Moisture
- Appropriate Temperature
- pH

1.1 C:N ratios

All organic material contains carbon and nitrogen. Carbon is a major component of the cellulose and lignin that give cell walls their strength. Nitrogen is found in proteins and many other compounds inside plant cells. The carbon-to-nitrogen ratio (C: N) of a material is an estimate of the relative amounts of these two elements it contains. It is usually

based on the percent dry weight of carbon and nitrogen in the material. A ratio of about 30:1 is ideal for the activity of the microbes in the vermicompost. This balance can be achieved by controlling the materials included in the vermicompost or by adding nitrogen either from fertilizer or from organic materials high in nitrogen, such as manure or grass clippings. Table 1 shows the approximate ratios for some materials commonly added to vermicompost piles.

Table 1: Carbon to nitrogen ratios in various materials

Various material	C:N Ratio
Cow manure	20:1
Vegetable waste	20:1
Grass clippings	12 to 25:1
Tree leave	30 to 80:1
Straw	40 to 100:1
Wood	700:1
Poultry	13 to 18:1
Saw dust	200 to 500:1

Source: Dr. Chris Starbuck "Processes in Compost Making"

The items at the beginning of the list are highest in nitrogen; those at the bottom are highest in carbon. These ratios represent comparative weights. The 30:1 ratio in vermicompost is the most desirable to supply the microorganisms with the proper amount of carbon they need for energy and the proper amount of nitrogen they need for protein synthesis so they can function efficiently and quickly.

To estimate the C: N of a mixture, average the ratios of the individual materials. For example, a mixture of equal parts grass clippings and leaves might have a C: N of $(20 + 50) \div 2 = 35$.

1.2 Appropriate Temperature

Microorganisms generate heat as they decompose organic material. The appropriate temperature for vermicompost pile is between 25 and 32 °C is for effective vermicomposting. Due this temperature the rate of decomposition rate was very high by rapid growth in worm's production. With the high temperature its significantly helps in pathogen reduction. Due to low temperature decomposition rate reduce in Ladakh. Worms facing problem in cold temperatures when temperature goes to -20 °C they are doing struggling for survival and the decomposition process rate slowed down during winter season in place like Ladakh.

1.3 Appropriate Moisture

Moisture is the major factor for decomposition, Microorganisms only consume organic molecules if they are properly dissolved in water, approximately 60-80% moisture content is best for vermicompost. If the moisture content falls below 40% of moisture content the microbial activity will slow down or become dormant. If the moisture content exceeds 80% of moisture content, aeration is hindered, nutrients are leached out, decomposition slows, and the odor from anaerobic decomposition is emitted. The "squeeze test" is a good way to determine the moisture content of the composting materials.

1.4 Rotation/ Aeration

Rotation is the another major factor for proper

decomposition, for that available oxygen is must. Proper rotation causes Aeration, which replaced oxygen to the center of the compost pile where it is lacking. Proper decomposition can only occur if sufficient oxygen is present. This is called aerobic decomposition. Timely turning of manure at least twice a month is very necessary to proper aeration and proper decomposition.

1.5 Site Selection

Surface Area of vermicompost pile is neither to large or nor to small. It should be medium so that proper temperature and moisture can manage under Ladakh condition. Location of vermicompost unit should be selected where maximum solar radiation they can get especially in places like Ladakh. But in other plan areas the vermicompost unit should be in shaded area.

1.6 pH

The level of pH in the waste depends upon the decomposition rate and characteristics of feed material. The release of organic acids may decrease the pH and production of ammonia from nitrogenous compounds may raise the pH. At higher pH levels, more ammonia gas is generated and may be lost to the atmosphere. A pH value between 6.5 and 8.5 is optimal for compost microorganisms. As bacteria and fungi digest organic matter, they release organic acids. Normally, the pH of the organic manure will be very acidic at first, at a level from 4.0 to 4.5. By the time the process is complete, the pH should rise to approximately 7.0 to 7.2.

For this study we used *Eisenia foetida* (Red earthworm) which is selected because its best for higher altitude like Ladakh where mortality is the major issue and its high worm multiplication rate and converts abundant amount of organic wastes under low temperature too.

Important Preventive and Precaution measures for reducing mortality of worms

Most important parameter while doing site selection especially for Ladakh is south facing where maximum solar radiation we achieve for maximum production either

commercial or personal. Vermicompost research trial was done at HMAARI SKAUST-K stakna after lots of release for three years finally the result will find that at least 30 day's partially decomposed cow dung used to avoid excess heat and mortality of worms. Restriction of fresh dung and waste because worms would die in fresh cow dung. The organic wastes were free from, chemicals, pesticides and metals etc. Frequently turning/ rotation boost Aeration, help to maintaining for proper growth and multiplication of earthworms. Optimum moisture level (50-60%) and temperature 25-32°C (Sharma, 2009)^[8] was maintained for proper functioning of worms as per research and we find the same. Exceed moisture cause mortality by high uptake of liquid by worms. Ants are dangerous enemy of worms, so charcoal powder was mixed to the raw materials to escape from them so no sugar, no salt, no oil no chemical product no sour, bitter contents material used in Vermicompost bedding to protect worms from ants, lizard, rats, rabbit, etc. Prevent from birds so cover the bed nicely to retain heat as well as protection from above mention enemies of worms. Activities of worms were monitored frequently for producing quality produce. All works from production to packaging was done in shade and the products were stored in shade and one kg poly bags or 50 kg poly bags were used for marketing.

Results and Discussion

Ladakh where temperature varies too high from -30 °C to + 32 °C then epizoic species such as *Eisenia foetida* (Red earthworm) perform best for this region. As the mortality rate is too low during harsh winter. Rate of multiplication is 4-5 worms from each cocoon. During summer season the rate of multiplication is too fast than winter season. It's taken normally three and half month in summer season and during winter around eight nine months for proper decomposition. Once it decomposed it perform best at field crop because Ladakh is already having low organic carbon and its boost the quality and fertility of the soil. Data collected from farmer's field and its statistics is depicted in (Table 2) which clearly indicated that benefit and cost ratio is 1:2.36 which is profitable enough for farmers.

Table 2: Cost: Benefit ratio of Vermicompost

Cost of Vermicompost production per bag in 4 month (Rs.)	Gross Income (Rs) per year	Net Income (Rs) Per bag	B.C. Ratio	Total 3 unit cement structure 30x 8ft produces 900kg/unit, 2 unit of vermin bag(4'x4'x2') produces 450kg/unit, total compost produced- 7200kg, sale per year of vermicompost@35/Kg
106500	252000	145500	1:2.36	

Conclusion

The success of any production system basically depend on need, availability of inputs and marketing channels by which one can get the remunerative price by using locally available resources. The key to the success of organic farming system is the production of all inputs like, manures, plant protection etc., and on-farm utilizing the local resources wherein animal husbandry plays a catalytic role. The study on economics of vermicompost production indicated that it is 50-57% economical enterprise as compared to costly chemical fertilizers. Direct marketing of vermicompost from producer to consumer was found to be strongest marketing channel, however marketing through

cooperatives and trader was also found in few instances. Economics of vermicompost production was carried out in Coorg district of southern Karnataka, India to compare benefit cost ratio and observed 1.78 and 1.52 for wet method and heap method, respectively (Reddy *et al.*, 2009)^[7]. Specialized market for vermicompost was not observed in the study area but obvious that about 85% Vermicompost was marketed directly from producers to local consumers. It is essential to clearly define a national policy on organic farming by supporting private sector groups, NGOs or associations, and encouraging farmers to produce their own fertilizer in respective country (Ranaivoarisoa *et al.*, 2016)^[6].



By this case study it can be concluded that Latsal Lukh ar Tsogspa SHG in Summoor Nubra, 14th ladies group started Vermicompost and set an example for the village, beside that started using Vermicompost in their farm mean time they started sailing in Hotels and Guest houses of Nubra itself. First time they harvest around 3600 kgs in 4 month and solded at the rate of Rs 35 /kg and earn 126000 rupees, in entire year SHG earned Rs 252000. Ladies are very happy with this technology and decided to sail worms @ 300 per Kg. Beside that they encouraging interested farmers/ farm woman to prepare this multifunctional quality product on their own farms so that farming community can be benefitted. Data collected from SHG's field indicated that benefit and cost ratio (1:2.36) is significantly higher and can boost-up women economy which is today's essential need. Meantime it also help women towards self empowerment in this remote areas with the help of NABARD and SKUAST-K Leh which played significant role to uplift the socio economic status of all farmers of Ladakh and boost organic farming which is the main mandate of nation.

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