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ECONOMICAL AND EFFICIENT APPROACH OF WASTE DISPOSAL AND RECYCLE THE ORGANIC WASTETHROUGH VERMI COMPOSTING TECHNOLOGY

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Abstract:

Vermi compost farming has been identified as one of the feasible agri-business activity for the farmers and rural women requiring less time and investment. Vermicompost can be used for all crops: agriculture, horticulture, ornamental and vegetables at any stage of the crop. Organic farmers can use vermicompost as a natural fertilizer to the plants. The major use of vermicompost is its availability at low costs as compared with other natural fertilizers.The present study was carried out in Sarah Tucker College Campus, Tirunelveli from August to October 2022**.** A mixture of dry leaves, card board, paper pieces, garden soil, organic waste including kitchen waste, buttermilk, water and earthworms were the cheapest materials used for Vermicomposting, were filled in a Vermi Pit. It is one of the easiest methods to recycle vegetable waste and garden waste to produce quality compost; the earthworms consume biomass and excrete it in digested form called worm casts. The soil inside the Vermipit is about 25 cm height. *Eudrilus eugeniae* is the common type of earthworms used for Vermicomposting**.** Vermicompost stimulates to influence the microbial activity of soil, increases the availability of oxygen, maintains soil temperature, increases soil porosity and infiltration of water, improves nutrient content and increases growth, yield and quality of plant. After a minimum of 65 days the colour of the compost started to changecolour and the complete decomposition of the compost took about 100 days with ideal conditions. Once the compost was ready, the residue turned black in colour. Approximate 100kg of best quality vermicompost harvested from single bed with single harvest. Total duration required for decomposition of vegetable wastes is about 65 days. It is concluded that the vermicomposting technology is an economical and practical way of solving waste disposal problems and recycling the organic waste. The current economic crisis is challenged by this technology's ability to provide people with fresh knowledge, self-confidence, and opportunities for tremendous entrepreneurship.

Key Words: Vermi Composting, Eudrilus Eugeniae, Microbial Activity, Waste Disposal, Entrepreneurship

Introduction:

"Cutting food waste is a delicious way of saving money, helping to feed the world and protect the planet". (Tristram Stuart, 2014). Women empowerment is defined by the process of attaining the ability to make strategic life choices. A study revealed that a women‟s perception of conservational gender-role values is affected by that of her spouse‟s employment intent as a women (Werbel, 1998). It ables to think logically and act independently. It is the course that builds power in women over their own lives, in communities and society. Moreover, they have minimal learning opportunities to capacitate them to become productive women in the community due to their poor literacy (Leach, 1998). It is a way towards improving women‟s capability to manage intellectual, social, and financial resources of states, as measured by women‟s participation in personal, social, economic as well as political aspects. Women play an important role in farm enterprises. Vermicomposting as enterprise has been running this successfully and earning good amount of money in production of vermicompost and to study the participation level of farm women about production of vermicompost. It is the Eco-friendly method of converting organic waste into nutrient rich fertilizer. Vermicompost farming have been identified as one of the feasible agri-business activity for the rural women (Kusum,2005; Baraskar *et al*., 2018a), requiring less time and investment (Baraskar *et al.,* 2018a).The production technique is simple and unlike crop production is not affected much by the climatic changes (Baraskar *et al*., 2018a).Various studies have indicated vermicompost farming as an additional source ofincome (Meti, 2013; Baraskar *et al.,* 2018ab) and thereby empowering rural women to a resonable extent (Diiro *et al*.,2018). Vermicomposting is the systematic procedure to decompose and transform organic matter into vermicast (Beetz 1998). Both earthworms and casting have high market demand (Manohar *et al.,* 2016).Vermicomposting venture has a potential to help farmers fetch resonable profits with little inputs. The word Vermiculture means the scientific method of breeding and multiplications of earthworms in controlled conditions. It aims at creating improved conditions artificially so that the earthworms can multiply in shortest period of time and space. Vermitechnology will be useful in field for decomposition of organic waste matters specially paper mill waste. India produces about 3,000 million tons of organic wastes annually which could be

utilized for recovery important resources like manure, fuel, food and fodder. Beside biogas and alcohol, this huge amount of waste has also the potentiality to produce 400 million tonnes of plant nutrient. The current work is designed to document the process of vermin compost production, the morphology, behaviour of the earthworm *Eudrilus eugieniae* and also focus the women empowerment through vermiculture to promote entrepreneurship.

Materials and Methods:

The present study was carried out in Sarah Tucker College Campus, Tirunelveli from August to October 2022 for the production of vermiculture. The various substrates taken for the present work were vegetable wastes, paper waste and garden soil also adding the inoculum of buttermilk and the earthworm (*Eudrilus eugeniae*). The present study was conducted to evaluate the efficacy for the establishment of yield performance of vermiculture. Vermicomposting is a process to decompose and transform organic matter into vermicast.

Materials Required for Vermi Composting:

Card board & paper pieces	10 kg
Garden Soil	20 kg
Organic waste including kitchen Waste	70 – 80 kg
Dry leaves	3 kg
Earthworms	250
Water	Sufficient supply of water.
Butter milk	

Vermi Technology:

Prepare the pit 8cm × 8cm with flooring and make proper arrangement of shade and fill up the pit by adding cardboard ,garden soil ,vegetable wastes, dry leaves and number of 250 earthworms and provide water up to 30 days daily and wait and Add the microbial bio- inoculum as buttermilk of 3 litres by turning of compost once in a week and continue the process of filling covering ,watering and turning up to the completion of pit After complete filing of pit, continue watering up to 45 days and turning once in a week. Stop watering for 2 days and remove the compost from the pit. Make a heap in shady place for 3days and collect the worm from the lower level of heap and again release them in the pit atlast sieving andpacking of Vermicompost was done.

Study Animal:

The earthworm *E.eugeniae* was collected from the killikum agricultural college Thirunelveli Tamilnadu. *Eudrilus eugeniae* is the commonly type of earthworms used for vermicomposting in tropical and sub-tropical countries.

Classification:

Kingdom	Animalia Phylum Annelida
Class	Clitellata Subclass Oligochaeta Order Haplotaxida
Family	Eudrilidae
Genus	Eudrilus
Species	eugeniae

Eudrilus eugeniae are Epigeic worms and other word called Litter dwellers live in decaying organic matter, not in soil. They do not have burrows. It is small sized and they are very active or quick moving. The initial length of Earthworm is about 14cm and the final Length of Earthworm is 17cm

Results:

The Morphology and Their Behavior of *Eudrilus Eugieniae*:

Vermiculture is the propagation of earthworms. Its goal is to increase its quantity for a continued productive harvest. Table 1 shows that the features of *Eudrilus eugieniae.* It is one common local species. The spent vegetable waste was vermicomposted using *Eudrilus eugeniae* based on efficiency and sustainability in which earthworms are the primary agents. African night crawler (*Eudrilus eugeniae*) to eliminate organic waste is ecologically efficient and environmentally sustainable. Earthworm species native to tropical west Africa and now widespread in warm regions under vermicompost; it is an excellent source of protein and has great pharmaceutical potential.

Table 1: Features of *Eudrilus euginae*

Name ofworm species	Limits and optimal Temperature	Limits and optimal moisture	Colour	Size of adult worm	Time to maturity	Incubation Time
Eudrilus eugeniae	25◦c(16◦c-30◦c)	80‰(70‰-85‰)	Reddish-brown	5-7mm *80-190mm	40-49 days	12-16 days

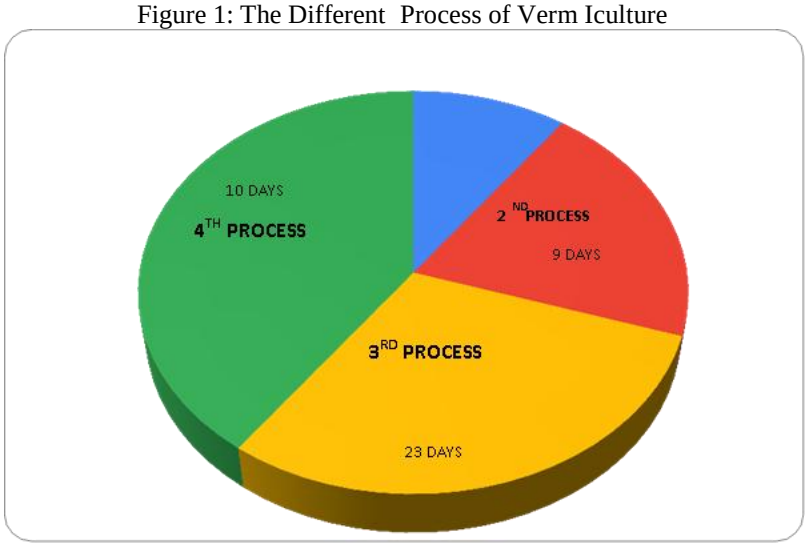
The different process of vermiculture for a suitable substrate for the wastes into organic fertilizer: Table 2 indicates that the process of vermiculture taken place.

Table 2: Different process of Vermi culture

Process	Days taken place	Substrates	Recordedphotos
1st Process	1 day	Cardboard Dry leaves Vegetable wastes Garden soil Butter milk	
2nd Process	After 9 days	Water Dry leaves Vegetable wastes Garden soil	
3rd Process	After 23 days	Earthworms was introduced (*Eudriluseugeniae)*	
4th Process	After 10 days	Vegetable wastes Buttermilk Garden soil	

Here it shows that the process that we undertake in our vermiculture. The 1st process was completed in one day and the substrate used in 1st process are cardboard, dry leaves, vegetable wastes, garden soil ,and the inoculum butter milk to make the vermi bed. The moisture content and the substrate are decomposed in 8days approximately. After the 1st process , 2nd process taken place after 9days , the substrates that we used in 2nd process are dry leaves, vegetable wastes, garden soil and water also poured sufficiently on the substrates. It takes time to produce nutrient content in the vermiculture. By following, 3rd process taken place after 23 days here we introduced earthworm *Eudrilus eugieniae* to make rich manure. At last 4th process done after 10 days with vegetable wastes, inoculum buttermilk and garden soil to settle and it take time to decompose, on that time stop watering. After a minimum of 65 days the colour of the compost started to change colour and the complete decomposition of the compost took about 100 days with ideal conditions. Once the compost was ready, the residue turned black in colour and ready for harvest the rich black gold manure. Figure 1: represent the process of vermiculture

Figure 1: The Different Process of Verm Iculture



The Impact of the Extension Project Designed to Empower Women in the Community:

The present study was undertaken to find out extend of participation level of women in production of vermiculture. [Vermicomposting – A Source of Alternative Income for women].Vermiculture is the cultivating of earthworm mainly for the purpose of using them to make vermicompost from the vegetable waste or biodegradable waste.

Expected Income:

Approximate 100kg best quality vermicompost harvested from single bed with single harvest. Total duration required for decomposition of vegetable wastes is about 65 days. The harvested compost is ready to sell packed within one kg bags for 20 rupees.

Assessment as an entrepreneur in this women empowerment through vermiculture project. The triple of the profit was earned from the vermiculture.

Expenditure:

Investment	=	500/- (Cost price of Earthworm *Eudrilus eugieniae)*
Selling price	=	2000/-PROFIT:
Profit	=	Selling price – Cost price
	=	2000 – 500 = Rs 1500/-

Discussion:

Verm iculture is a source of alternative income for women. It is a complete plant nutrient and contains not only worm casting but also bedding material and organic waste at various stages of decomposting (Urmila Gupta *et al., 2006).* Vermin culture enterprise is a relatively new enterprise that is spreading rapidly among women in rural. The present study was supported by Varsha Rathod (2006). Women play an important role in enterprises, immemorial women support to the family by earning and undertaking various type of work where more than hundred beneficiaries has been running this enterprise successfully and earning good amount of money. Alka Patki *et al.,* (2000) also reported that a significant relationship between the source of information and role performance of women. In general, a great proportion of the crop nutrient input during cultivation returned in the form of the plant residues. Estimation showed that 30-35 % of applied N and P and 70-80 % for K remained in the crop residues of food crops. Nikhade *et al . , (1985)* reported that the similar finding with present study reported that income of the women had significant association with the use of fertilizers. Such nutrient rich crop residues must be prepared before they are used as a fertilizer, and earthworms are suitable candidates for the same (Suthar, 2007). Suthar (2006) demonstrated that vermicomposting of some crop residues mixed with cattle dung, resulted in an increase in total N (91–144%), available P (63–105%), and exchangeable K (45–90%) content of it. Therefore, ready vermicompost relatively contains more exchangeable plant nutrient in available form than those by other plant growth media. Present results support above hypothesis that worm casts can act as a best plant growth media when conjugated with some amount of NPK fertilizer. The nutrients content in vermicompost vary depending on the waste materials that are being used for compost preparation. If the waste materials are heterogeneous one, there will be wide range of nutrients available in the compost. If the waste materials are homogenous one, there will be only certain nutrients available. Studies byAira et al. 2002; Suthar, (2008) have revealed that vermicompost may be a potential source ofnutrients for field crops if applied in suitable ratios with synthetic fertilizers. Also, vermicompost may contain some plant growth-stimulating substances. The plant-hormone- like is extensively reported in worm-processed material possibly due to higher microbial populations (Krishnamoorthy and Vajranabhaiah, 1986; Tomati *et al.*, 1987; Mascolo *et al.*, 1999). Also, Suthar *et al.*, (2005) reported a hormone like effect of earthworm body fluid on seedling growth of some legumes. The earlier workers have reported a positive effect of vermicompost application on growth and productivity of cereals and legumes, ornamental, flowering plants and vegetables, etc. Findings of the present investigation revealed that majority of women are performing important role in vermiculture enterprise. Baraskar *et al., (2018)* indicated a positive influence of education on the employment generation through vermicomposting. This gives an indication of women empowerment in the rural areas, wherewomen mainly engaged in vermicompost production, also contributed some share to the income of their respective families as has also been concluded by Meti (2013) and Baraskar*et al., (2018).* The success story of Kamal Morarka, Beniwal set up a vermicompost unit on his 700 sq yard plot with a one –time investment of Rs. 1.25 lakh. One year later his account books balanced out: Cost of setting up a unit: Rs 1,25,000.00; Net returns in first year. Rs. 1,20,000.00. Each kg of compost beniwal harvests at the cost of about Rs. 7.00 is sold at Rs. 40 per kg, and the study of vermiculture that impact the extension project designed to empower women in the community by earning from the production of vermicompost that the majority of rural women were completely utilizing it.

Conclusion:

It is concluded that the vermi composting technology is an economical and practical way of solving waste disposal problems and recycling the organic waste. The current economic crisis is challenged by this technology's ability to provide people with fresh knowledge, self-confidence, and opportunities for tremendous entrepreneurship.It can be concluded from the above study through the women participation in

vermicompost. If therefore becomes essential to engage them in such entrepreneurial activity which requires very less inputs and skills. So, vermicomposting can be a source for income generation because it is very low cost technique. In areas where creation of low or semi-skilled jobs is considered advantageous, vermicomposting may supply an opportunity for employment. Where accumulation of food waste, paper, cardboard, agriculture waste, manures, and bio solids is problematical, composting and vermicomposting offer potential to turn waste material into a valuable soil amendment. Vermicompost, a more valuable commodity, is best used sparingly such as in container media, greenhouse application, establishing new plants such as rootstock in vineyards, and wherever it can be directed in close proximity to plants. The findings can be promoted as a vegetable wastes recycling technology for organic vegetable production to conserve natural resources and to minimize the deleterious impact of vegetable wastes on mother earth.

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