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RESEARCH ARTICLE

WEALTH FROM WASTE THROUGH WORMS IN THIRUKANDALAM

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ABSTRACT

Vermicompost an age old technology of composting using various worms, usually red wigglers, white worms, and other earthworms to create a heterogeneous mixture of decomposing vegetable or food waste, bedding materials, and vermicast had not lost its significance. Vermicast, also called worm castings, worm humus or worm manure, is the end-product of the breakdown of organic matter by an earthworm. These castings have been shown to contain reduced levels of contaminants and a higher saturation of nutrients than do organic materials before vermicomposting. Containing water-soluble nutrients, vermicompost is an excellent, nutrient-rich organic fertilizer and soil conditioner. This process of producing vermicompost is called *vermicomposting*. With an eye to all benefits, increasing attention is being focused of late on breeding of earth worm and subsequent preparation of rich manure. Agriculture based only on chemical fertilizers and other chemical inputs is not desirable because constant use of such inputs causes soil infertility and affects productivity. "Compared with 10-15 years back, many farmers are now becoming increasingly aware about the harmful effect of chemical use to grow their crops, and are moving towards alternative sustainable solutions. This Project sanctioned by Tamil Nadu State Council for Science and Technology under the DIT Scheme (Dissemination of Innovative Technology) has helped us to implement this Age old but all time welcomed technique by farmers in our adopted Village at Thirukandalam.

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INTRODUCTION

Thiruvallur district is spread over 3422 Sq. km. According to 2001 census, the total population is 27,38,866 which consists of 13,90,292 males and 13,48,574 females. Agriculture is the chief occupation of the Thiruvallur district. Farmers of the district grow rice, black gram, green gram, sugar cane and groundnut. Horticultural crops like mango, guava and vegetables are also cultivated. Nearly 16940 small scale industries, are successfully running in the district some of which are wood, textile, chemical, engineering, non-metallic and leather industries (Map 1: Thiruvallur District) (https://www.google.co.in/search?q=thiruvallur+district+map) women's Christian College in collaboration with the Institute of Sustainable Development, has adopted a village named Annanagar which is 50 kilometers away from the College in the Thirukandalam Panchayat of the Ellapuram Panchayat Union in Thiruvallur District. There are 150 houses in the village and the community belongs to the Irula tribes. Almost all of them are illiterate, economically backward, landless laborers working in the rice mills, brick kilns and jasmine gardens in and around the village. The striking feature which draws our attention is extreme poverty besides lack of toilets, medical facility, stagnation of water & poor sanitation. (Map 2: Ellapuram Panchayat in Thiruvallur District) (https:// www.google.co.in/search?q=thiruvallur+district+map). With Agriculture being the chief occupation of the Thiruvallur district and farmers of the district growing rice, black gram, green gram, sugar cane and groundnut and also horticultural crops like mango, guava and vegetables.

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Why Vermicompost Manure

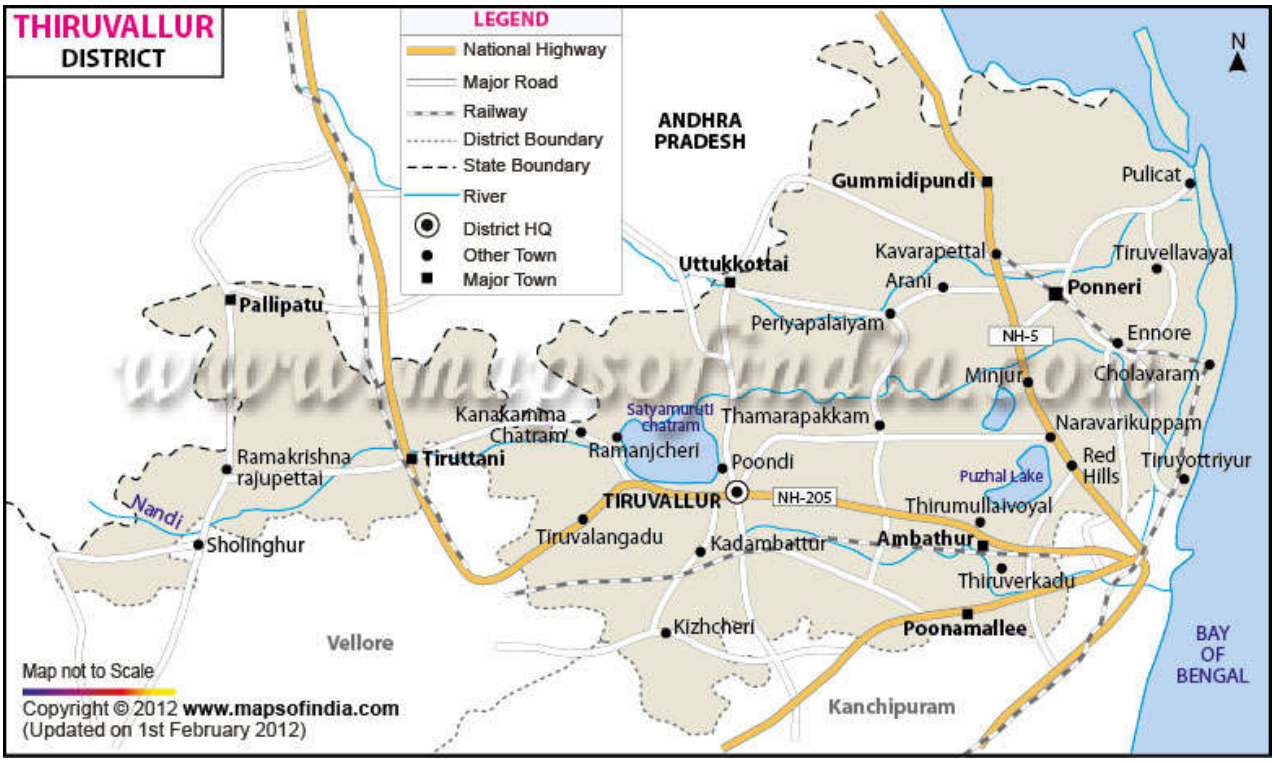
- It is 100% organic. There are no harmful chemicals and it does not need to be mixed with anything.
- The nutrients in earthworm compost are very easily absorbed by the roots of plants. Unlike chemical fertilizers, vermicompost is not easily flushed from the soil because of the worm mucus that it contains (Natural Resource, Agriculture, and Engineering Service (NRAES) 1992. Plants have longer to obtain the nutrients and get the maximum benefit (Zularisam *et. al.,* 2010).
- As the compost is passing through the body of the worms it is enriched with bacteria and microbes. These help plants to become more disease resistant and also

repel some plant pests (Manickam, 1967). The presence of increased microbial activity can make the area much more attractive to birds which also help to remove plant pests (Lazcano *et al.,* 2008).

- As the compost works on the plants and they become healthier the need for pesticides is reduced. The reduction in pesticides helps the area to recover faster and can start an improvement cycle that will run on. This compares with the typical cycle when chemical fertilizers are used (Ndegwa and Thompson, 2001). The chemical fertilizers might increase plant yields but they do nothing for plant health. Continued use of chemical fertilizers inevitably leads to a breakdown in the soil. Ammonia and salts build up which attack the plants making them less able to withstand disease (Kharrazi *et al.,* 2014).

the plants is not available with chemical fertilizers. The distribution of the compost through the soil also helps to encourage healthy root growth (Indian Agricultural Research Institute (IARI), 1989)).

- Vermicompost is a colloid and holds up to nine times its own weight in water. This can make a huge difference when there is a dry spell (Palm *et. al.,* 2001). The water is held at an organic level so tends to evaporate slowly while still being available to the plants (Jambhhekar, H. 2002).
- Chemical fertilizers bombard plants with huge amounts of nutrients that are going to drain by and eventually be washed out of the soil by the rain. The chemicals can get into the aquifers and can contaminate drinking water (Tamilnadu Agricultural University (TNAU) 1999)). This is avoided by using compost which is



Map 1. Thiruvallur District

Map 2. Ellapuram Panchayat in Thiruvallur District

- Among the hormones that earthworm compost contains are hormones that help plants to grow. Germination of seeds is encouraged, the growth of the plant is stronger and the crop yield improved. This natural support for

lower in nutrient content but which does not get washed out of the soil. The nutrients are held in place and released slowly so that the plants receive what they

need over a prolonged period (Reinecke and Reinecke, 2007).

With financial assistance from Government and Training rendered by Academicians this Vermicompost Technology will enable the villagers of Thirukandalam to create a product that is purely natural and can convert its waste into wealth so that it can double or triple its economy in the near future and can eventually eradicate poverty.

MATERIALS AND METHODS

Phase 1: Day 1

- Survey of Village
- Identifying and locating appropriate sites for instilling Vermicompost Unit

Phase 2: Day 2

Gathering farmers from Thiruvallur District and villagers from Thirukandalam for a Teaching Session on Gradual detoriation of soil fertility, High cost of inorganic fertilizer, Availability of sufficient farm waste, vermicompost and vermiwash production technique, harvesting, packing and Easy marketability of Vermicompost Manure. As there are 150 houses in this village each village can have a small vermicompost unit installed in their backyard (Figure 1: Snapshots of the Village).

Figure 1. Snapshots of the Village

Phase 3 - Small Scale Vermicompost Unit Initiated in the School

The 7 member Team from the PG & Research Department of Biotechnology visited Thirukandalam on 3rd March 2016 and reached the village by **1.00 pm.** The **2 Plastic Drums** for the study were placed in the backyard of one of the student's house near the School campus. Step by step method of preparation of worm culture bed was followed for good results.

- **First step**: 2 Plastic Drums were placed in a shady place for the compost to be prepared.
- **Second step**: In one drum a bed using the following base materials such as coir waste, sugar cane husk were layered. This was overlaid by a layer of soil. Water was sprinkled on it to get a moisture level of 40-45%. Care was taken to see that the bed appeared wet.
- **Third step**: In the second drum, organic waste with cattle dung in equal quantity was mixed and appropriate quantity of water was poured over it so as to make a homogenous mixture. This mixture was allowed for two weeks. During this period heating of substrate will take place. Mr. Nehru (Teacher) and the children of the School were requested to turn the material 2-3 times at 4-5 days interval. After a period of 15 days both these contents were mixed and the worms (*Lumbricus rubellus*) were introduced (Figure 2 : Vermicomposting Protocol).






Figure 2. Vermicomposting Protocol

Harvesting of Compost - It took about 2-3 months for harvest of the compost. When the top layer of the compost was turned to deep brown colour grains of tea, it indicated the right time to harvest the compost. Watering was stopped for 3 - 4 days before harvesting. All the vermicompost including the earthworms were collected from the tank, heaped in a conical shape on cemented floor under the sun for 3-4 hours. As the earthworms go down (against the sun light) and congregate in a ball shape at the base of the heap, the vermicompost was collected from the top and was dried under shade for 2-3 days. The earthworms was collected from the base of the heap and released again in to the tank for further composting. The dried vermicompost was sieved with a wire sieve for separation of undigested food material from compost. Since this is an adopted Village of Women's Christian College, weekly regular visits and Follow – up was done to assess the next cycle of implementation of this technology. The rich manure collected at the end of 3 months was sent to National Agro Foundation for Soil Testing (**Table 1 : Soil Analysis**). The results indicate the Vermicompost to be rich in all soil parameters essential for plant growth.

Table 1. Test results generated by national agro foundation

S. No.	Parameters	Estimated Level	Basic desired level	Unit
1	pH	6.88	6.5 – 7.5	-
2	Electrical Conductivity	16.99	< 1	mS/cm
3	Organic matter %	19.04	>1.5	%

S. No.	Nutrient / Parameter	Estimated Level	Basic desired level	Unit
1	Nitrate Nitrogen	163.3	>14	ppm
2	Available Phosphorus	590.27	>100	ppm
3	Potassium Exchangeable K	3606	>150	ppm
4	Calcium Exchangeable Ca	4892	>2000	ppm
5	Magnesium Exchangeable Mg	1689	>500	ppm
6	Sulfur Available S	1058.2	>20	ppm
7	Zinc Available Zn	46.67	>2.5	ppm
8	Manganese Available Mn	1689	>10	ppm
9	Iron Available Fe	47.05	>9	ppm
10	Copper Available Cu	4.71	>2	ppm
11	CEC (by addition)	58.23	>0.9	meq/100g
12	% K Saturation	15.88	3 – 5%	%
13	% Ca saturation	42.00	65 – 70%	%
14	% Mg saturation	24.17	20 – 25%	%
15	% Na Saturation	17.95	0 – 2%	%

Future Prospectus and Conclusion

A more commercial approach, with far greater potential profit of this Project would be to contact and establish links with Governmental and Non- Governmental Organizations to help the villagers in marketing. Once this Technology takes shape we can persuade local plant nurseries on a regular bases to sell our products, either directly or on consignment and then combine this approach with advertisements on community notice boards, or by way of the internet or through the local papers. Gradually we can also tie up with Vermiculture Entrepreneurs to buy our product at a fair price and thus enhance the life style of the farmers of Thirukandalam.

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Website

https://www.google.co.in/search?q=thiruvallur+district+map

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