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Study of Vermicasts from Earthworms: A REVIEW STUDY

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Abstract

This publication is for entrepreneurs interested in a commercial earthworm enterprise. Information about vermiculture – raising earthworms for bait or feed – is included. Information about using these worms, usually Eisenia fetida, to process waste into vermicompost is also included. Vermicompost is used in nurseries or the landscape industry as an ingredient in potting soil mixes and performs pest and disease control functions as a soil amendment. Production and marketing issues are covered for both types of earthworm businesses. Whether you are raising worms for bait or using them to produce vermicompost, you will need to learn how to raise earthworms. For your worm-based business, you will have to separate earthworms from their growing environment and sell your product—either the worms or the vermicompost.

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1. INTRODUCTION

Over the past several years, many people have begun raising earthworms as a source of income or as a means of managing organic waste. Some are drawn to the business by extravagant claims of vast potential markets for earthworms in large waste disposal systems and agriculture and as a source of food for animals. Despite these claims, the current major commercial use of earthworms is as bait for freshwater sport fishing.

Although several other outlets for sales of worms exist, there is much competition for markets. Research and development on uses for worms are under way throughout the world, but the opening of new markets for worms and castings will be slow and somewhat uncertain. Those interested in getting into the earthworm business should explore potential local markets carefully, particularly if a full-time occupation is the goal.

Earthworm growers can make money by selling earthworms and vermicompost or from tipping fees (charging to have organic materials normally disposed of in landfills "tipped" by a dump truck onto the worm grower's site, to be fed to the earthworms). Vermicomposting is the process of turning organic debris into worm castings (manure). The focus is on processing the waste rather than creating ideal conditions for raising earthworms. Earthworm size and their reproductive rates are frequently lower than those of the same species raised in vermiculture systems. Large Vermicomposting facilities typically make money primarily from tipping fees, followed by sales of castings, and then, in a distant third place, by sales of earthworms.

Vermiculture is the raising of earthworms for resale, so the focus is on ideal conditions for worm growth, reproduction, and health. Worm farmers usually purchase and haul feedstock or pay for feedstock to be delivered to them others may get the material for free but pay for it to be pre-composted and hauled to their site. Worm growers make money from sales of earthworms and sometimes, but not always, by selling castings.

2. LITERATURE REVIEW

For vermiculture in agriculture, overlapping interest occurs at either end of the waste management stream. At one end, is the need to deal with specific agricultural by-products, or wastes, and Vermicomposting is identified as one sustainable method of utilising these wastes and turning them into a resource. This has been engaged on a large commercial scale mainly using windrows for the treatment of pig solids (Edwards et al, 1985; Chan and Griffiths, 1988; Wong and Griffiths, 1991) and cattle solids (Hand et al, 1988; Edwards, 1998b). At the other end is the use of the resultant vermicompost products, such as: the application of vermicompost as soil amendments in agro ecosystems; the use of Vermicasts in potting mix blends for plant propagation; and, vermicompost, or Vermicasts, as a plant.

Produce earthworms or use worms for waste processing?

The two main reasons that people grow worms are to sell them as bait or feed or to use earthworms to process waste materials

Vermicompost, a valuable soil amendment. Although the needs of the worms must be met in either type of system, the objectives are different. Raising worms for bait requires closer management than raising them to process agricultural or food wastes. When you choose to sell worms for bait or as feed for if she or poultry, you will sell off the livestock from the system periodically. Bait worms must meet a certain size standard and will need to be separated from smaller worms and eggs. You should be consistent in your feed and bedding. You will also need to optimize Eisenia fetida, a good composting worm of many names. Photo courtesy of Bentley Christie, RedWormComposting.com. ATTRA Worms for Bait or Waste Processing (Vermicomposting) temperature, aeration, pH and moisture conditions to promote worm reproduction and growth. All of this requires consistent management and attention to detail. For a waste processing system, the goal is low-cost production. The materials that you process might not be ideal for feed or bedding, but if the source is consistent, you can design a workable system. With skilful marketing, it's possible to be paid tipping fees for waste removal and be paid again by the end user for the if nil products. Tipping fees are charged to those who generate garbage for the service of hauling it away. Do some market research and consider what type of worm farming system if it's your situation before you commit resources to setting up your operation. Producing worms will require considerable attention, especially at the start. If you have never managed a household worm composting system, begin with a small-scale trial and learn the basics.

Production systems

Worm production takes place at scales that range from a bin in the kitchen for processing household scraps or raising fishing worms to large mechanized systems able to accommodate tons of organic material on a continuous basis. This publication is focused on commercial-scale operations. In general, these production methods can be grouped into four types: *Batch reactors* (containers on legs or on the ground) are filed, allowed to work and then emptied. This type of processing is being tested at various scales throughout the United States. These systems can be used to raise worms or for waste processing.

– *Stacked bins* or containers are a type of batch reactor and require considerable handling and lifting. It is difficult to monitor bed conditions and to add feedstuff s. Systems using stacks of large, shallow drawers reduce some of the drawbacks. Considerable labour is involved. *Windrow systems* on concrete or on the ground require the least capital investment, but they are slow and labour-intensive, even with machinery. Although windrows have been used for worm production, they are most appropriate for waste processing. Continuous flow reactors are the most expensive of these systems. Labour costs may be less, however. Equipment, skilled management and excellent marketing are necessary to ensure a profitable enterprise. Continuous processing has emerged as the preferred method for commercial production of vermicompost. The worms never leave the bed, so tedious harvesting procedures are avoided entirely. Feeding, misting and collecting the finished product can be automated, and it is much easier to produce hitch shows that the compressed air engine is cheap when compared to the conventional SI engine.

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Reduction in soil C : N ratio

Vermicomposting converts household waste into compost within 30 days, reduces the C:N ratio and retains more N than the traditional methods of preparing composts (Gandhi et al. 1997). The C: N ratio of the unprocessed olive cake, vermicompost olive cake and manure were 42, 29 and 11, respectively. Both the unprocessed olive cake and vermicompost olive cake immobilized soil N throughout the study duration of 91 days. Cattle manure mineralized an appreciable amount of N during the study. The prolonged immobilization of soil N by the vermicompost olive cake was attributed to the C: N ratio of 29 and to the recalcitrant nature of its C and N composition. The results suggest that for use of vermicompost dry olive cake as an organic soil amendment, the management of Vermicomposting process should be so adjusted as to ensure more favourable N mineralization immobilization (Thompson and Nogales 1999).

Role in nitrogen cycle

Earthworms play an important role in the recycling of N in different agro ecosystems, especially under *hum* (shifting cultivation) where the use of agrochemicals is minimal. Bhadauria and Ramakrishnan (1996) reported that during the fallow period intervening between two crops at the same site in 5- to 15-year *hum* system, earthworms participated in N cycle through castejectionn, mucus production and dead tissue decomposition. Soil N losses were more pronounced over a period of 15-year *hum* system.

Growing concerns relating to land degradation, threat to eco-systems from over and inappropriate use of inorganic fertilizers, atmospheric pollution, soil health, soil biodiversity and sanitation have rekindled the global interest in organic recycling practices like composting. The potential of composting to turn on-farm waste materials into a farm resource makes it an attractive proposition. Composting offers several benefits such as enhanced soil fertility and soil health – thereby increased agricultural productivity, improved soil biodiversity, reduced ecological risks and a better environment.

Even though the practice is well known, farmers in many parts of the world especially in developing countries find themselves at a disadvantage by not making the best use of organic recycling opportunities available to them, due to various constraints which among others include absence of efficient expeditious technology, long time span, intense labour, land and investment requirements, and economic aspects.

Why Worm Compost?

Worm compost can be used several ways in rural or urban commercial agriculture.

- An on-farm produced growing medium component (usually at 5 to 20% by volume) for
- container grown transplants or plants.
- An on-farm produced source of balanced available nutrients/minerals which can be applied as
- A dry surface application or extracted with water and applied as a fustigation (nutrients water).
- An alternative to fish based fertilizers which are commonly used in organic farming.
- A source of microorganisms and micronutrients that can contribute to plant and soil health.
- A "crop protestant" that may help mitigate insect infestations and disease infections.

Life Cycle

- Reported time for cocoon to go from formation to hatching in favorable conditions: 4 to 6 weeks
- Reported time that cocoon can protect young worms in unfavourable conditions: months to years
- Reported time for worm to develop from emergence to maturity (producing young): 6 to 8 weeks
- Reported time a red worm will live, feed and reproduce in a favorable environment: 3-4 year

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