



Vermicompost Production Demonstration Trials in the Bilate Catchment

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1. Introduction

As part of the CROSSROADS project, vermicompost production demonstration trials were established in the Bilate Catchment to assess the feasibility and performance of different organic biomass combinations in producing organic fertilizers. The activity aimed to demonstrate improved vermicomposting practices by integrating locally available biomass resources, particularly *Erythrina brucei* [Korch], with current farming practices. This back-to-office report documents the construction of vermicompost production facilities, experimental design, treatment allocation, and management practices applied during the establishment phase and routine management practices throughout the production cycle.

2. Construction of vermicompost production boxes

Fifteen vermicompost production boxes (Picture 1) were constructed for the experiment and installed under a shaded structure to protect the vermicomposting materials from direct sunlight and adverse weather conditions. The boxes were arranged into two sets beneath the shade, with each set consisting of seven compartments, and the 15th box was positioned adjacent to these sets. Each vermicompost box measured 112 cm × 112 cm × 42 cm, providing a uniform capacity across the treatments. The shaded structure covering the boxes had overall dimensions of 8.70 m × 1.90 m.



Picture 1. Vermicompost production boxes established in the farmers' training center, Gederat Kebele, highland site of the Bilate catchment: top picture - construction of wooden boxes, left picture - preparation of plastic cover, and right picture - vermicompost production box covered with plastic. Picture: Wolde Mekuria

3. Experimental design

The experiment was established using a completely randomized design with five treatments, each replicated thrice, resulting in 15 experimental units (vermicompost boxes) (Figure 1). All treatments received an equal amount of manure (45 kg per box) and differed only in the proportion of organic biomass sources, namely barley residues representing current farmers' practice and biomass from *Erythrina brucei* [Korch]. The control treatment followed the existing Farmers Training Center (FTC) practice, consisting of 45 kg of manure thoroughly mixed with 0.75 kg of barley residues (considered 100% barley biomass). The remaining treatments progressively substituted barley residues with *Erythrina brucei* [Korch] biomass at ratios of 75:25, 50:50, and 25:75, and the final treatment consisted of 100% *Erythrina brucei* [Korch] biomass combined with manure. This design allowed for a systematic evaluation of the effects of varying biomass compositions on vermicompost production.



Figure 1. Vermicompost production demonstration trial design

4. Assigning each treatment to boxes

Treatments were assigned to vermicompost boxes using a lottery system to ensure proper randomization. Each box was numbered from 1 to 15, after which the treatments were drawn sequentially from a pool and assigned in order, with the first treatment allocated to box 1, the second to box 2, and so forth. This procedure ensured that all treatments were randomly and evenly distributed across the boxes, fully complying with the requirements of a completely randomized design.

5. Introduction of Vermi-worm in each box

Before the introduction of vermi-worms, the biomass prepared for each treatment was watered and thoroughly mixed to create a suitable and uniform substrate (Picture 2). To ensure consistency across the treatments, an equal number of vermi-worms was added to each vermicompost box. Specifically, three handfuls of vermi-worms were applied per box and placed at the center of the substrate or the surface of the biomass mixture to promote uniform colonization and decomposition.



Picture 2. Mixing of the biomass before introducing vermi-worms (left) and introduced vermi-worms (right). Picture: Wolde Mekuria

6. Activities to be done: Management of Vermicompost Production

Following the establishment of vermicompost production units, management activities will be implemented as part of the operational plan to ensure effective decomposition and worm survival. The vermicompost materials will be watered every three days to maintain appropriate moisture levels and regularly turned and thoroughly mixed at the same interval to enhance aeration and decomposition. Measures will be taken to protect the boxes from rainfall, excess moisture, and damage from birds by covering the boxes with canvas sheets throughout the composting period.

The continuous treatment of the substrate will be monitored, and the portion of the substrate where all the biomass is decomposed by the worms will be kept aside as finished vermicompost material. When all the substrate is decomposed (eaten by the worm), the production will be measured as the amount obtained from a particular treatment in one production cycle. The quality of vermicompost will be assessed in the laboratory using key physical, chemical, and biological indicators.