

Pilot Operation of a Waste-to-Protein Treatment Facility in Dimapur

The pilot will be set up a breeding facility for rearing the Black Soldier Fly (BSF) and producing the larvae in Dimapur close to Naga Shopping Arcade from where the organic wastes will be diverted from going to landfill, use the waste to feed the BSF. The larvae will then be processed to make fish feed and animal husbandry for sale.

Problems

1. Urban solid waste management is considered one of the most immediate and serious environmental problems confronting urban municipalities. The severity of this challenge will increase in the future given the trends of rapid urbanisation and growth in urban population. Currently 115 MT of garbage collected daily in Dimapur and recycling organic waste material (biowaste) is still fairly limited. There is growing public and environmental concerns, and need for a more sustainable method of dealing with municipal waste that embrace the concept of a circular economy.
2. Fish meal and other protein source for animal husbandry are expensive for farmers.

Solutions

The black soldier fly composting project therefore uses, larvae to compost organic waste reducing the waste going to the landfill by about 60%. The end product being nutrient rich larval biomass can be used to replace fish meal in animal feed and compost which can be used to fertilize soils. This method is a relatively cheaper method of dealing with waste and will create jobs.

Social & Environmental Impact

Reduction in the amount of waste going to the landfill at the pilot site in Dimapur and community members appreciating how waste can become useful.

Objectives of the Pilot

Based on the analysis of this study, it is submitted that the pilot project for the development of BSF larvae as fish feed has these objectives:

1. Establish a commercial protocol for the production of BSF larvae in Dimapur;
2. Collect detailed data about the production of BSF on a commercial basis;
3. Develop evidence based solutions for resolving the critical factors for implementing larvae production facilities (breeding units and rearing units) for the commercial phase; and
4. Re-analyse the optimal business model for commercialising the technology.

Strategy for Implementing the Pilot

The pilot project will have three phases. Plans for each phase are provided in detail below. It is estimated that the duration of the pilot will be one year and six months to two years.

Phase One

This phase will take about four to five months. During this period the following issues will be resolved:

1. Obtaining access to land through a medium term lease,
2. Construction of cost effective breeding units for BSF and boxes for rearing BSF larvae (because it may not be financially practical to construct permanent concrete units during the pilot),
3. Training of skilled staff,
4. Contact tertiary education institution and government research institutes,
5. Developing management and data collection protocols,
6. Import BSF,
7. Sourcing sufficient biomass for the breeding facility,

8. Completing a number of BSF life cycles,
9. Accumulate sufficient larvae for phase 2,
10. Obtaining the larvae rearing units,
11. Selecting the participating farmers,
12. Training selected farmers to rear the BSF larvae, and
13. Help farmers' source biomass for their rearing units.

Phase Two

This phase will take about ten to twelve months, the primary object of this period is to collect data and try to optimise the entire value chain. Key objectives of this phase are as follows:

1. Collect and analyse the biomass composition (visual and laboratory analyses),
2. Research and development in relation to optimising breeding techniques of BSF,
3. Organise and execute a site visitation, the purpose of which is to validate the business case, check the implementation of breeding and rearing protocols, try to obtain answers on the questions arising from the pilot, meet the farmers participating in the trials and record their experience for analysis and adoption,
4. Monitor the rearing process,
5. Ensure that data collection procedure is correctly implemented,
6. Collect and organise data from the rearing facilities and the breeding facilities,
7. Observe the utilisation of the larvae based fish feed by the cultivated fish,
8. Explore various processing procedures of larvae as fish feed to optimise their utilisation,
9. Work with the education and research institutes to analyse the nutritional profile of the larvae,
10. Resolve challenges arising from larvae scale production of BSF and rearing them, and
11. Explore various options of income generation by the breeders and the fish farmers,

Phase Three

The final phase would be around three or four months. This phase will be initiated during the end of phase two to optimise the pilot phase. The primary focus of this phase is to analyse the collected data and develop a plan for the commercialisation phase based on concrete evidence.

The objectives of this phase include:

1. Analyse the proposed business models based on the collected data,
2. Assess plans for expanding the breeding facility for the commercial phase,
3. Re-evaluate the costs of operating commercial rearing facility by farmers,
4. Develop strategies to manage the issues related to the critical success factors of developing this technology in Nagaland, and
5. Complete report for the pilot phase.

Thought out the pilot phase the contracting parties will provide regular updates about the status of the project to inform about the progress of the pilot.

Business Case for Pilot

The scale of the pilot will be small, which means that the earnings and the expenses are reduced. In order to make projections, the following assumptions are made.

The assumptions have made these on the basis of literature and field research to ensure that they are representative of the market conditions in the target area. Assumptions for the projected investment costs and projected income in relation to the pilot are provided below.

Assumptions for the Pilot

1. Cost of constructing the unit is much lower because the pilot would involve smaller installation on land rented.
2. One small scale breeding and one small scale processing unit will be set up for the pilot.
3. Breeding unit will have cages of volume 1 m³ and each cage will be able to house 3000 flies. There will be about 10 cages initially for the pilot.
4. The rearing facility for the pilot will need one structure to house the boxes because they would be operating only five boxes. This will substantially reduce the cost of setting up and maintaining a rearing facility during the pilot.
5. Fish farmers in the target area are able to replace up to 75% of their commercial fish feed with BSF larvae.
6. Measuring and handling devices include thermometers, shovels, carts, humidity meters, weighing scales (large and small), fans, tarpaulins for covering breeding units to reduce heat loss at night, etc.
7. Given the biomass conversion rate of 15% by the BSF larvae, it is estimated that the pilot rearing facility would need about 11-12 tons of biomass every year to operate.
10. Staff costs for the breeding facilities are higher because operating that facility requires skilled labour such as managers, experts and technicians.
11. Staff costs for the pilot rearing facilities are much lower because the farmers have to manage limited numbers of larvae boxes and it is assumed that the farmers will be rearing the larvae by themselves. The staff cost for the pilot rearing facilities reflects a token amount.
12. Disposable costs include the cost of consumables, such as gloves for handling the larvae, gas for heating water, spoilage, etc.
13. Capital depreciation is excluded because it has no effect on the cash flow.

Projected Capital Expenditure: Pilot Breeding Facility

Sl. No.	Description	Cost
1	Breeding Unit	60000
2	Biomass Storage Unit	30000
3	Wooden Cages	30000
4	Technical Training	50000
5	Electrical equipment	10000
6	Measuring and Handling Devices	10000
7	Administrative licences	10000
TOTAL		200000