



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
AFRICAN CENTRE OF EXCELLENCE IN SUSTAINABLE USE OF INSECTS AS
FOOD AND FEED**

TRAINING MODULE

FOR

BLACK SOLDIER FLY PRODUCTION

ACE II- INSEFOODS

P. O. BOX 210-40601

BONDO, KENYA

TEL: +254-572501804

www.jooust.ac.ke

Copyright © 2017 Jaramogi Oginga Odinga University of Science and Technology (JOOUST)

The Modules are protected by copyright

First Edition, 2017

All rights reserved. No part of this Module may be reproduced in any manner without written permission from the publisher

Authors: Mr. Evans Nyakeri

Dr. Mary Onditi

Editors: Prof. Monica Ayieko

Prof. Adrian Mukhebi

Publisher: Jaramogi Oginga Odinga University of Science and
Technology (JOOUST)

Acknowledgement

Jaramogi Oginga Odinga University of Science and Technology (JOOUST) wishes to acknowledge the contributions of individuals who assisted in the production of these modules. These include the authors – Mr. Evans Nyakeri and Dr. Mary Onditi, the Editors – Prof. Monica Ayieko and Prof. Adrian Mukhebi. Your technical advice in the development and production of these modules was invaluable and highly appreciated. We would also wish to thank the World Bank for their financial support for the ACE II Project, the Inter-University Council of East Africa for their support and lastly but not least the Kenyan Government for provision of enabling environment for research.

Our gratitude also goes to the following institutions: COCHRANE Centre (South Africa), Makerere University (Uganda) and Jomo Kenyatta University of Agriculture and Technology (JKUAT) (Kenya); the professional input from the Deans' Committee of JOOUST and the Ministry of Education, Science and Technology (MOEST). To you all, your contributions have in one way or another contributed to the production of these modules.

Introduction

The world is faced with a rapid human population growth and eminent protein deficit, thus need to widen the scope of food and feed resources to include natural food and feed resources currently underutilized. Edible insects are an inexpensive alternative source of animal protein for humans and livestock and adoption of rearing systems can ensure sustainable availability and environmental conservation. The Black Soldier Fly is a native species which is adaptable to mass rearing, has high protein content and has potential to serve as an agent of waste management. JOOUST in collaboration with the Africa Centre of Excellence in Sustainable use of Insects as Food and Feeds (INSEFOODS) has developed appropriate Black Soldier Fly rearing modules. It is hoped that the modules will enable farmers to acquire knowledge, skills and attitudes on Black Soldier Fly rearing techniques.

Purpose of the modules

The purpose of the modules is to enable farmers acquire knowledge, skills and attitudes in Black Soldier Fly rearing techniques.

Learning Outcomes

The general learning outcomes of these modules are as follows:

- To enable farmers to acquire necessary skills and knowledge to establish and manage Black Soldier Fly production system.
- To enable farmers acquire skills and knowledge on how to harvest and process the Black Soldier Fly for feed.
- To provide farmers with knowledge, skills and attitudes on how to sustainably rear the Black Soldier Fly.
- To provide opportunities for skill development and transfer in rearing the Black Soldier Fly.
- To provide business and job opportunities for trainee farmers.

COURSE CONTENTS

MODULE ONE: INS 00201 HISTORICAL OVERVIEW OF USE OF INSECTS AS FEED

Historical perspective in the use of insects as feed: Types of insects used as feed, different communities using insect as feed, target animals for insect feed; Historical background on the use of the Black Soldier Fly; Importance of rearing the Black Soldier Fly; National legislation and regulation on domestication of wild animals.

MODULE TWO: INS 00202 THE BODY STRUCTURE AND ECOLOGY OF THE BLACK SOLDIER FLY

Description of the Black Soldier Fly: different body parts, adaptation and functions of different body parts; varieties/strains of Black Soldier Fly; life Cycle of Black Soldier Fly; general characteristics of Black Soldier Fly life cycle stages, ecological requirements of different life cycle stages.

MODULE THREE: INS 00203 BSF COLONY ESTABLISHMENT

Design of production facility (Insectarium, larvarium and hatchery), Materials and equipment for establishing a colony, methods of starting a colony: attraction and procuring of eggs, capturing of live females, egg laying attractants, Types of production systems: open, confined, maintenance of Ecological Conditions (Temperature, relative humidity, and light); Housing: types of housing structures, materials and equipment:, netting material, plastic and wooden structures etc

MODULE FOUR: INS 00204 BSF COLONY MANAGEMENT

Insectarium: Siting of insectarium, light versus dark areas; Partitioning: use of nets, cages and compartmentalization; Pupation: introduction of pupa and use of pupating media; Breeding environment: enrichments and other necessities lighting, artificial/potted plants, perching sites, watering points and forms, oviposition sites and attractants etc.); Maintenance of ecological conditions: (emergence, breeding, watering etc.); General management of an adult colony :watering frequency, use of oviposition attractants, oviposition media, need for aeration; Hygiene practices; Egg collection: How, when, frequency and duration;

Hatchery: Egg hatching: conditions, containers and apparatus Ecological conditions of the nursery area; Egg incubation methods and collection of neonates; early feeding practices and choice and processing of substrates; feeding rates and feeding frequency.

Larvarium: Larvae distribution: stage and amount; Feeding: stocking density, feeding structures; timing, and what to feed, frequency of feeding, rations; sources and types of substrates; Hygiene: when, how and frequency of cleaning; Ecological conditions of larvarium and brood area: temp, relative humidity, lighting conditions; Substrate preparation (sorting, chopping, depth, watering, Feed requirements at different stages etc.); Tell-tale signs (indicators of comfort and discomfort); Harvesting: equipment for harvesting, BSFL harvesting methods; timing of harvesting, harvesting procedures. Production systems: (Batch and Continuous).

MODULE FIVE: INS 00205 BLACK SOLDIER FLY PRODUCTS AND MARKETING

Potential economic opportunities across production chain: feed, egg, whole Black Soldier Fly larvae; Profitability calculation; Product development and marketing; Production plan and record

keeping: How to schedule a simple production plan, types of records, importance of keeping records.

MODULE SIX: INS 00206 OPPORTUNITIES AND CHALLENGES IN BSF FARMING

Opportunities: Types of finished products, Demand for products, value addition, market for products.

Production challenges: In-breeding and control; Predators, pests and diseases; Colony collapses; Potential for BSFL farming in Kenya: climatic conditions, Technicalities, Substrate types and availability, substrate sourcing, selection of substrates on basis of nutrient content.