



Small Flies, Big Changes



A guide
towards circular and
sustainable agriculture





SMALL FLIES, BIG CHANGES:

A guide towards circular and sustainable agriculture

“ORQUÍDEAS” PROGRAM
WOMEN IN SCIENCE:
AGENTS FOR PEACE
CT 112721-210-2023
Project Code 100910





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Ministerio de Ciencia, Tecnología e Innovación - MinCiencias
Universidad Nacional de Colombia
Centro de Investigación de Artrópodos Terrestres - CINAT
Insects for Peace

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First Edition, 2024

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Presentation

This publication embodies a shared dream: to demonstrate that peace can take root and flourish in Colombia's rural territories.

Developed through the Orquídeas – Women in Science program, a partnership between the Ministry of Science, Technology, and Innovation in Colombia (acronym in Spanish, MinCiencias) and the Universidad Nacional de Colombia, this guide aspires to inspire sustainability and hope in communities that, despite enduring conflict, have found unexpected allies in insects to transform their present and shape a brighter future.

Led by the Center for Terrestrial Arthropod Research (CINAT, by its acronym in Spanish) and the *Insects for Peace* program, this effort owes its success to the dedication and passion of an interdisciplinary team, as well as the trust and resilience of rural communities. It is more than research; it is a shared journey of learning and celebrating the human and natural potential of our regions.

These pages go beyond practical advice on the circular economy and the use of insects, specifically the Black Soldier Fly (*Hermetia illucens* L.), as animal feed and biofertilizer. We present a tool for empowerment, enabling individuals to transform their reality through simple yet impactful actions.

As Eduardo Galeano said, “*Many small people, in small places, doing small things, can change the world.*” With this work, we aim to plant a seed for circular, sustainable, and autonomous economies while reinforcing the social fabric of our rural communities. We believe these tiny creatures, symbols of renewal, unity, and possibility, have the power to inspire every farmer who cultivates the land with their hands and their hope.

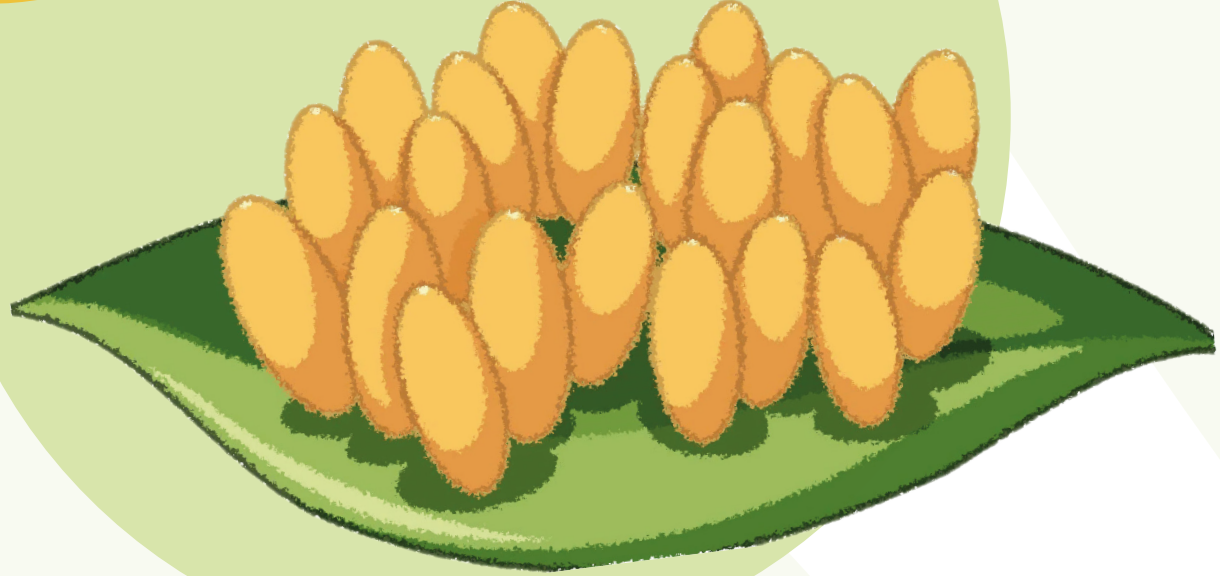
Karol Barragán-Fonseca
Coordinator of Insects for Peace
Professor at Universidad Nacional de Colombia

Why should we cultivate the Black Soldier Fly?



1

The Black Soldier Fly is found in natural ecosystems in countries like Colombia, where we can set traps to collect its eggs



2

Black Soldier Fly larvae are rich in protein and fatty acids

40% Protein 30% Fat



3

Ideal for feeding fish, pigs and poultry. This makes us less dependent on commercial feed



4

The larvae feed on organic waste, such as that produced in our crops and kitchens



5

The waste left by the larvae can be used as plant fertilizer



6

This is how we save money and produce food and biofertilizers in a more environmentally friendly way



Black Soldier Fly Life Cycle



Eggs
2-4 days



Young larva
5-6 days



Larva
14-18 days



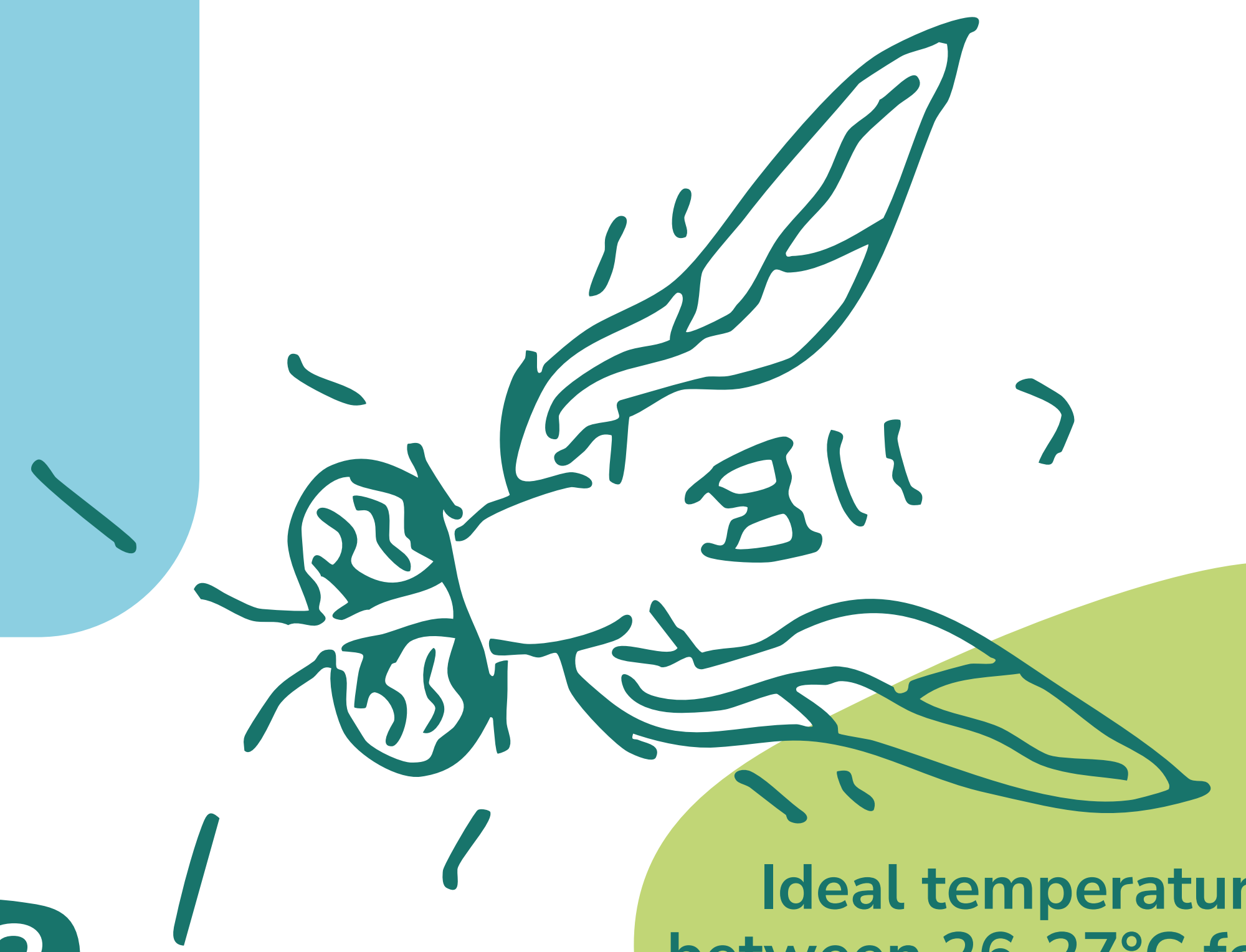
Pupa
12-14 days



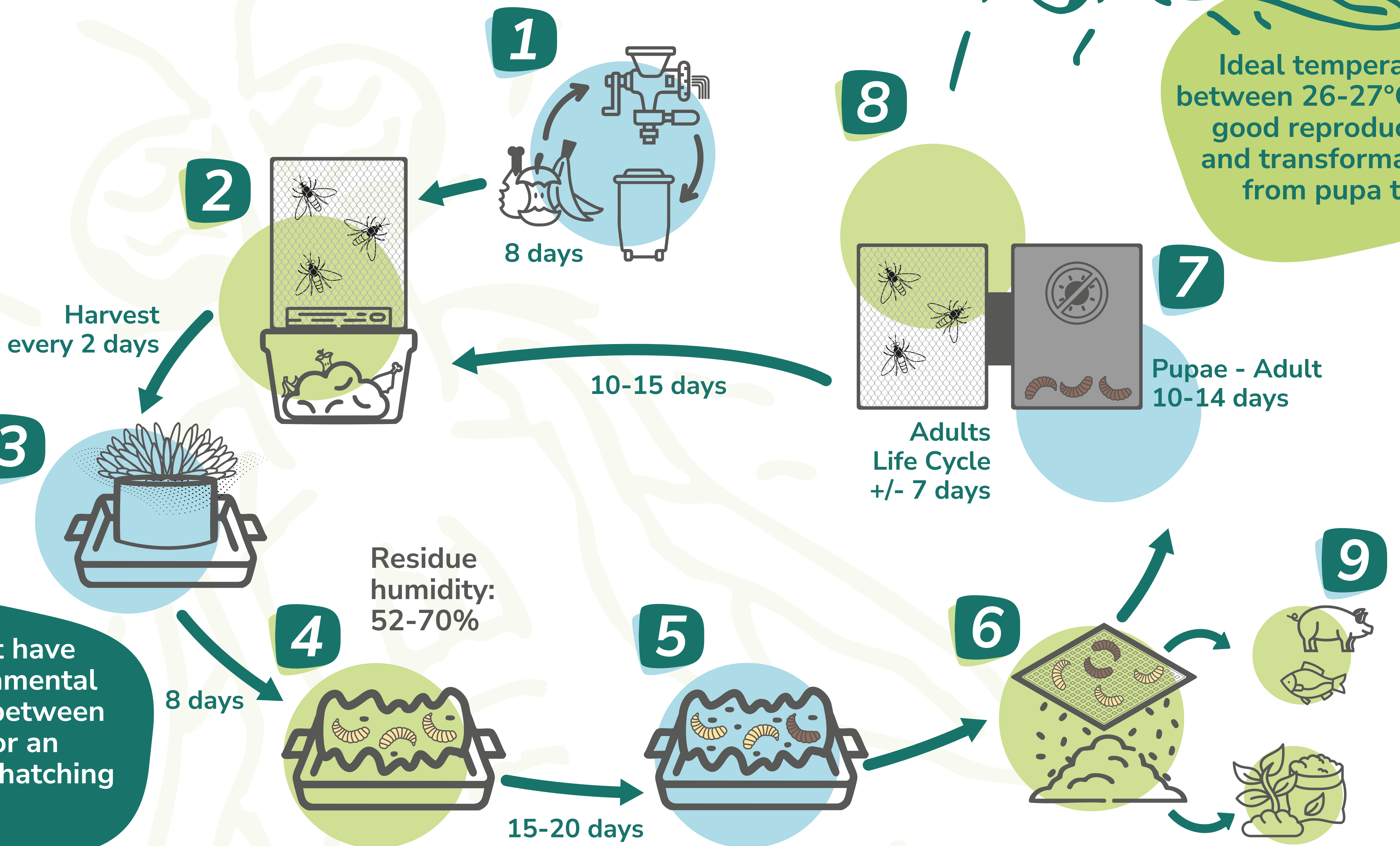
Adult fly
6-8 days

The complete cycle takes 39 to 50 days

Steps to set up a Black Soldier Fly production



Ideal temperature between 26-27°C for good reproduction and transformation from pupae to fly



- 1 Collect organic waste, crush it, and store it for one week.
- 2 Place the fermented waste in a mesh container and add wooden slats for flies to lay their eggs.
- 3 Collect eggs from the slats and incubate them in a mixture of 40% chicken concentrate and 60% water.
- 4 Transfer the eggs to plastic baskets containing the stored waste.
- 5 Feed the larvae until the first 10% change from beige to dark brown.
- 6 Use a sieve to separate the larvae from the compost they generated.
- 7 Place the larvae in baskets in a dark room or area (they avoid light).
- 8 Ensure the dark area connects to a transparent cage. When adults emerge from pupae, they will fly toward the light.
- 9 Use the larvae and some prepupae as animal feed.

What kind of residues can we use?

Larvae fed on manure or visors should not be used as feed for the same species



Harvesting residues



Discarded visors, chicken skin or similar



Animal manure



Decomposing or discarded organic waste



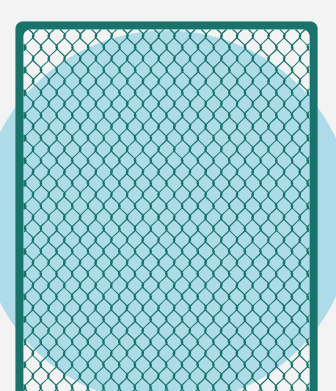
Fruit or vegetable peels

Machinery and inputs depend on waste volume and system optimization

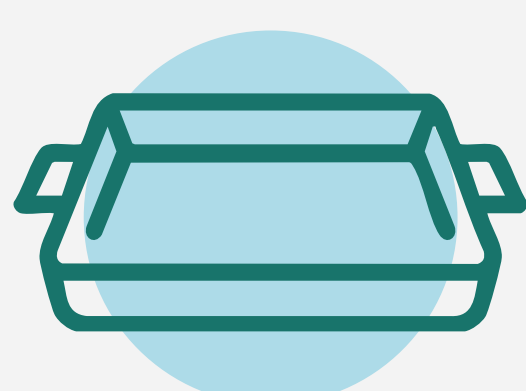
Materials and infrastructure



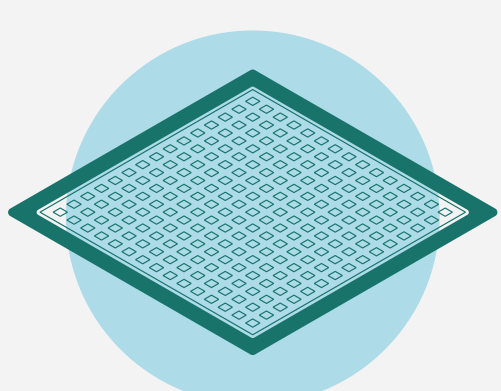
Basic infrastructure for local production



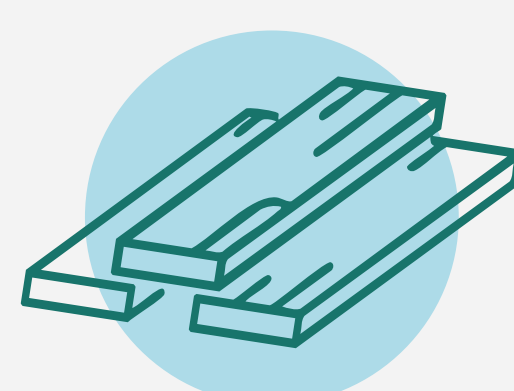
Fabric cage 1m³



Plastic trays of 60x40x18cm



Sieve



Wooden slats 15x5cmx5mm



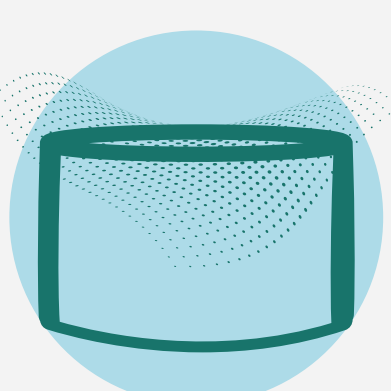
Kitchen scale



Storage bin 200 lts



Scale



Cilindrical (PVC) tube and a mesh

Results of the process

Pests like grain mites, ants, and mice must be prevented, as they can disrupt production



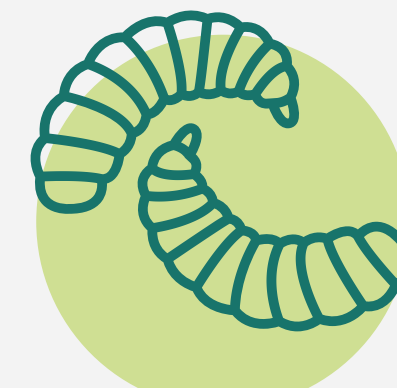
1 g of eggs



10-15 Kg of organic residues



3-4,5 Kg of organic fertilizer



1-2 Kg of fresh larva



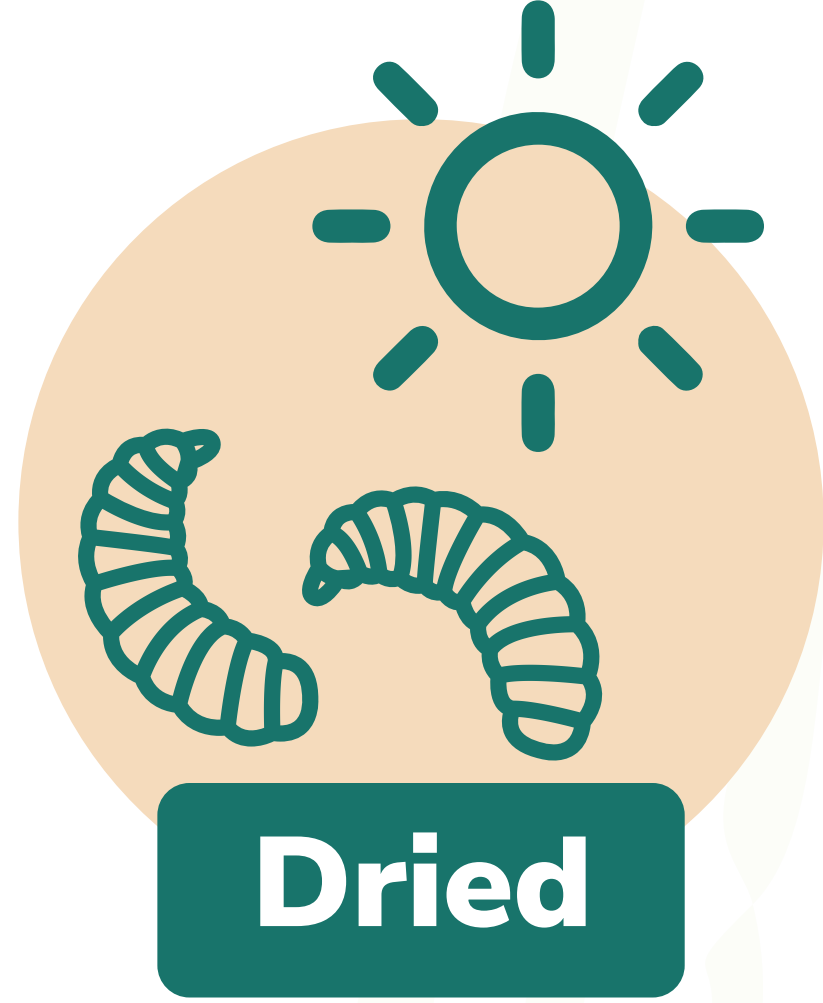
400-800 g of dry larva flour

In 1m², 8 vertical trays can hold 80 Kg of waste for biotransformation

Black Soldier Fly for Chicken Feed



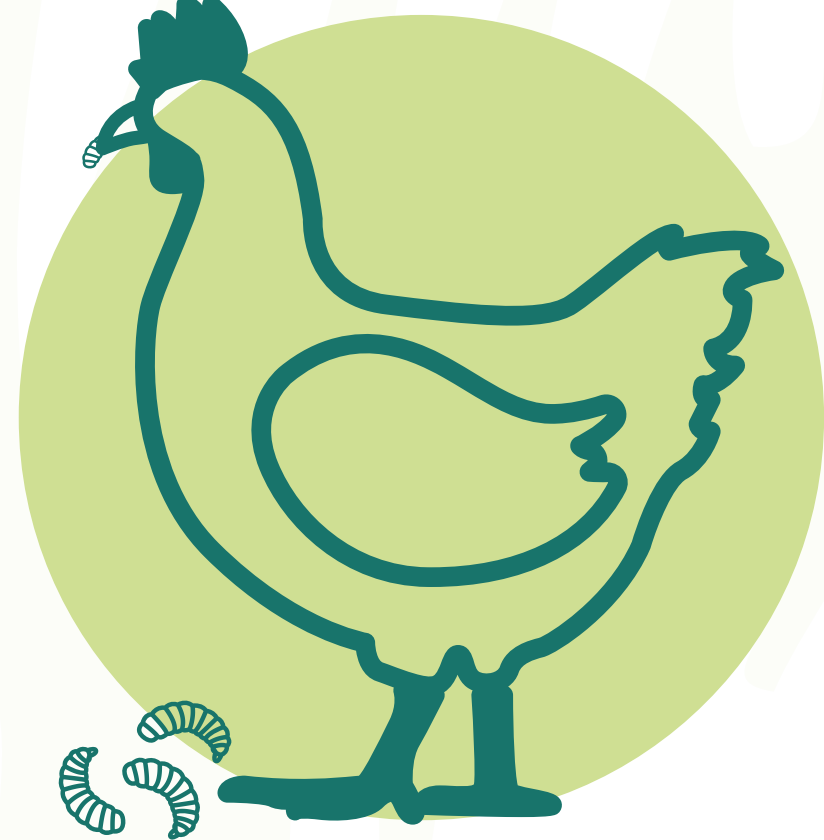
In what forms can the larvae be supplied?



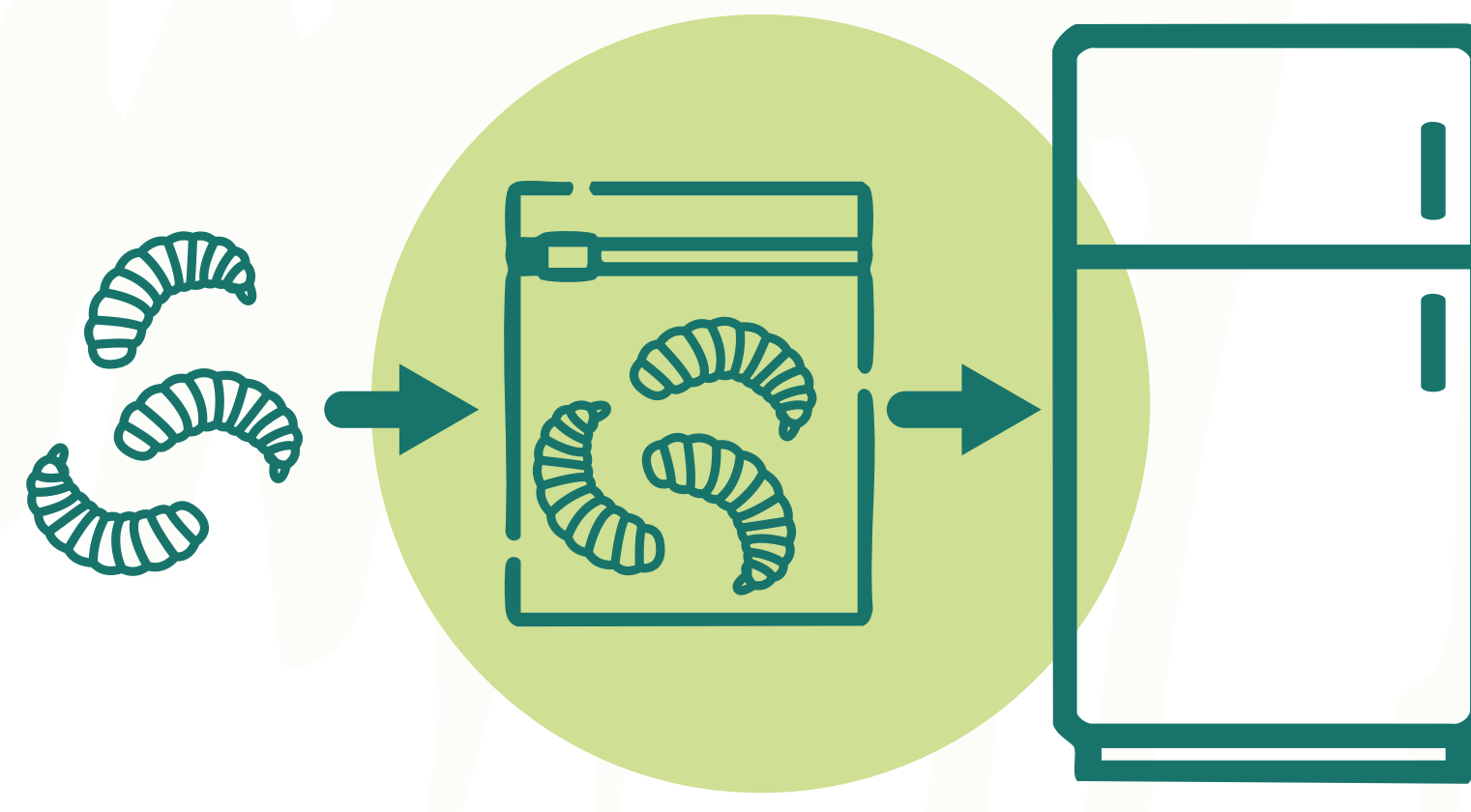
How are the larvae supplied?



Mix with feed and raw materials like corn to partially replace animal feed



Supply as snacks to complement the diet



Live larvae can be used immediately after separation, as a diet supplement, or stored in portions in a refrigerator for up to 5 days

Larvae become less active in the cold but regain movement and freshness once removed from the refrigerator



How many larvae should be provided?



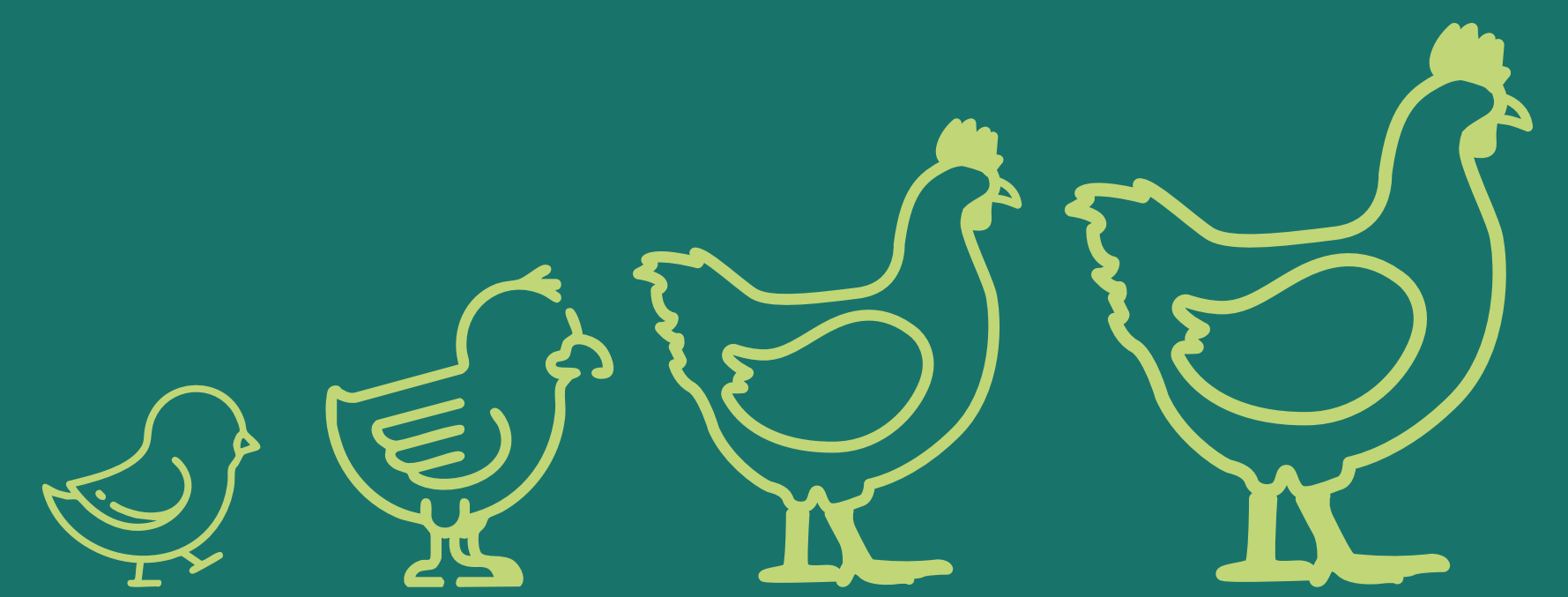
Supplying 30 male broiler chickens with 100 g of larvae daily from day 22 to day 35 reduces animal feed usage from 4 to 3,6 bags, achieving a 10% cost reduction



In one experiment, replacing 20% of animal feed with larvae and other raw materials led to chickens eating less while gaining more weight compared to those fed only chicken feed

When should I feed larvae to my chickens?

After the first two weeks, larvae can be introduced gradually to accustom the chickens, with primary use during the fattening stage



Can chickens be fed exclusively on larvae?

No! Larvae primarily provide protein and reduce reliance on raw materials like soy, but they must be supplemented with other ingredients to meet the chickens' nutritional needs

Chicken welfare is improved by eating live larvae

Additional benefits: Along with larvae, compost is produced, which can be used for your own crops or sold

Your chickens will be happier!



Black Soldier Fly residues as biofertilizer for plants



The production of larvae generates **frass** (excrement and other residues from these insects)

Frass can be used for your crops or sold to generate income



These residues contain **nutrients** that are good for plant growth and help with water retention



8 to 10 days of rest before sowing: For seedbeds you should mix the frass with the soil and let it rest in a dry place



20 to 30 g of frass per kilo of soil. Sow 2- or 3-week-old garden seedlings (Eg: cilantro, lettuce, cucumber, tomato and aromatic plants)

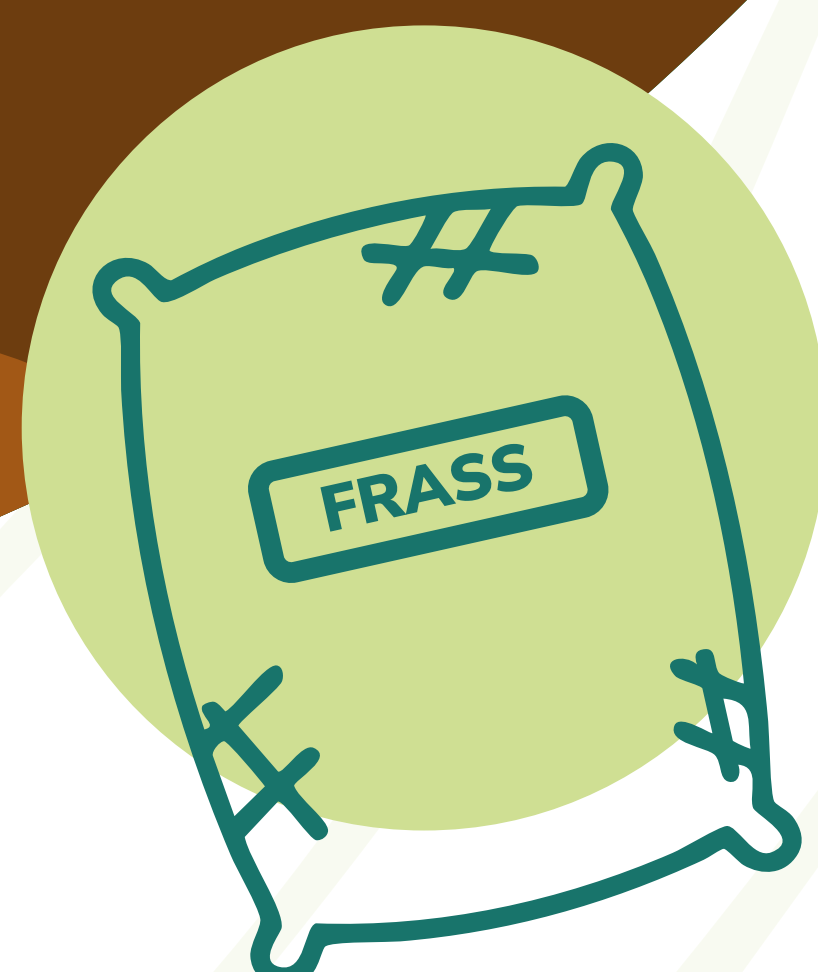


300 to 500 g of frass for trees and shrubs. Apply directly to the soil, in contact with the roots



Frass can also be used to enhance the effectiveness of other fertilizers

When not in use, store the **frass** in a cool, dry place with the container or bag tightly sealed



BSF production provides protein and biofertilizer, reducing costs, increasing income, and promoting sustainability in your production system



Nitrogen
2,8 %

Phosphorus
2,9 %

Potassium
4 %

Calcium
1,7 %

Magnesium
0,99 %

Iron
0,16 %

Manganese
106 mg/Kg

These values may vary depending on the larvae's diet



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