



*Discover the Ecosystem with*  
**Un Kurdu Kraker!**



Funded by  
the European Union

*Dear Reader,*

First of all, as the Teacher Foundation, we are excited to present a new project under the ICSE Science Factory umbrella: Open Schooling. The Flour Worm Project! If you're wondering why we chose the name 'flour worm,' let us explain in one sentence: You can do much more than just throw away your waste—you can turn it into a high-protein food source for the future.

This project aims to fully explore the cyclical power of nature and re-evaluate organic waste generated in daily life (vegetable and fruit scraps, tea leaves, etc.) through mealworms. The high-protein food obtained is shared with local institutions (e.g., Karaali MTAL, a poultry farming facility) through collaboration, creating a genuine circular economy model. Moreover, students at Maya Schools are also involved in this process, experiencing firsthand the journey of organic waste transforming into valuable protein.

The Open Schooling model brings together different stakeholders (schools, NGOs, private sector representatives, and women entrepreneurs) around a common goal. This is precisely why, as a foundation, we believe that education should not be limited to the classroom, but that young minds should develop in close collaboration with society, producing real solutions to real problems. In this booklet, you will discover how flour beetles transform organic waste into an extraordinary protein source, who we collaborated with during the project, and why this is so critical for the future. Now let's step into the magical world of protein production from waste together

**From Organic Waste to**  
*Valuable Protein...*

*Kraker is a flour worm  
born in flour...*

Although it looks tiny, it plays a  
huge role in the cycle of nature.

But it is not aware of this!

How do Kraker and his friends  
benefit the world?

Are you ready for 15 fun activities to  
find out?

*Kraker*



# Activity 1

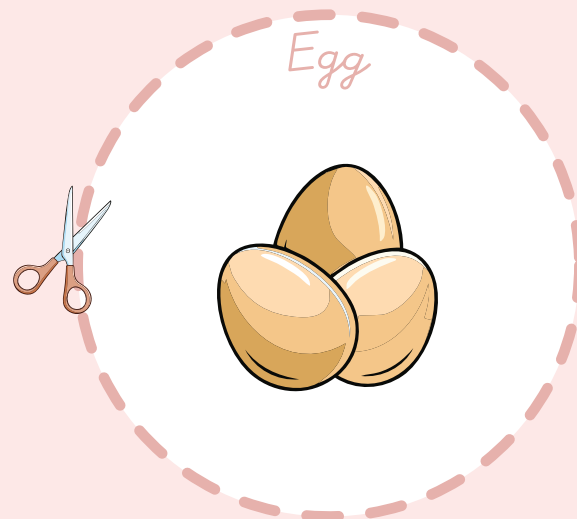
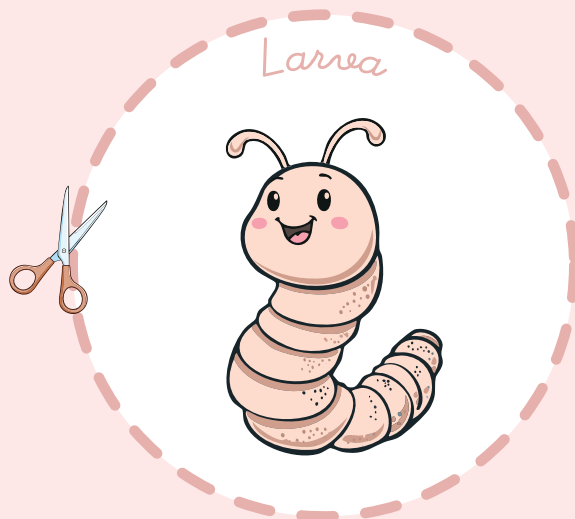
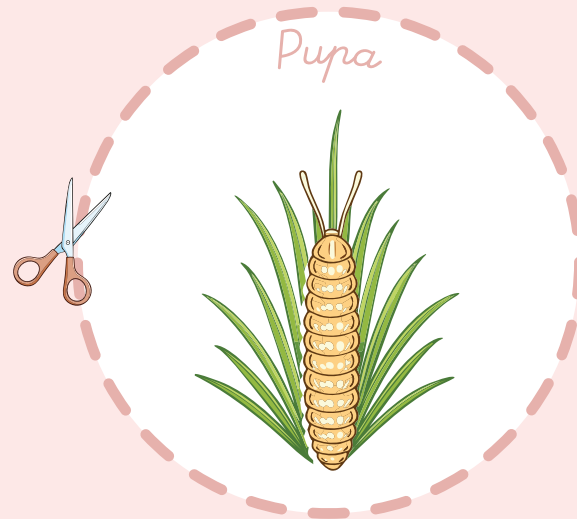
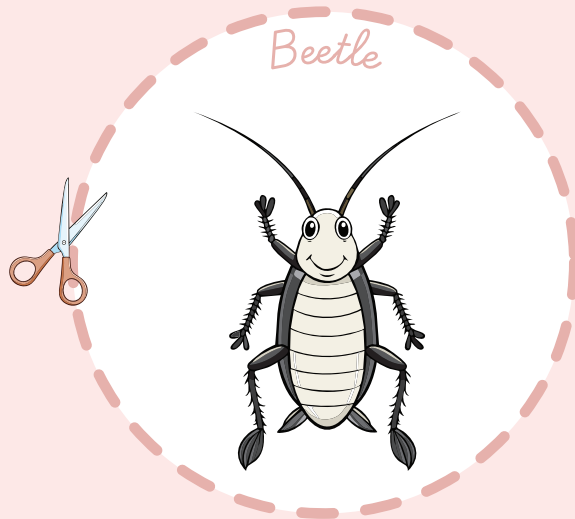


Is Kraker a **superhero**? A **scientist**?  
Colour it in and add clothes and accessories!

*Did you know?*

Flour beetles help make soil more fertile  
by breaking down organic waste in nature!

## Activity 2



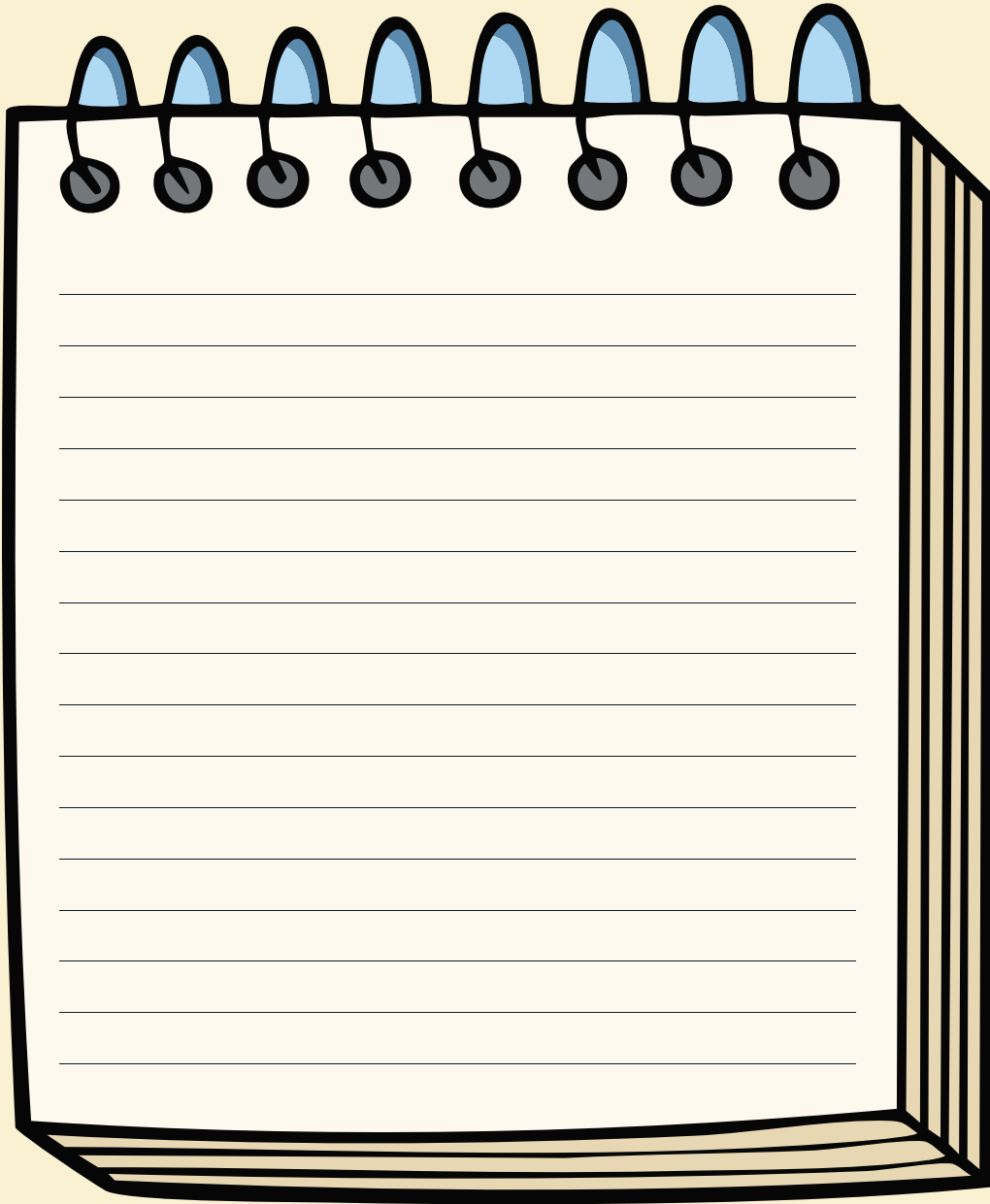
Cut out the stages of the flour beetle's life cycle shown above and **stick them in the correct order**. In your opinion, at which stage is Kraker most active?

*Did you know?*

At an ideal temperature of 28 °C, the life cycle is completed in 8–10 weeks, while at 20 °C, this period can reach 16 weeks. Temperature directly determines the speed of every organism.



## Activity 3



Examine real mealworms closely with a magnifying glass. Discover details such as **their body structure, legs, and movement** patterns! Take notes like a scientist!

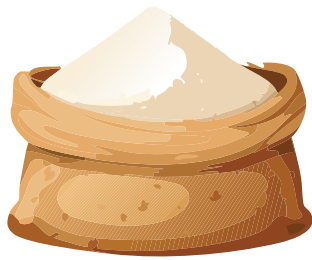
*Did you know?*

During the larva-pupa transition, the head and chest parts first turn bright golden yellow, then dark brown, acquiring their distinctive 'cocoon' appearance.

## Activity 4

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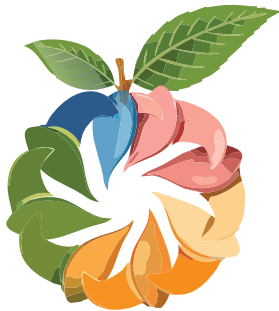
Flour

☐

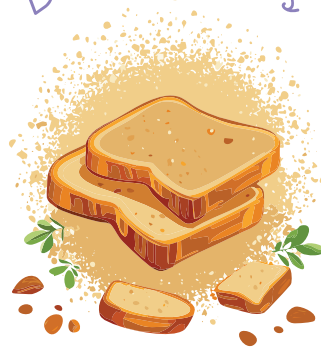
Vegetable

☐

Fruit Peels

☐

Bread Crumbs



Kraker's Favourite Foods  
What do you think Kraker likes **to eat the most?**

*Did you know?*

Flour beetles especially  
love grains and starchy foods!



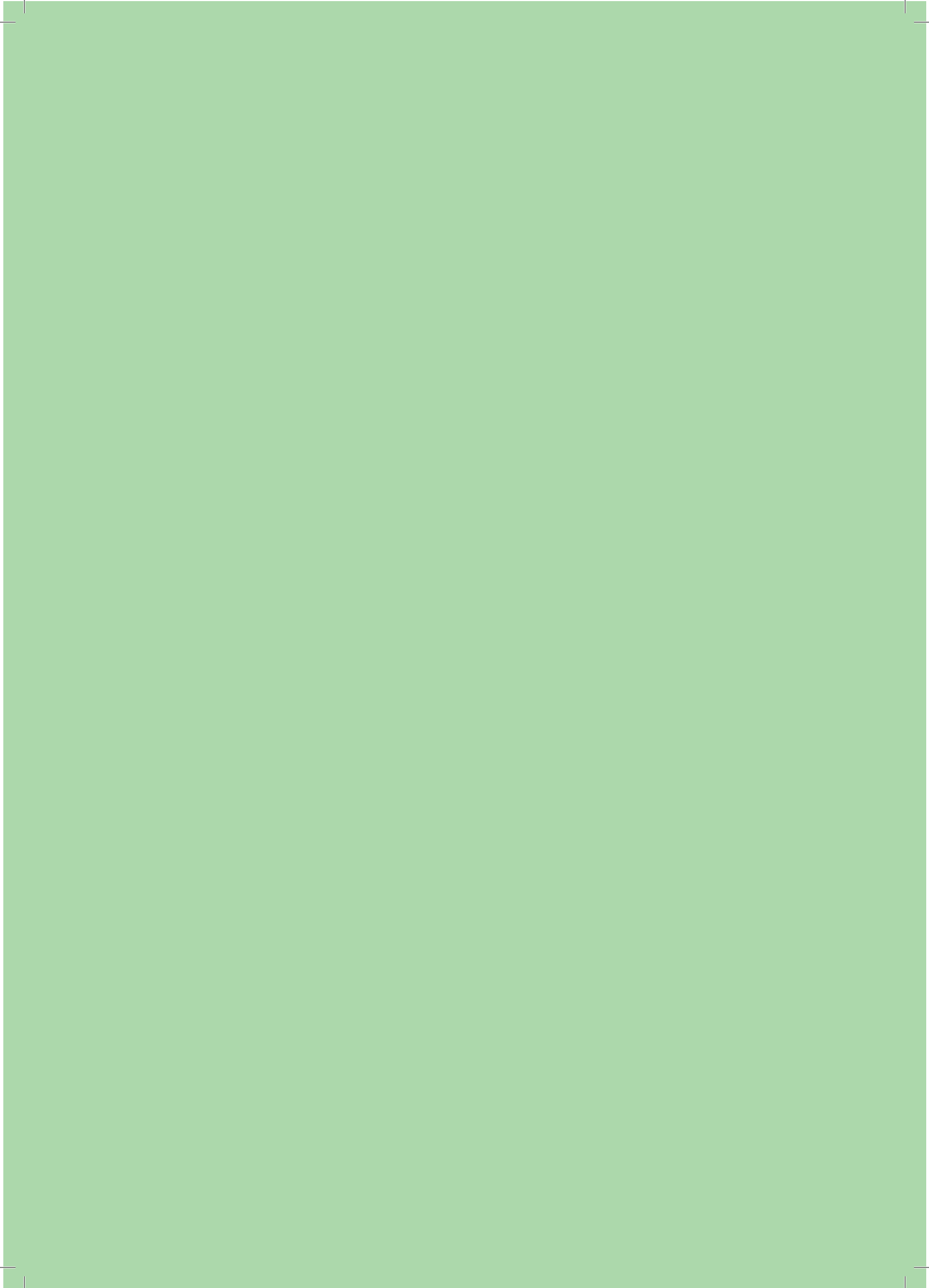
## Activity 5



Where is the flour beetle in the ecosystem? Arrange the cards in the **correct order to complete** the food chain.

*Did you know?*

In nature, every living thing is connected to each other and plays an important role in the food chain.



## Activity 6



Kraker's Adventure Map  
**Help** Kraker reach nature!

*Did you know?*

The leaf cover at the top of the ecosystem filters direct sunlight, allowing flour worms to work in cool, dark tunnels.

## Activity 7



*What can I do?*

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*What did I experience?*

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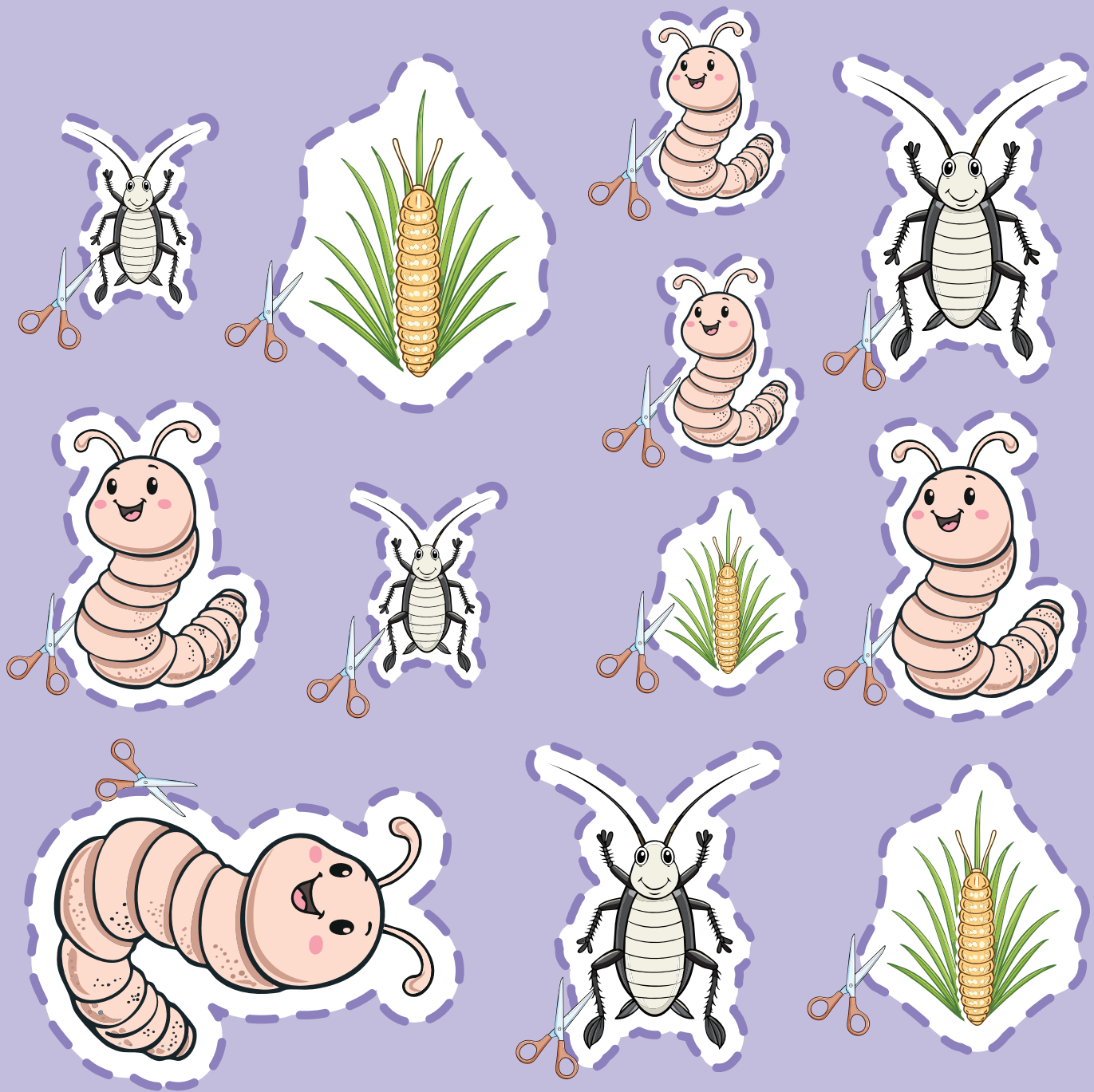
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Now you can **design your own mealworm habitat**.  
Observing mealworms will give you clues about **how they grow and feed**.

*Did you know?*

Flour beetles dig small tunnels with the tips of their noses in the flour, bran, or decaying leaves where they live. These tunnels serve as both hiding places and a way to keep the environment moist.

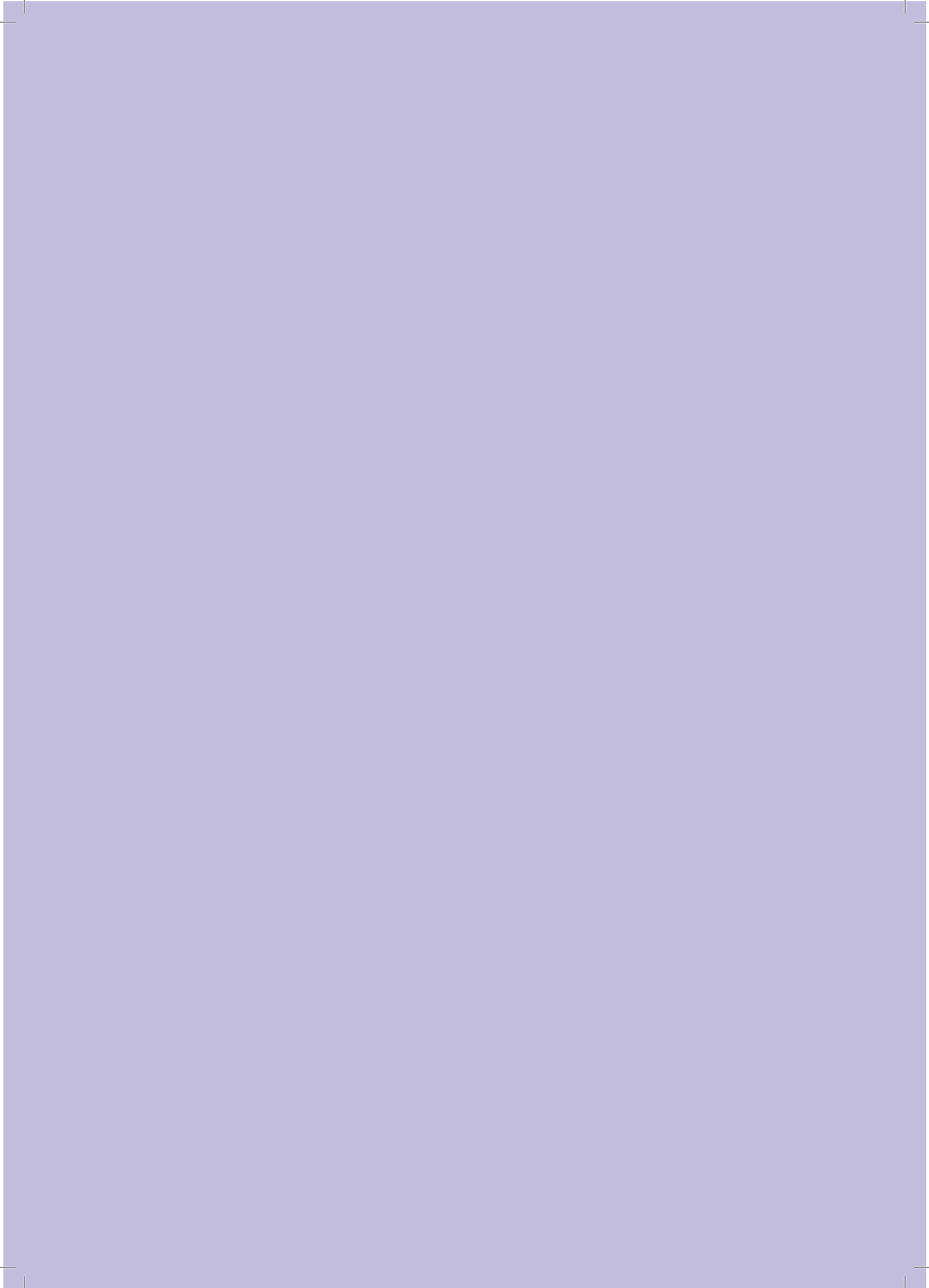
## Activity 8



Cracker and Friends  
**Cut and paste** to create Cracker's family.

*Did you know?*

A flour worm lives for about 6-9 months  
and then turns into an insect!



# Activity 9

## Cracker's Diary

I feel a little strange today. I don't want to run around looking for food like I did yesterday. It's as if something is changing inside me. I think I'm on the verge of a big transformation, but I don't know what will happen!

Complete the story **using your imagination.**

Did you know?

# Activity 10



How to Make Compost?  
**Draw and describe the process** of making compost by  
reusing food waste.

*Did you know?*

Compost is a natural fertiliser for soil!



# Activity 11





Flour Worm Ecosystem House  
Design and draw an ecosystem for flour worms.

*Did you know?*

Agricultural waste enters the food chain and sustainable cycle thanks to the voracious appetite of flour worms.

## Activity 12

<i>Food Source</i>		<i>Protein Content (per 100g)</i>
	Mealworm	~50g
	Chicken Egg	_____
	Salmon	_____
	Lentils	_____

★ Which food source has the highest protein content?

\_\_\_\_\_

★ If mealworms were athletes, which food would they prefer?

\_\_\_\_\_

Compare the protein content of 4 different food sources and discover which one has the most protein!

*Did you know?*

Mealworms contain up to 50% protein by dry weight. This is almost twice as high as beef (20–24%) and chicken (20–25%).

# Activity 13

Scene 1

One day, a mealworm got lost in nature and...?

Scene 2

Scene 3

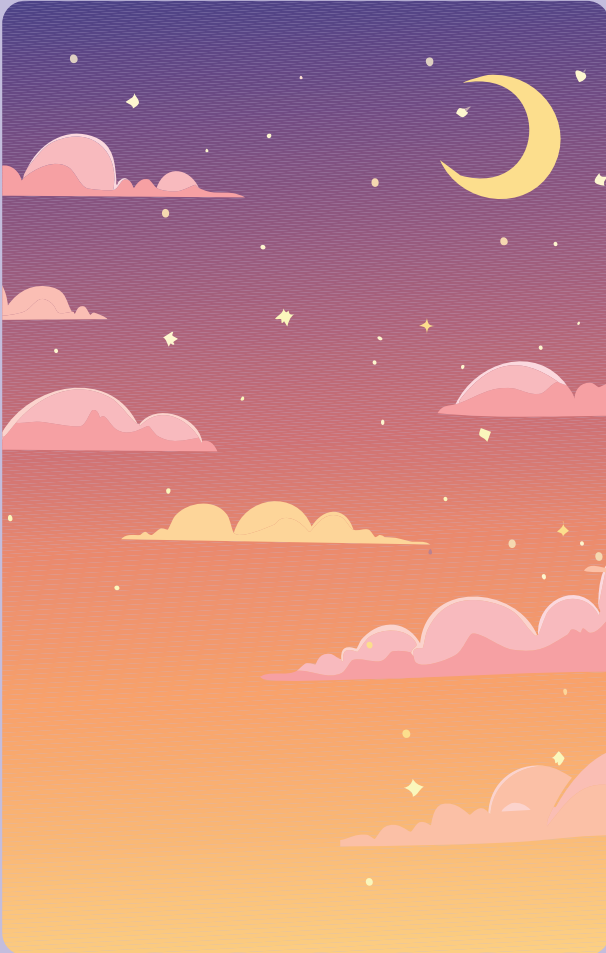
Scene 4

Create a 4-panel comic strip telling the story of the mealworm's adventure.

*Did you know?*

Mealworms sometimes cannot find food for long periods of time in nature and may enter a state similar to hibernation!

## Activity 14



Do mealworms prefer **night** or **day**?  
Draw mealworms wherever you like.

*Did you know?*

Mealworms generally prefer dark environments  
and are more active at night!

# Activity 15

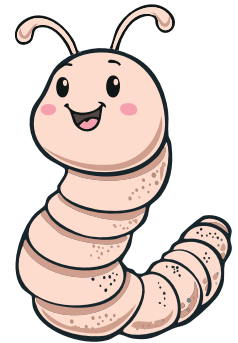
This image shows a single sheet of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

A flour worm **farm in space**? An **alternative protein** source? Flour worm robots? Imagine how flour worms might be used in the future and write about it in detail.

Did you know?

Flour worms convert agricultural waste, flour crumbs, and even some food industry waste into biomass with high efficiency. This way, both the food chain and waste management come together in a single ecosystem.

# Is it Possible to Solve Environmental Problems with Mealworms?



The Mealworm Project, which is part of the Open Schooling project within the ICSE Science Factory, aims to convert organic waste into a sustainable and high-protein source. The project involves the biological decomposition of daily organic waste such as vegetable and fruit scraps and tea leaves using black soldier fly larvae (*Hermetia illucens* larvae) to produce biomass with a protein content of 40-45%.

Developed within the framework of the circular economy, this method enables approximately 1 kg of organic waste to be converted into 200-300 grams of larval biomass, which in turn can be processed into 80-120 grams of pure protein. The implementation of this method reduces methane gas emissions resulting from the decomposition of organic waste by 60%, contributing significantly to environmental protection and providing an alternative to traditional feed sources that are dependent on imports.

Students involved in the project are also practically involved in this process, gaining the opportunity to develop their problem-solving skills through education on sustainability and environmental awareness.

The Un Kurdu Project offers effective solutions to critical global issues such as food safety, waste management, and climate change.

# Thank You

In this process, which will serve as a successful example of the Open Schooling approach within the scope of ICSE Science Factory, the Gölbaşı District Governor's Office and Gölbaşı Municipality will provide local government support, while Gölbaşı District MEM schools and families will coordinate educational stakeholders by involving them in the project. The First Teacher Foundation will take the lead, using the Open Schooling principle as a guide, while Maya Schools will establish the 'Flour Worm Unit' to develop a model system for converting cafeteria waste.

The flour worms cultivated in this unit will be distributed to relevant local stakeholders as part of a circular economy and sustainable production model. Karaali MTAL will provide expertise in poultry farming to utilise the flour worms as feed; Çiğdemim Association will contribute through volunteer and community efforts to connect the project with the local community.

We would like to sincerely thank all our stakeholders who have contributed to the implementation of this pilot project.

## Maya Tam Benlik Science Group Students

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**Sibel Kahraman** - German Teacher  
**Serap Serim** - Social Studies Teacher  
**Beyza Çelikbaş** - Project Design Specialist  
**Fatih Balcı** - Education Specialist  
**Onur Aydın** - Project Coordinator



