

# Biology

**Insects in the ecosystem: helpers or pests?**

RecyCOOL Lessons

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# Insects in the ecosystem: helpers or pests?

## **Description of the lesson**

First, you will learn more about the role of different varieties of plants as well as the role of insects in the ecosystem. After this, you will play a game on a board that will teach you what decisions farmers have to make, including planning the planting of their fields.

## **Objective:**

Explore how ecosystems work and what factors can influence the growth and health of plants.

## **After this lesson you will be able to:**

- you will know the benefits of planting different plants every season
- you will know the benefits of legumes
- you will know what (and how) can help deter pests in farming and agriculture

## **Tools and materials**

printer, scissors, two dice and one person to play the game with

## **BIODIVERSITY:**

A variety of plants and animals living on the world or in one selected area.

## **CATERPILLAR:**

A caterpillar is an insect like a worm, that transforms into a butterfly.

## **INSECTICIDES:**

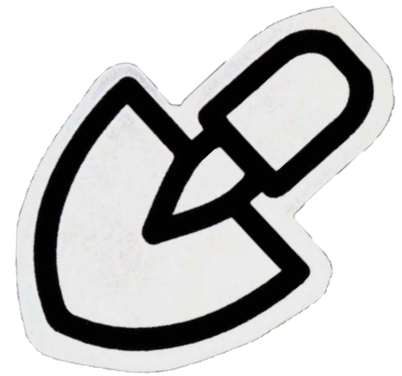
Insecticides are chemical poisons that are sprayed to kill insects to prevent them eating the plants.

## **NUTRIENTS:**

Nutrients are molecules that plants, animals and we humans need to make energy, move, grow...

## **BENEFICIAL:**

Describes when something provides positive impact or effects.



Have you ever wondered why insects exist?

What do you think insects have to do with your shirt or trousers?

Write down your thoughts, or discuss it with your neighbour in the class.

In this lesson we will have a look at cotton growing. Cotton is one of the most important sources for our clothes. Cotton-cultivation (if grown as a mono culture) often contributes to the degradation of the environment, when it is cultivated in a way that is not good for the ground, the people and the planet.

One problem with cotton farming is there is a pest that is really harmful for the plant, called the "cotton bollworm."

The caterpillar goes into the cotton boll and eats the fibres that our clothing would eventually be made from. To deter pests like this particular worm, farmers often spray insecticides onto the cotton crops. The problem with this method of deterring pests is that these insecticides are toxic to the worm, but also to the plant, other plants, animals and insects around the field, the people who spray them, and also to our skin when we wear the clothes.

Photo credit: [Encyclopædia Britannica](#)



Other insects, animals and insects can be very helpful for the plant to grow, by creating diversity within the field and offering protection and nutrition to the environment. **And, this is so important because the cotton plant is dependent on the environment it is growing in.**

The poison also gets into the ground, where it kills microorganisms that are really important to the plant growth. **These microorganisms provide nutrients to the plants.** Without them it is harder for the plant to reach them.

With their movement, the animals in the ground loosen the soil, which makes it easier for the roots to travel through the ground. When the ground is more loose, it also saves more water than if it is a compressed block of soil.

**So by spraying the insecticides, you can see how a "domino effect" results in a whole ecosystem being affected.**  
**The good news is that there are methods out there that are much better for the environment!**

One of the most important things for the ecosystem is to have a variety of plant life. Different plants have different properties, will need different nutrients and will grow differently.

When different plants grow together, they can be beneficial for each other. This is called **companion planting**.

In our case of cotton farming for example, these other plants can be utilised to ensure the healthy growth of the cotton plants, in a natural way: chilli plants can deter the cotton bollworm sunflowers will attract the cotton bollworm so it is distracted from reaching the cotton plants.

Then there is a special kind of plant, called a “**legume**”. Planting legumes ensures that the ground will be enriched with important nutrients, that will come from the plant. Often they also root very strongly through the ground, which loosens it. **This means that the ground will be able to retain more water, which creates a much better environment for microorganisms.**

Well known legumes can be found in your kitchen cupboards! An edible seed from a legume plant is called a “pulse” and some examples of these are chickpeas, soy beans, lentils and peas. **So as well as being beneficial to the cotton farm environment, their produce can also be eaten or traded.**





Photo credit: [Vegconomist](#)

By spraying pesticides, we help the cotton plant only for a short amount of time. When farmers avoid spraying pesticides, it is much healthier for everyone.

The results of eco-friendly farming are most visible after a couple of years, especially when the farmer had previously used pesticides as a pest-deterrent. **But in the end, it doesn't destroy our planet earth and so the positives of this method make it worth the wait.**



# Reflection

Let's play a game!

German:

English:

Each player gets a sheet with their own playing cards.

Cut out your field and the "plant" cards.

To count your revenue and expenses simply calculate on the piece of paper that you have. For that you will need a pen and paper.

The aim of the game is to get money through your farming practice and make profits. Whoever has the most money in the end will win.

## **How the game works**

You are allowed to choose what grows in your fields. To do this, you always place the card with the plant onto the chosen field.

You roll the dice one after the other. Each roll of the dice represents a season in which an event happens.

This means that before each time you roll the dice, you think about where you will plant which plant.

Also, if you choose to plant the same plant twice in a row, you must place a new card on the field. Then roll the dice. Now an event has happened and you can calculate your harvest. The money you pay with is Z

## Expenses

To plant a field you have to pay:

cotton	1 Z
sunflower	1 Z
legumes	1 Z
corn	1 Z
chilli	1 Z
wheat	1 Z

If you plant 4 fields of one variety side by side you can save some work steps. You only pay 3 Z.

## Income

cotton	5 Z
sunflower	3 Z
legumes	3 Z
corn	5 Z
chilli	5 Z
wheat	4 Z

### Disclaimer

These are not reliable comparable prices. Prices depend on region, world market and many other factors.

**You start with a capital of 10 Z, which you can first use to buy your first plants.**

## 2 Famine

Food prices have risen, if you have more than 15 cotton fields, you have to buy food. Pay 1 Z per cotton field. The wage for corn and wheat has increased by 1 Z.

## 3 Flood

There was a very heavy rain, and the fields were flooded. Plants drown if the soil is not well rooted. If the last time you planted a legume was more than three seasons ago, you lose 5 Z for cotton, 2 Z for sunflower, corn, wheat and chilli, nothing for legumes (they are very hardy)



## 4 Cotton boll moths

This year there was a cotton boll moth endemic. These spread particularly well when the cotton fields are large.

For every four field parts hanging together, you lose 5 Z per field. If the fields are smaller, it is only 3 Z per field. If you planted chillies, they will scare away the pests. If you planted sunflowers, they will attract the pests and they will not go after the cotton as intensively. This applies to all the fields that are around the chilli or sunflower fields. You only lose 1 Z.

## 5 Good harvest

This year was a particularly good year, you earn 1 Z more per field.

## 6 Dry summer

This year was a particularly dry summer. Plants could handle it better if the soil is healthy. For this it is important that the plants in the field change regularly. Even better is if you plant legumes once in three years. If you had no rotation, you lose 3 z per field. If you had rotations without legumes, you lose 2 per field. If you have a rotation with legumes, you lose nothing.

### **7 Storm from the north**

There was a strong storm from the north that blew away some of the light cotton bolls. Corn and sunflower fields took some of the brunt of the storm.

one field south of the corn and sunflower fields the other plants are protected. If you do not have corn and sunflower fields north of your cotton fields, you lose 3 Z per field.

If you do, you lose only 1 Z per field.

### **8 Storm from the east**

There was a strong storm from the east that blew away some of the light cotton bolls. Corn and sunflower

fields took some of the brunt of the storm. One field to the west of the corn and sunflower fields the other

crops are protected. If you do not have corn and sunflower fields to the east of your cotton fields, you lose 3 z per field. If you do, you lose only 1 Z per field.

### **9 Hot summer**

This summer is especially hot, there are very few clouds and the plants are exposed to direct sunlight more often, so the soil dries out faster.

Plants will handle these conditions better if the soil is healthy. For this

it is important that the plants in the field change regularly. It is even better if you plant legumes once in three years. If you had no rotation,

you lose 2 per field. If you had rotations without legumes, you lose 1 per field. If you had rotations with legumes, you lose nothing.

### **10 Plant disease**

There is a plant disease outbreak in cotton. It spreads especially well

when the fields are planted close together. The disease comes from neighbouring farmers. All fields that

are adjacent to each other also get this disease. Additionally, this disease has an easier time getting to large fields. So if you have a field in the middle that is bigger than four squares, this field is also affected.

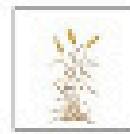
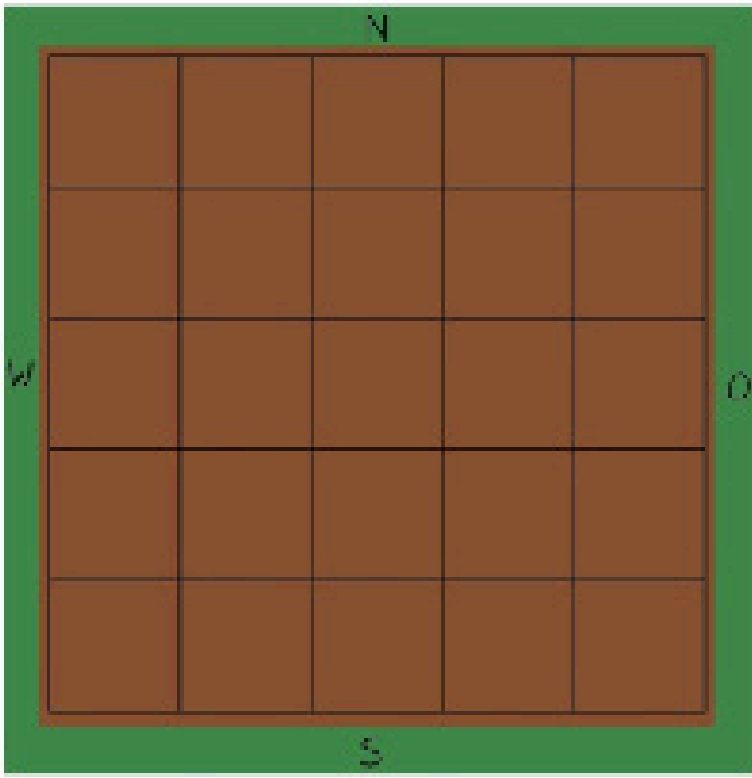
You lose 2 Z per field.

### **11 Expensive fertiliser**

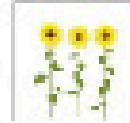
This year fertiliser was very expensive, which means you could only afford a little. You have to divide it among the

### **12 Bonus**

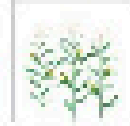
If you do crop rotation, you get funding of 30 Z.



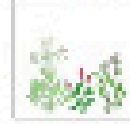
wheat



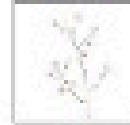
sunflower



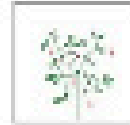
corn



legumes



cotton



chili

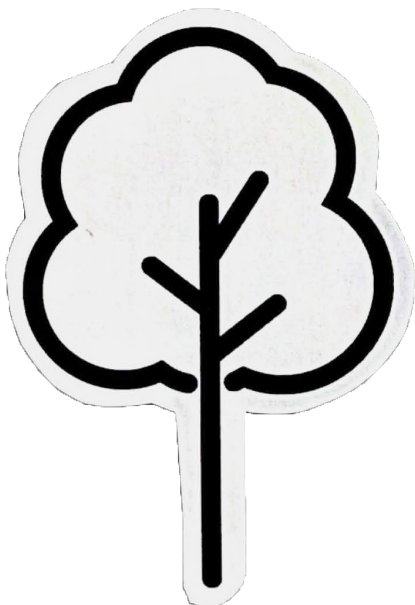

# Resources

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