Geography

Impact of cotton cultivation on the Earth

RecyCOOL Lessons

Disclaimer

These lessons have been created for and tested with young people in Slovakia, the Czech republic, Germany, Hungary and Croatia. They are open-source and available for adaptation for different groups globally.

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Impact of cotton cultivation on the Earth

Description of the lesson
First you will learn about the needs of the cotton plant, then about watering methods in different areas. Lastly, we will explore the difference between healthy soil and destroyed soil with an experiment.

Objective
Objective of this lesson is to find out what the impact of cotton growing can have on our planet by creating two different types of ground and comparing them.

After this lesson you will be able to
– talk about the changes to landscapes through different types of soils and watering methods

Tools and materials
two containers (without holes) that are the same size, sand from the builders merchant, soil, old dead leaves, tiny stones, dead tiny twigs, water, scale to measure the water

DEGRADATION:

Degradation in a geographical context means the process of changing the environment, in a negative way.

Many of our clothes are made of cotton, which of the clothes you are wearing are cotton?

What do you know about cotton plants?

How much do you know about the problems caused by cotton growing? What have you heard?

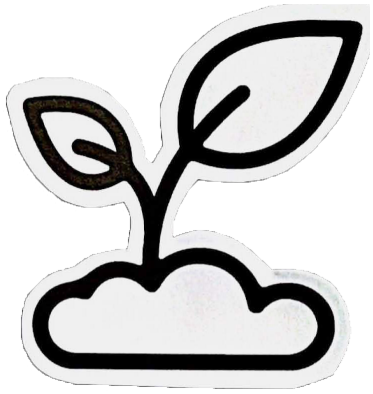
Cotton grows in subtropic and tropic climates. Cotton is a plant that has been grown and used for cloth for thousands of years. Cotton without chemicals naturally rots down and enriches the soil for more plants to grow.

There are two periods of growth:
– The period in which the plant grows
– The period of ripening

During the growing period the plant needs a lot of water. During the period of ripening, it must be dry and warm, rain would be harmful. You could say the plant needs a dry head and wet feed.

This means, growing cotton needs areas with rain seasons and dry seasons. A typical rain is the monsoon, it is particularly well known in India. Normally, the trade winds blow here. Due to strong heating or cooling, the direction of the air changes. Especially when the air heats up, it can absorb a lot of water and it rains heavily.

Because we are now buying so many clothes, there is so much more cotton needed, and so people have started to grow cotton in intensive agriculture and in new countries. They have started to grow cotton in warm and dry countries, without the typical rain-seasons. This means, they have had to water the field by artificial means – and use the water from rivers and lakes.



In conventional farming, chemical pesticides and fertilisers are used. This usually enables the farmer to harvest more cotton on their land, but at a potential cost to their health and the environment.

• Fertiliser gives extra nutrition (food) to plants
Pesticides are chemicals that are used to kill pests like insects and unwanted plants

In organic cotton farming are a few chemicals allowed only. There is a very strict list with the ones that do not harm the environment. Usually they are only used when needed, and not on all crops, just in case.

The use of chemicals is restricted to ones that are on a clear list that do not harm the environment, and are usually used only if there is a problem rather than on all the crops just in case.
There are many problems with pesticides. Not all countries control their use in the same way and chemicals banned in Europe might be used in cotton producing countries.

These chemicals can:

• kill helpful organisms in the soil
• hurt people who breath in the spray when they are applied
• run into rivers and damage water quality
• cost a lot of money and put farmers into debt so that if the crop fails they have no way to repay the debt

Let's look at the soil health part.

When farmers year after year grow the same single crop and when farmers spray pesticides, the organisms in the ground are reduced and the ground becomes more compact and cannot hold much water. This process is called degradation. It is harder for plants to grow in this kind of soil.

If there are helpful insects and microorganisms in the ground, they make nutrition available for the plants to use. As animals and plants naturally decompose into the soil it creates a soil rich in nutrients and a mineral rich mini-ecosystem with microorganisms that feed and breathe life back into the soil with insects travelling through the ground, loosening the soil. This creates many little holes filled with air or water after it rains, which makes it easier for roots to grow. So healthy ground is a system of sand, roots, organisms, air and water – imagine it looks a lot like a sponge!

Photo credit: Stringer Shanghai / Reuters

Task

To compare healthy ground to ground or soil that has been ‘degraded’, we will construct two different types of ground.
(Of course the ground is not exactly the same as our experiment – but it is a good way to visualise the differences.)

FIRST STEP

You need two containers with the same size.
Fill one container with sand until the container is nearly full and compress it slightly.
The other one will be our healthy ground. You can also fill it with sand or soil, but mix twigs, stones or whatever else you can find (this creates spaces of air, and shows the better growing of roots in the ground).

SECOND STEP

Start to fill 50 ml of water into each container. Do this again and again until the containers are full. Try to absorb which container can take more water. How much water can the container absorb? Write down your results.

THIRD STEP (optional)

After you finish the experiment, you can plant something in the container. The easiest plant to grow is cress, but you can also try all different kinds of seeds that you can find in your kitchen at home. For example flaxseed, sunflower seeds, lentils... Keep in mind that different plants need different circumstances, so not everything will work. And if the container does not have drainage holes, be careful not to overwater.

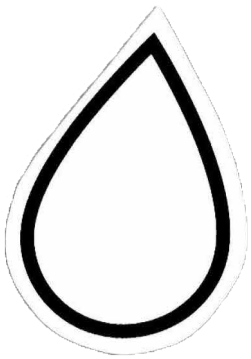
When the ground is healthy, more water can be held in the ground. When this happens, farmers need less water for their fields. There are different methods to water fields, if that is needed.

There are many different methods of irrigating the crop, the whole field can be flooded, the water can be sprinkled or sprayed through guns of water spread out in lines or circles, pipes or hoses overhead or lying on the ground or it can be diverted through channels.

The water itself can come from different sources: rivers, lakes, man-made reservoirs, bore holes, man made waterway (leat) etc. One of the most efficient methods is drip irrigation, which is when the water is delivered to the ground through perforated water pipes – (pipes with a series of little holes) – that filter the water through to the ground.

But in all cases the water is being diverted from its natural course. In this way lakes and rivers nearby can get dried out, fish, plants and animals lose their habitat.

A very famous example of land that has been degraded partly to the cotton crop is the Aral Sea – in this area, cotton cultivation was not a traditional crop and it is cultivated with extensive irrigation. So over the decades, as a result of land degradation, you could see the lake shrinking. The Aral Sea is a really famous example, which you can see below.



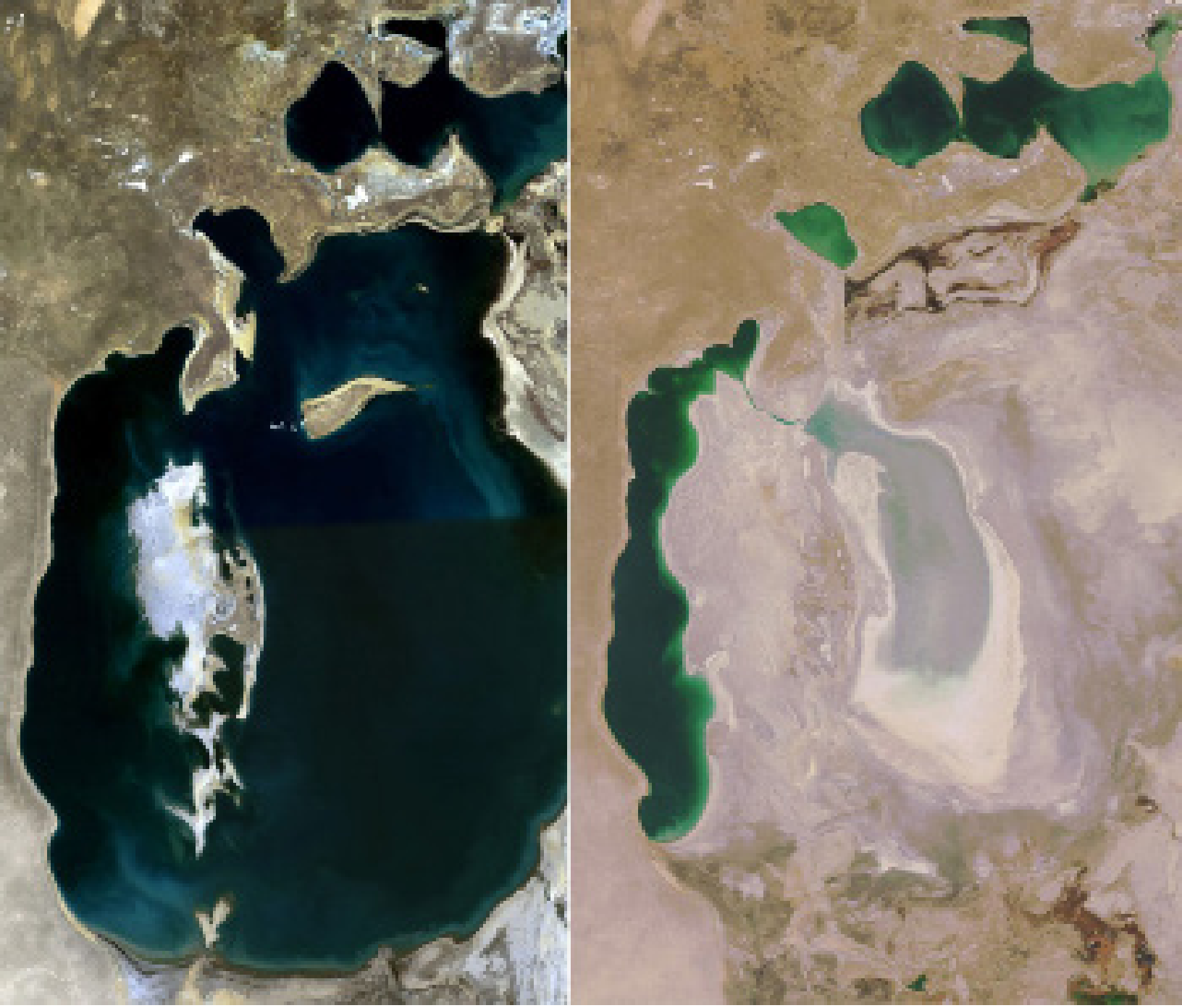


Photo credit: MSA Berlin

Luckily it is possible to restore environments, this is what is happening now: People are trying to get the sea restored. This will bring life back into the area. You can find out more about it in this article.

Reflection

What did you discover about cotton cultivation and the problems caused by it?

Can you think about the solutions; how can we avoid environments being destroyed by cotton cultivation?

What can farmers do to make sure their ground stays healthy?

You can find some ideas on the video from soil association in the attachment.

Resources

ProSieben, Uncovered. Menschengemachte Naturkatastrophe: So zerstört der Baumwollanbau die Umwelt. 2020. Available at https://www.youtube.com/watch?v=rX3zSKdVxUo

Bremer Baumwollbörse. BAUMWOLLE UND WASSER TEIL 2: MODERNE BEWÄSSERUNGSMETHODEN IM ÜBERBLICK. 2018. Available at https://baumwoll-boerse.de/2020/12/08/baumwolle-und-wasser-teil-2-moderne-bewaesse-rungsmethoden-im-ueberblick/

Martin Henke. l Baumwolle I – Eine der ältesten Kulturpflanzen der Menschheit. Access 2023. Available at ://www.carlmarie.de/magazin/wissen/baumwolle-teil1-anbau-und-eigenschaften/

Attachments

For German speakers: YouTube video 16 min
Menschengemachte Naturkatastrophe: So zerstört der Baumwollanbau die Umwelt | Uncovered | ProSieben
https://www.youtube.com/watch?v=rX3zSKdVxUo

There is also an automatic translation, that works well for english
How farmers changed from conventional cotton to organic cotton, you can explore here: https://www.cottondiaries.com/

For English speakers: YouTube video 16 min
THE ENVIRONMENTAL IMPACT OF COTTON // + is organic cotton ACTUALLY better?

The first part of the soil association video https://www.youtube.com/watch?v=o0LFVIwhiPA&t=180s

Here you find the link to the soil association website. https://www.soilassocia-tion.org/take-action/organic-living/fashion-textiles/organic-cotton/

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