

SCIENCE WEEK

#scienceweek

7-14 Nov 2021

Supported by Science Foundation Ireland

CREATING OUR FUTURE: FARMS

Classroom Resource Booklet



INTRODUCTION

**CREATING
OUR
FUTURE**

Creating Our Future aims to build on the success of research and science in our battle against Covid-19 and ask the public how we can shape a better Ireland through research and science. From July to November events will be held across the country where the Irish public will be invited to share their opinions on current research being carried out, their thoughts on the direction those studies should take, and offer ideas for other research opportunities yet to be explored.

Science Foundation Ireland is inviting primary schools to get involved in the process of generating ideas. We will be introducing 6 themes over a period of 6 weeks and presenting lesson resource on these themes. Each resource will incorporate some different ideas for introducing the topic in your classroom with trigger questions to aid discussion, a related science investigation or design and make project and some ideas for carrying out your own research on the topic.

The resource is not designed as a complete lesson plan but rather some suggestions to inspire you to create your own lesson on the theme. Teachers can choose to engage with any of the resources or even all 6. At the end of the 6 weeks and as we approach Science week in November, we will then ask teachers to capture their learners' ideas and submit them to us to ensure that the ideas of Primary school pupils are incorporated into the overall project.



BACKGROUND

This week's theme is Farms. We rely on farms to produce food for people and we need space to grow that food but with the worsening climate and biodiversity emergency, we need to think about the future of farming. We need to think about the challenges to farming presented by increased flooding, droughts and extreme weather events. We need to look at how our food is produced and how we can adapt that to ensure that we can continue to feed ourselves and also ensure we have clean water, clean air, a stable climate and that we protect biodiversity at the same time.

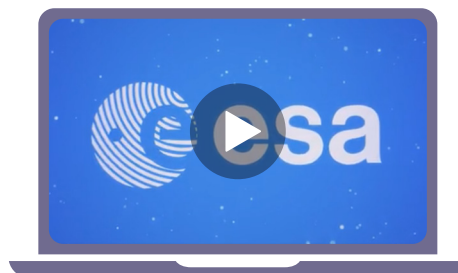


TRIGGER QUESTIONS FOR DISCUSSION

Farming and Space

How can satellites in the skies above us help with management of farmland? What are the advantages and disadvantages of using this technology?

You can find other videos on the use of satellite images in farming at https://www.esa.int/ESA_Multimedia/Search?SearchText=farming&result_type=videos



Source: ESA

How could we grow food on the moon? Airbus Foundation Discovery Space: Food on the moon - YouTube. Try out the Astro Farmer, Asto Food and Astro Crop activities from https://www.esa.int/Education/Teachers_Corner/Primary_classroom_resources.



Source: YouTube - Airbus



Source: YouTube - Kneppflix

Farming and Biodiversity

Can we farm for food while protecting nature? At the Knepp Estate in Sussex, they are producing free range organic meat and restoring biodiversity at the same time.



Source: YouTube - National Biodiversity Data Centre



TRIGGER QUESTIONS FOR DISCUSSION

The Future of Food

Would you eat insects?



Source: YouTube - Hexafly

Or snails?

Can you think of any reasons why we might need to find new types of food to eat? Can you find out about other new types of farming and food production?

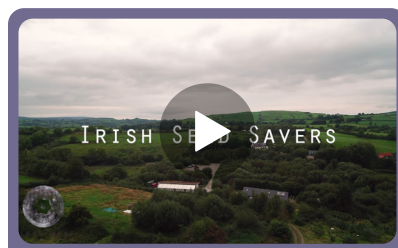


Source: YouTube: inCarlow Local Enterprise Office

Farming from seed to waste

Where do our seeds come from? Do you think we grow enough varieties of food in Ireland? Are we growing the correct types of crops for our soils and our weather? How can we make sure that we have enough variety to deal with changes in climate?

Can we use agricultural and food waste as a resource to generate renewable energy and improve soils? <https://greengeneration.ie/>. How could we reduce food waste so we are not wasting land and resources?



Source: YouTube: inCarlow Local Enterprise Office

RESEARCH PROJECT IDEAS

Track the seasonal changes by submitting records to the farmers wildlife calendar at <https://biodiversityireland.ie/surveys/farmers-wildlife-calendar/>

It is estimated that 28% of the world's agricultural land (1.4 billion hectares) is being used to produce food that is then wasted. This global food waste is responsible for 8-10% of greenhouse gas emissions. <https://stopfoodwaste.ie/resource/the-environmental-impact-of-food-waste>. Could you research food waste in school by carrying out a survey on uneaten school lunches and take steps to reduce your food waste?

There are lots of SFI discover centres around the country that have programmes on farming, food growing and biodiversity. Why not plan to visit one or check out their outreach programmes. <https://www.sfi.ie/engagement/discover-primary-science-and-maths/discover-centres/find-a-discover-centre/>

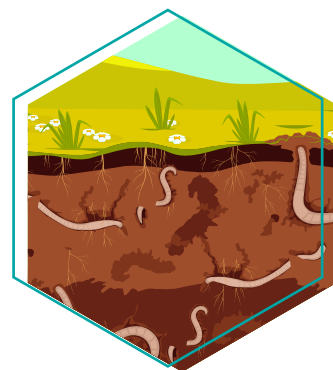
Can you grow more food in your school garden? School Earth Education <http://schoolearthed.ie/> have lots of gardening resources and publications to help you. Or you could book an outdoor or virtual visit with a gardening specialist from <http://www.heritageinschools.ie/>



CLASSROOM INVESTIGATION

INVESTIGATING SOILS

Soils are the basis of farming and growing food but soils depend on a number of factors such as the quality of natural nutrients that are returned to the soil and the invertebrates such as worms, beetles, woodlice, ants and a whole host of other tiny creatures who break down leaves and vegetation and aerate the topsoil so that we can grow food. This new resource is designed to help you investigate the soil and the creatures that live in it.



INVESTIGATING SOILS (EARTH WORMS AND SOIL MICROBES)

Class Level: All levels (with adaptations)

Curriculum Links

Strand: Environmental Awareness and Care, Living Things.

Strand Unit: Environmental Awareness, Caring for the Environment.

Curriculum Objectives: Recognise and investigate human activities which have adverse and positive effects on local and wider environments; Foster an appreciation of the ways in which people use the Earth's resources; Come to appreciate the need to conserve resources; Develop an awareness that air, water, soil, living and non-living things are essential to the environment; Identify the interrelationship of the living and non-living elements of local and other environments.

Skills Development: Use of simple keys in identifying invertebrates; Ask questions about animals and plants, familiar objects and events in the immediate environment; Use the senses to observe animals, plants, objects and events in the immediate environment; Observe characteristics such as the shape, size, colour, pattern, texture, sound and smell of familiar things in the local environment; Observe differences and similarities; Carry out simple investigations set by the teacher, make observations and collect data.

New Words/Vocabulary: Soil Horizon, Particles, Sedimentary, Volcanic.

Focail Nua: Cré (Soil), Cáithníní (Particles), Barrithir (Topsoil), Ábhar orgánach (Organic Matter).

Cross Curricular Links: (General) Geography: Soils and landscapes; Gaeilge (focail nua); English (new words).



INVESTIGATING SOILS (EARTH WORMS AND SOIL MICROBES)

Equipment/Materials

Soil samples examples (sand, clay, grit) in trays and a cup of water

Simple keys for ID Soil invertebrates Insects (available online)

Jam jar / trowel

Quadrats of 1m by 1m of hessian (coffee bag), or old carpet

Paper pens/pencils for recording

Engage

Trigger questions

- What is soil? (Properties of soil sand / clay / grit)
- What lives in soil?
- Why is soil important?
- What lives in the soil in the school grounds (or local area)?

Background

In our day to day lives, we use many products which come directly or indirectly from the soil. For example, vegetables, fruits, berries, nuts, and cereals. Beef, mutton, pork, and poultry come from animals that eat plants or seeds. Soils provide us directly and indirectly with building materials such as trees and clay and mud for bricks, and sand for concrete and glass. Soil is important for animals, birds and of course plants, which grow in the soil. These plants not only provide food, clothing and shelter but give us air to breathe.

Soil starts off as rocks. These are called parent rocks because, in a sense, they are the parents of the soil. Parent rocks have been exposed over hundreds of years to natural exposure, big changes in temperature and water entering and cracking rocks when it freezes. Gradually big rocks become little rocks. These are pounded and picked up by wind and water and rubbed against each other. They are gradually ground into even smaller particles, and this forms the basis of soil.

Some of these particles end up being very small, so small that you need a microscope to see them. These are called clay. Other slightly bigger particles are called silt; bigger again, sand; and the biggest, gravel.





INVESTIGATING SOILS (EARTH WORMS AND SOIL MICROBES)

Background (continued)

Soil is often described in terms of horizons and texture. If you see a cutting beside the road you may see different layers and colours of soil. These are called the A, B, C horizons, going down to the base rock, from which the soil has derived. Soils have been deposited over hundreds of years. Igneous rocks such as granite and basalt, were formed from volcanic activity. Sedimentary rocks such as limestone and sandstone were formed of compressed layers of clay, silt or sand or the remains of ancient plants and animals. Metamorphic rocks have been changed through heat and pressure in the Earth. Some rocks such as basalt and sandstone are acidic and break down to form acid soils. Others such as limestone are slightly neutral to basic. The level of acidity of the soil is known as the pH and this has an impact on the types of plants that grow well. The soil layer we are concentrating on for now though is the very top layer known as topsoil. It is generally the darkest in colour as it is full of organic matter, like rotting leaves. It is the living element of the soil and is most important for plant growth.

Lots of organic matter in soil helps plant growth and provides food and shelter for invertebrates or minibeasts, and microbes, which in turn help with the decomposition process (breaking down leaves and other organic matter) to provide better topsoil. It is an important cycle that is easily disrupted by stripping topsoil and taking away vegetation. The creatures that live in the soil are in turn food for other animals and birds.

Worms are of unique importance as they aerate the soil with their burrowing and prevent it from being too compacted. Worms allow plant roots to grow and draw organic matter, such as decomposing leaves, deep into soils by taking them from the surface, and by releasing their castes (Worm poo!!!).

Without healthy soil we would not be able to grow food and crops for ourselves. Look at examples of drought and soil loss throughout the world.





INVESTIGATING SOILS (EARTH WORMS AND SOIL MICROBES)

Investigation

Explore

- To investigate the properties of soil types provide samples of sand, clay, and grit in 3 separate containers. First invite learners to explore and describe the different properties of the dry soil. What does it feel like? How does it smell? What colour is it? What texture is it? What are the similarities/differences?
- Predict which sample will retain the most water and record predictions, before adding water to each sample. Which type of soil retains the most water and why? Water retention has to do with the particle size of each soil type.
- What will happen if you mix soil types? The best topsoils are called sandy loams, which is a mixture of all three soil types, including organic matter.
- Make sure to wash hands after handling
- To investigate the composition of your garden soil, half fill a large glass jar with soil, add some water, put the lid on, shake and leave to settle. Over time the different layers will settle out, allowing you to see and measure the proportions of sand, silt and clay in your soil.

Conduct Investigation

- Set pitfall traps in locations around the school grounds with small jam jars the evening prior to investigation. Dig into place with a trowel, ensuring the jar is flush with the surface of the soil. Place two small stones on either side of the jar and place a small flat cover over the stones. This prevents rain from going into the pitfall trap, and accidental drowning of invertebrates or minibeasts. Check pitfall traps the following morning and identify insects using a key, to see the variety of insects that live just above the soil surface.
- To estimate the numbers of worms in any given area are, a good Junior Activity is to play a game or do a rain dance on one area for a prolonged period. The vibrations will draw worms to the surface, thinking that indeed it has rained and that they can come to the surface safely to feed.
- For a more senior activity place hessian sacks or old carpet down in areas of differing land use, for example, the grassed area on a playing pitch, the area under deciduous trees that lose their leaves in winter, the area under evergreen trees. Sample areas are left for a month or more before checking to count the number of worms visible at the surface of each land use. Learners make and record their predictions about which land use may have the highest number of worms (soil in best condition).

Sharing: interpreting data/results

- Learners can compare worm numbers on each site.
- Consider which is the best land use for replenishing soils.
- How will you display and communicate your results?





INVESTIGATING SOILS (EARTH WORMS AND SOIL MICROBES)

Take the Next Step

Download the OPAL soil and earthworm survey booklet and Earthworm identification guide from <https://www.imperial.ac.uk/opal/surveys/soilsurvey/> to carry out a more detailed Earthworm survey.

Buglife UK have a handy online key to help identify the main groups of invertebrates <https://www.buglife.org.uk/bugs/identify-a-bug/> or you can find lots of simple keys to download online.

Would your school grounds or local park benefit from more Trees? Organisations such as CRANN can supply trees and advise on school planting.

Help improve the soil in your school garden by making your own compost

Adapt for Home

Similar investigations can be encouraged in children's own garden and local parks, and into the broader community, particularly in a rural community with mixed land uses.

Adapt for Junior/Senior level

Rain dances for Juniors simply to understand the importance of worms to soil health.

Follow-up challenge/project/citizen science link

If you can identify any of your soil invertebrates to species level, try recording what you find with the National Biodiversity Data Centre at <https://biodiversityireland.ie/>. You can also record any other wild plant and animal species that you find and identify.

SDG Links



Have your ideas heard!

Now that you have discussed your ideas for Farms, collect the classes ideas using this [template](#) and email them to creatingourfuture@sfi.ie





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For what's next

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