

4: Growing Pulses



Primary Schoolchildren – Ages 8-11

Aims:

To introduce agriculture as a managed system that has environmental impacts, and how farmers employ practices such as growing pulses to minimize these impacts.

Objectives:

- Students will understand how nutrients are passed from the soil to the plant through its root system.
- Students will understand nitrogen-fixing as a concept.
- Students will learn about symbiosis through the role of rhizobia in growing pulses.

Resources:

1. Instructions for growing pulse plants in a can, with lead questions (from teacher pack).
2. Diagram of nitrogen-fixation with rhizobia (from teacher pack).
3. Example of crop rotation (from teacher pack).
4. Crop cards 1 to 5 (from teacher pack).

Suggestions for further development:

- Visit a local farm or invite a farmer to speak in class.
- Pupils could record how their plants grow over a period of time – making observations recorded as diagrams/graphs etc.
- Pupils could grow alternative pulse plants such as chickpeas and navy beans and compare rates of growth.
- Pupils could research how to give their plants the highest yield through different watering and feeding techniques, living in symbiosis with rhizobia, or even planting different crops together.
- Pupils could research (at www.iyop.net) the impact that pulses in crop rotation have on sustainability.



Peas can be grown easily in a tin at school.

4: Growing Pulses



TIME DETAILS

5mins Pupils will be reminded /asked about what they already know about how plants grow. What are the basic needs for seed germination and growth (water, sunlight and nutrients)? If students already know about plants needing sunlight to create their energy, ask them what else do they need? What role does the soil play in feeding the plants? Do they know how plants get water and nutrients from the soil? What would happen to the plants if the soil had no water or nutrients?

25mins Pupils will follow worksheet (resource 1) to plant and grow pulse plants in tin cans, which they can observe growing over a period of time. Whilst planting, pupils will discuss and answer questions on how plants grow and how they get the nutrients they need.

15mins What is symbiosis? Pupils will explore the concept of symbiosis in the natural world. The relationship between the hippopotamus and oxpecker bird will be explained before discussing the relationship between pulse plants and soil. How does nitrogen-fixation work? Using resource 2, pupils will be introduced to the concept of nitrogen fixing and how rhizobia bacteria works with a plant to improve soil quality. How can pulses and nitrogen-fixation help other crops? How can growing crops together such as inter-cropping like the Three Sisters described well here [http://en.wikipedia.org/wiki/Three_Sisters_\(agriculture\)](http://en.wikipedia.org/wiki/Three_Sisters_(agriculture)) help? Using resource 3, pupils will learn how rotation (growing different crops one after the other) and using 'break crops' like pulse crops work.

TIME DETAILS

15mins Issue the pupils with the crop cards 1 to 5 (resource 4), one set for each small group. Ask five pupils to read out what the card says about the crop. The pupils must decide in which order they would plant them over a five year cycle. Remind them that the soil must be left in a suitable state for their first crop to be planted again in the sixth year. Ask pupils to present their crop rotation plan. Why have they chosen their particular order?



Resource 1

How to grow pea shoots



Pea shoots are great for growing in small spaces. What's more, they'll be ready to eat in less than three weeks. Pea shoots will also grow well inside your classroom if kept near a sunny window.

What you'll need:

- Dried peas
- A bowl (to soak your peas)
- Soil
- An old can (washed out!) or a plant pot
- Watering can

Here is how you can grow your pea shoots...

- 1 Make sure that none of your peas are split or cracked. Soak the peas in water for 24 hours (dried peas sold for cooking will normally grow fine and are much cheaper than buying seed packets). Soaking the peas is not essential but it will help to speed up germination. If you decide to soak your peas don't do this for longer than 24 hours because you will drown your seed or perhaps make them moldy!
- 2 Take an old can (or a pot or seed-growing tray) that's at least 6-9 cm (2-3 inches) deep. Ask your teacher to put some holes in the bottom of the can so that any excess water can drain out.
- 3 Fill your can with soil or compost, but stop about 3 cm (1 inch) below the top.
- 4 Water the soil and then place (called "sowing") a handful of peas on top of the soil. Leave a gap the size of a pea between each one.



Resource 1

How to grow pea shoots



- 5 Cover your peas with another 1 cm (a third of an inch) of soil before a final sprinkling of water. Do not compact (push down) the soil too heavily.
- 6 You're all set! All you need to do now is place your seeds in a sunny place and look after them by keeping the soil moist, checking them every day in hot weather, and adding water when needed.
- 7 After about a week your pea shoots will begin to emerge. And in two to three weeks your shoots will be 9-12 cm (3-4 inches tall) and ready to eat!



Teacher Notes – Lead Questions

While planting their crops, get pupils to engage in a discussion with their fellow classmates to answer the following questions:

1. What would happen if you didn't water / added too much water to the soil?
2. What might happen if you planted too many peas in your can or pot?
3. What do plants take from the soil that helps them grow?
4. What is nitrogen and why do plants need it?
5. What would happen if your shoots had too much / too little sunshine?
6. If you were going to grow your plants outside, what might attack your shoots before you get to eat them?



Additional Suggestion

Encourage students to track plant developments on a weekly basis, e.g. stem height, number of leaves, etc., and use the data to create simple graphs.



Resource 2

Diagram of pulse plant nitrogen-fixing



1. Tiny soil bacteria - called rhizobia, have a special relationship with pulse plants.

2. Pulse plants have special roots that provide 'homes' for rhizobia bacteria. These 'homes' look like little lumps on pulse roots. In these homes, the pulse plant provides sugars and other nutrients to the bacteria.

3. In these homes, the rhizobia draw nitrogen from the air and share it with the pulse plant. Pulse plants could not do this without the bacteria.

DECOMPOSITION

NITROGEN

4. When the pulse plant dies its roots release back the stored nitrogen into the soil making it available to help other plants grow

Resource 3

Example 4-step crop rotation



PULSES

- Broad Beans
- Butter Beans
- Podded Peas



ROOTS

- Carrots
- Sugar Beets
- Turnips



OILSEEDS

- Rapeseed
- Mustard
- Sunflower



CEREALS

- Wheat
- Barley
- Oats

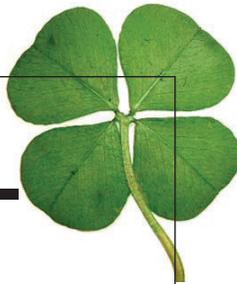


Resource 4

Crop cards



CLOVER



Use: Animal feed

1. Clover belongs to the family of plants known as legumes, as do pulses.
2. Clover works as a natural fertiliser.
3. As it grows in the soil, clover draws nitrogen from the atmosphere and makes it available to plants that follow in the next crop rotation.

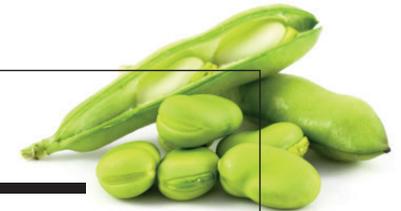
WHEAT



Use: Ground into flour or used in animal feed

1. Wheat belongs to the family of plants known as grasses, as do other cereal crops like barley and oats.
2. Fertilizer is often placed in the soil before a wheat crop, as wheat cannot draw nitrogen from the atmosphere like beans or clover.
3. Wheat can be planted at both the start of autumn and the start of spring.

BEANS



Use: High protein food for both humans and animals

1. As well as being delicious, beans are an excellent break crop.
2. Beans belong to the family of plants known as 'legumes', as do other pulses like peas, lentils and chickpeas.
3. Beans do use up soil nutrients while they grow but, as a pulse, they also add nitrogen back into the soil after the plant has been harvested.

Resource 4

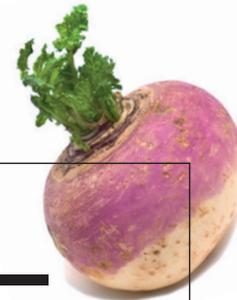
Crop cards



OATS

Use: Breakfast cereals and snack bars.
Also used as animal feed

1. Oats generally require less fertilizer than other crops to grow.
2. Oats and other cereal crops like wheat and barley have fibrous root systems that are good at capturing soil nutrients.
3. Crops like oats have leaves that quickly create shade which stops small weeds growing.



TURNIPS

Use: Food for both humans and animals

1. Turnips are an excellent break crop to plant.
2. Turnips are plants in the cabbage family. There are diverse plants in this family that are important for food production, including rapeseed, broccoli, kale, cauliflower and mustard.
3. Turnips thrive in well-worked and well-drained soil.

Teacher Note

An example of a successful crop rotation would be:
Year 1 Clover, Year 2 Wheat, Year 3 Beans, Year 4 Oats, Year 5 Turnips