

SDG 15 Seeding Sustainability

MM5: Dig Out the Secrets of Soil



MM5: Dig Out the Secrets of Soil

Experimentation and Exploration

Lesson 3: Nitrogen, Phosphorus and Potassium in Soil

Subjects: CSPE, English, Geography, Horticulture, Science

3 GOOD HEALTH AND WELL-BEING



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



15 LIFE ON LAND



Lesson Title and Summary: Nitrogen, Phosphorus and Potassium in Soil

In this lesson, students will explore nitrogen, phosphorus and potassium in the soil and their importance for plant nutrition and growth. Learners will be introduced to the nitrogen, phosphorus and potassium cycles and how they enter and exit our soil. Through videos and activities, learners will also explore ways to support soil health in an eco-friendly way.

Vocabulary: Nitrogen, Phosphorus, Potassium, Leaching, Nitrogen Fixers

In this lesson, the learner will:

- discover the importance of Nitrogen, Phosphorus and Potassium in soil
- explore ways to support soil health in an eco-friendly way
- develop teamwork, active listening and communication skills

Materials:

- Worksheet: Nitrogen
- Worksheet: Phosphorus
- Worksheet: Potassium
- Worksheet: How to Increase Soil Health
- Internet access

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ACTIVITY INSTRUCTIONS

Activity 1: Nitrogen (10 minutes)

1. Watch the video Understanding Our Soil: The Nitrogen Cycle, Fixers, and Fertilizer [4:29 min]
2. Have learners complete the worksheet: Nitrogen
3. Discuss as a class

Activity 2: Phosphorus (7 minutes)

1. Watch the video Phosphorus Cycle [2:47min]
2. Have learners complete the worksheet: Phosphorus
3. Discuss as a class

Activity 3: Potassium (5 minutes)

1. Watch the video Potassium in Plant Health [1:44min]
2. Have learners complete the worksheet: Potassium
3. Discuss as a class

Activity 4: How to Increase Soil Health (28 minutes)

1. Divide the class into groups.
2. Assign each group either Nitrogen, Phosphorus or Potassium
3. In their groups, have learners complete the worksheet: How to increase soil health.
4. Have each group share their answers.

NOTE: Learners will conduct an experiment on the amount of nitrogen, phosphorus and potassium in soil in lesson 9. It may be beneficial to keep their worksheets from this class to refer to in Lesson 9.

REFLECTIVE EXERCISE: 3-2-1 (10 mins)

- Three things they feel they have learnt from the tasks.
- Two things they found most interesting and would like to explore more.
- One – their opinion they have about the tasks.

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EXTENSION / REDUCTION ACTIVITIES

Reduction: For a shorter class, have learners watch the videos at home and discuss in class.

Extension: For a longer class, have learners watch the additional videos. Have learners create and present a poster for Activity 4. See Media Communication module: Posters.

MEDIA BOX (materials, online video links, extra resources, case studies etc)

Understanding Our Soil: The Nitrogen Cycle, Fixers, and Fertilizer [4:29 min]

https://www.youtube.com/watch?v=A8qTRBc8Bws&ab_channel=JimiSol

Free Organic Nitrogen Sources For Plants And Garden! Our Top 10! [10:54]

[https://www.youtube.com/watch?](https://www.youtube.com/watch?v=xJgkXK3htyY&ab_channel=CountryLivingExperience%3AAHomesteadingJourney)

[v=xJgkXK3htyY&ab_channel=CountryLivingExperience%3AAHomesteadingJourney](https://www.youtube.com/watch?v=xJgkXK3htyY&ab_channel=CountryLivingExperience%3AAHomesteadingJourney)

Is there enough phosphorus in your soil? | DIY garden projects | Gardening Australia [5:02 min]

https://www.youtube.com/watch?v=_DPPNQsUvgs&ab_channel=GardeningAustralia

Phosphorus Cycle

[2:47min] [https://www.youtube.com/watch?](https://www.youtube.com/watch?v=izgqpfPZyRQ&ab_channel=MooMooMathandScience)

[v=izgqpfPZyRQ&ab_channel=MooMooMathandScience](https://www.youtube.com/watch?v=izgqpfPZyRQ&ab_channel=MooMooMathandScience)

Potassium in Plant Health [1:44 min] [https://www.youtube.com/watch?](https://www.youtube.com/watch?v=86Xb8Wf3qX4&ab_channel=CropNutritionfromTheMosaicCompany)

[v=86Xb8Wf3qX4&ab_channel=CropNutritionfromTheMosaicCompany](https://www.youtube.com/watch?v=86Xb8Wf3qX4&ab_channel=CropNutritionfromTheMosaicCompany)

LOCAL TRIP / EXPERTISE / ADDITIONAL WORK AND ASSESSMENTS

If you plan to deliver Lesson 9, which is an experiment testing the soil for nitrogen, phosphorus and potassium, you will need to buy a soil test kit. Some suggested test kits:

- Up to 60 soil samples using test tubes and reagent: <https://www.quickcrop.ie/product/super-soil-test-kit-60-tests>
- Up to 8 soil samples using an integrated control / test tube chamber (additional test tubes will be needed if you choose this test kit as each test will need to sit for 10 minutes): <https://www.thegardenshop.ie/soil-test-kit/>

Speak to local farmers and growers about what nutrients are deficient in your area.

Speak to a local farmer about how they make sure they have enough nitrogen, phosphorus and potassium in their soil. Now, talk to an organic gardener about how they make sure they have enough nitrogen, phosphorus and potassium in their soil. How do they compare?

L3: NITROGEN

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Answer the following questions as you watch the video:

What are some examples of nitrogen fixers?

What do they do?

Why do plants need nitrogen?

Why is nitrogen fertiliser possibly not as good as using nitrogen fixers?

What role does bacteria play in the nitrogen cycle?

What forms of nitrogen are available to plants?

What do plants most often rely on to take up nitrogen?

What role do worms play in the nitrogen cycle?

L3: NITROGEN

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How does nitrogen leave soil?

Does nitrogen leave the soil if it is in organisms? Why could this be important?

How do nitrogen fixing plants relate to bacteria?

What is the trouble with fertilisers?

What other minerals do the fungi bring to plants?

L3: PHOSPHORUS

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Answer the following questions as you watch the video:

What does phosphorus do for our bodies?

What does phosphorus do for plants?

What type of is phosphorus encountered in the world?

Where are phosphate compounds found?

How does phosphorus leach into the soils?

What are two other sources of phosphorus?

How do phosphates re-enter the soil after being taken up by plants or animals?

How are they carried to lakes, rivers and oceans?

L3: PHOSPHORUS

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What organism in bodies of water take up phosphorus?

Why is the phosphorus cycle very slow?

Why are phosphorus fertilisers potentially damaging to water ecosystems?

What are dead zones? How are they formed?

L3: POTASSIUM

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Answer the following questions as you watch the video:

Is potassium mobile in soil? Why or why not?

What is the cation exchange capacity?

How do plants take up potassium?

What does potassium do for plants?

What types of stress does potassium help plants withstand?

L3: HOW TO INCREASE SOIL HEALTH



Group name:

Circle what nutrient you are researching: nitrogen phosphorus potassium

You will need to use the internet to research the following questions about your nutrient. Be sure to manage your time well and allocate roles to your team (e.g. note-taker, researcher, time keeper, etc.).

Explain the role of your nutrient in the growth and development of plants.

How does your nutrient interact and affect the other two nutrients?

What are some symptoms of a deficiency of your nutrient in plants?

What happens if there is too much of your nutrient in the soil?

What are two consequences of excessive use of fertilisers on the environment and ecosystems.

L3: HOW TO INCREASE SOIL HEALTH

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What are three ways you can increase the amount of your nutrient in the soil organically / naturally (e.g. not using synthetic fertilisers)?

Do you think farmers and growers in your area struggle with a deficiency of your nutrient in their soil? Why or why not?
