Build Competencies in **food** DIVERSITY

interpreting **growth factors**

MAKE IT PERSONAL

Have you grown any plants from seed? What were some issues when you tried growing a plant? What were some solutions you learned to help the plant grow?

EXPLORE AND CREATE

Plant Growth

Farmers and others involved in agriculture use growth staging guides to help them monitor crops as they grow. These **growth staging guides** provide examples of different stages in the crop's progress.

Work with a partner or in a small group to explore one of the growth staging guides provided in the **WHAT NEEDS DO CROP PLANTS HAVE?** carousel slide. Obtain any support you may need from classmates and/or a trusted adult.

Use the growth staging guides as examples that help you create your own **growth staging guide for a plant** of your choice:

- Choose a plant that is a source of food.
- Create your own format or use a graphic organizer such as a **Cycle Diagram**.
- Find photos or create your own illustrations for your growth staging guide.
- Label and write a short description of each stage of growth of your plant.

Use **WHAT NEEDS DO CROP PLANTS HAVE?** for these learning tasks. Use the Learning Source and the information for this guiding question in the **food DIVERSITY** carousel on **www.projectagriculture.ca**. Use these weblinks for additional information.

Find out more about the beginnings of the life cycle in Seeds and Germination on the Let's Talk Science website at https://letstalkscience.ca/educational-resources/backgrounders/seeds-and-germination.

Compare crop plants to a tomato plant by exploring the information in The Life Cycle of a Tomato Plant from Let's Talk Science at https://letstalkscience.ca/educational-resources/backgrounders/life-cycle-a-tomato-plant.

Get information on specific needs that all plants have in Needs of Plants on the Let's Talk Science website at https://letstalkscience.ca/educational-resources/backgrounders/needs-plants.

If possible, obtain a seed or your food plant and grow it in a safe setting. Take photos and write descriptions of each growth stage.

Growth Factors

Limiting factors are the growth factors that are in the least supply. Plant growth cannot be greater than that allowed by the most limiting factor.

Revisit the soil zones you may have learned about in the **HOW IS PLANT DIVERSITY INFLUENCED BY AGRICULTURAL LANDSCAPES?** Learning Source at www.projectagriculture.ca/topic-item/how-is-plant-diversity-affected-by-agricultural-landscapes/. What do you think the main limiting factors are in each of the soil zones?

Soil Zone	Limiting factor and why I think this
Brown Soil Zone	
Dark Brown Soil Zone	
Black Soil Zone	
Grey and Dark Grey Soil Zone	

Fertilizers are considered to be an **input** – this means that it is a resource that farmers use to grow their crops or raise livestock. Fertilizers are used to provide nutrients that are not readily available in the soil, helping farmers to foster plant growth and increase yields.

Consider the following quotation. What does it tell you about fertilizer? Then, use the sources and questions on the following pages to investigate how and why fertilizers are part of a crop's growth factors.

Fertilizers all come from the earth. There are traditional sources of fertilizer like manure. Nitrogen fertilizer can either come from the soil or be produced commercially. Phosphorus occurs naturally in the soil, and is mined from the soil and processed into a more concentrated form. Potassium is another nutrient that crops need to grow that can be applied as a fertilizer. Micronutrients are nutrients that are not present in the soil in large quantities; plants only use small amounts of these nutrients, but still need them to function.

Nutrients are the soil's vitamins. Even if you eat a balanced diet, you might still be missing some of the essential elements. You might need extra vitamin D, for example, which can be added to milk or taken in pill form. Similarly, nutrients like phosphorus and nitrogen can be added to the soil. Whenever you eat a food product like bread made out of wheat, you're actually eating nutrients that were stored in the ground.

Kienlen, A. (October 4, 2016). Pay Dirt. Grains West: Online. https://grainswest.com/2016/06/pay-dirt/

Investigate with the **three** sources identified below and respond to the questions.

SOURCES

- Use the SnapAG fact sheet **Fertilizer**, from Agriculture in the Classroom Canada at https://aitc-canada.ca/en-ca/learn-about-agriculture/sheet/fertilizer to learn how fertilizers are used and where they come from.
- Get information on fertilizers and how they work in the **What is Fertilizer?** webpage from Fertilizer Canada.
- Compare organic and conventional fertilizers in the SnapAG fact sheet **Conventional or Organic Fertilizer?,** from Agriculture in the Classroom Canada at https://aitc-canada.ca/en-ca/learn-about-agriculture/sheet/conventional-or-organic-fertilizer. Search online for other sources of information on organic and conventional fertilizers.

Find some of the sources on the **WHAT NEEDS DO CROP PLANTS HAVE?** carousel slide and the weblinks listed below.

Find the Fertilizer Canada webpage at https://fertilizercanada.ca/about/what-is-fertilizer/.

Download the SnapAG fact sheets on Fertilizer and Conventional or Organic Fertilizer? on the WHAT NEEDS DO CROP PLANTS HAVE? carousel slide.

Find more information from the perspective of Organic Alberta in Even Our Food Needs Food found at https://organicalberta.org/article/synthetic-fertilizer/.

QUESTIONS

What are the four main nutrients found in fertilizers and what do they provide for plant growth?

	Type of fertilizer	What this fertilizer provides for plant growth
One		
Two		
Three		
Four		

What does green manure refer to? Why is it a fertilizer?

What opinions or perspectives on the use of conventional and organic fertilizers can you identify?

In what ways does the use of fertilizer affect the life cycle of crop plants? Give **two** examples.

EXPLORE AND INVESTIGATE

Life Cycle Inputs

Design an experiment that investigates how the life cycle of a crop plant is affected by soil and inputs that address plant needs.

Develop a problem for your experiment that focuses on the growth and life cycle of a crop plant. Consider examples like the following or develop your own:

- What is the effect of two different soil types on the growth of a crop plant? Create the experiment by growing a plant from seed in two different types of soil.
- How does fertilizer affect the growth of a crop plant? Using the same soil, grow three plants from seed. Add conventional fertilizer to one plant; organic fertilizer to the second plant and no fertilizer to the third plant.

Use the lab template on the following pages as a starting point to create and design your lab.

Write a hypothesis that is based on evidence and background information. Make a prediction that describes what results you think you will see.

Identify the variables in your experiment – what you are going to change and what you are going to keep the same. For example, how will the variables allow you to compare soil types or the addition of an input like fertilizer?

What materials will you use and what procedure will you follow? What are your observations and conclusions? How will you organize and record these?

LAB

Record the **problem** and your **hypothesis** below. Make a list of the materials you need for your lab in the chart.

MATERIALS	QUANTITY

PROBLEM:

HYPOTHESIS:

PROCEDURE

Develop the steps you will use to carry out the lab. Describe or draw them below.

OBSERVATIONS

Plan to use a **Retrieval Chart** to record your data. For example, you can design a chart similar to the example here that will help you record each plant's growth over days or weeks.

Make sure you also identify what criteria you will use to assess the growth of each plant. Consider the examples provided on the following page and identify this as your manipulating variable in the Lab Variables chart.

Growth of Plant	Week 1	Week 2	Week 3	Week 4
Plant 1 (Identify plant variety, soil type or fertilizer input used)				
Plant 2 (Identify plant variety, soil type or fertilizer input used)				
Plant 3 (Identify plant variety, soil type or fertilizer input used)				

VARIABLES

Plant growth is affected by several factors including the type of seed, soil type, the seed position and depth when planted, the amount of water, the amount of light and temperature and fertilizer used.

- Which of these variables will be constant throughout your lab? These are your controlled variables.
- Which of these variables will you change? For example, will you grow three different plant varieties? Or will you grow the same plant variety in three different types of soil? Select one to be your manipulating variable.
- What will you look for as your plant grows? The height of the plant or its appearance? The number of leaves? The length and thickness of the stem? Select one to be your responding variable.

ANALYSIS

What similarities or differences did you notice between each of the plants in your lab? Why do you think these similarities or differences resulted?

IDENTIFYING LAB VARIABLES	
Manipulating variable	1:
Responding variable	1:
Controlled variables:	1:
	2:
	3:

RELIABILITY AND VALIDITY

- In what situations would you be able to repeat the lab procedure?
- Are your results valid (truthful), or are they full of errors?

CONCLUSION

Answer the initial problem and summarize what you learned. What are three things you would do differently if you repeated the lab? Why would you do these things differently?