

LEARNING EXPERIENCE FIVE

Guiding Question: How can sustainable agriculture support food security?

This Learning Source provides starting points and information to investigate: • Food security • Sustainability • Food waste	Build Competencies: Trade perspectives Students map the connections between food security, sustainability and technologies, track food waste, create a sphere of influence chart to assess implications and assess food security recommendations. This handout includes activities that support competencies and literacy, and weblinks to online resources that can support student learning. 	 Assess   Look for evidence of understanding of the following concepts: • Societal needs • Human impact • Waste For a formative assessment, ask students to identify critical factors that influence food security and create a glossary that explains the interrelationships between them, using definitions, images, illustrations or their own examples to illustrate each factor. Students can be provided with the option to create their glossaries with a Bubble Map or a Retrieval Chart.
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Additional Research or Background Sources

Consult teacher or student background sources such as the examples that follow to further explore, enrich or expand activities for this guiding question. Student research sources are also provided in **Build Competencies** handouts.

PROOF is an interdisciplinary research team investigating household food insecurity in Canada. PROOF provides several resources on their website that can help students make connections between food insecurity and food accessibility and choice. Find information and statistics at <https://proof.utoronto.ca/food-insecurity/>. Access *Fact Sheets* at <https://proof.utoronto.ca/resources/fact-sheets/>.

Managing Food Security for Resilience: The Role of Ecosystem Services is a Canadian International Development Agency (CIDA) policy brief that deals with the relationship between ecosystems and food security, including the concepts of resilient food systems and ecosystem services. Although dated, it is suitable for teacher background. Access the policy brief at www.mcgill.ca/isid/files/isid/methot.pb12.pdf.

The IndigenousNutrition.org website, at www.indigenousnutrition.org/index.html, provides articles and information about challenges faced by Indigenous peoples in moving away from self-sustaining, local food systems.



Additional information and discussion questions are provided in the carousel slide for this guiding question in the **sustainability MATTERS** section of the LEARN webpage.

Click on the carousel slide to open and explore the following content.

- A discussion of an **agroecosystems approach to livestock framing** and food security
- **Focus on waste prevention** graphs, information and a video trailer

Indigenous Food Sovereignty in Canada: Policy Paper 2019 is a policy brief from the Rural Policy Learning Commons and is suitable for teacher background on the concept of food sovereignty. Access it at <http://rplc-capr.ca/wp-content/uploads/2019/02/Penner-Kevany-Longboat-2019-Indigenous-Food-Sovereignty-in-Canada-Policy-Brief.pdf>.

La Via Campesina, found at <https://viacampesina.org/en/>, is an international movement for peasants, small and medium size farmers, landless people, rural women and youth, indigenous people, migrants and agricultural workers from around the world. La Via Campesina comprises 182 local and national organizations in 81 countries from Africa, Asia, Europe and the Americas. Altogether it represents about 200 million farmers.

The Enough Movement website focuses on food security and can be found at www.enoughmovement.com. Download their report on food security and sustainability at www.enoughmovement.com/report. How do these issues affect the global food supply?

The Food and Agriculture Organization of the United Nations provides information and articles that illustrate the importance of healthy ecosystems for the provisioning of key services that contribute to food security in *Ecosystems for water and food security*, found at www.fao.org/family-farming/detail/en/c/286464/.

Find a white paper *Characterization and Management of Food Loss and Waste in North America* prepared for the Commission for Environmental Cooperation Canada at www3.cec.org/islandora/en/item/11772-characterization-and-management-food-loss-and-waste-in-north-america-en.pdf.

Agriculture in the Classroom Canada provides a resource on Food Waste, found at <https://aitc-canada.ca/en-ca/learn-about-agriculture/category/food/food-waste>.

Alberta Agriculture and Forestry's 2017 study and report on food waste can be accessed at [https://www1.agric.gov.ab.ca/\\$Department/deptdocs.nsf/all/bt14879/\\$FILE/FWS2017.pdf](https://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/all/bt14879/$FILE/FWS2017.pdf).

Initiatives, research and weblinks regarding food waste from the Food and Agriculture Organization of the UN is provided in *SAVE FOOD: Global Initiative on Food Loss and Waste Reduction* at www.fao.org/save-food/en/.

The Food and Agriculture Organization also provides information and links on *Food Loss and Food Waste*, found at www.fao.org/food-loss-and-food-waste/en/. Access the 2019 digital report on *The State of Food and Agriculture* on this webpage.

Initiatives, research and weblinks regarding food waste from the Food and Agriculture Organization of the UN is provided in *SAVE FOOD: Global Initiative on Food Loss and Waste Reduction* at www.fao.org/save-food/en/.



Find **Science 9**, **Science 20** and **Biology 20** learning outcomes supported by this learning experience on the following pages.

Use this activity to focus on the impact and influence of human activity on the environment, ecosystems and biogeochemical cycles. Encourage students to apply understandings of agricultural practices to societal needs and issues, including the concept of food security and accessibility as well as the demands that food production places on the capacity of the earth's resources.

Ask students to compare waste in both ecological and human contexts and address how waste is part of both ecosystem cycles and the human food chain. Students can also be asked to identify actions that can improve food security, including those that decrease food waste.

After completing activities in this learning experience, have students reflect on the balance between protecting natural resources and ecosystems and meeting needs for food security.



Look on the VIEW webpage for video interviews with Alberta farmers about the food production system. As students watch the video, ask them to identify perspectives shared by farmers.

> EXTEND LEARNING

Provide students with the following statement as an introduction to a **jigsaw research** activity.

Agricultural sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs. Therefore, long-term stewardship of both natural and human resources is of equal importance to short-term economic gain.

Organize students into research groups and assign topics such as the following to each group. Have each group research and prepare evidence that supports the connection between the statement, the concepts of sustainability and stewardship and their topic.

- 🔥 Scarcity of resources
- 🔥 Energy flow in agricultural ecosystems
- 🔥 Human health
- 🔥 Waste management
- 🔥 Food security and accessibility



Tell students to consolidate their evidence into no more than four main points. Have students prepare their points on a slide, a poster or a chart. Students can use a **Four Row Chart** to organize their points. Find this graphic organizer in **sustainability MATTERS Project Tools**.

Rearrange students into sharing groups, with at least one student from each research group. Provide time for each research expert to share their four main points with their new group members.



LEARNING EXPERIENCE FIVE: LEARNING OUTCOMES AND COMPETENCY MAP

project AGRICULTURE Activity	GRADE 9 SCIENCE	SCIENCE 20	BIOLOGY 20
	CONCEPTUAL KNOWLEDGE	CONCEPTUAL KNOWLEDGE	
LEARNING SOURCE How can sustainable agriculture support food security?		Unit D: Changes in Living Systems 20-D2.1sts Explain that science and technology have both intended and unintended consequences for humans and the environment (SEC3) [ICT F2-4.8, F3-4.1] - Assess whether the efforts to reduce human impact on biogeochemical cycles are viable, taking into consideration a variety of perspectives (considerations for deep-well and deep-ocean injection of wastes, for example, include properties of waste, concentration, uncertainty, environmental concerns, risks and benefits to human health and organisms, costs) 20-D2.2sts Explain that science and technology are developed to meet societal needs and expand human capabilities (SEC1) [ICT F2-4.8] - Contrast the diet of people in developing countries and that of people in developed countries in terms of energy efficiency and environmental impact, and describe ways to address potential food shortages in the future 20-D3.5k Describe how factors including space, accumulation of wastes (e.g., salinization of soil), competition, technological innovations, irrigation practices (e.g., Hohokam farmers) and the availability of food impact the size of populations	Unit A: Energy and Matter Exchange in the Biosphere 20-A1.1sts Explain that the process of scientific investigation includes analyzing evidence and providing explanations based upon scientific theories and concepts (NS5f) [ICT C6-4.2] - Explain, in terms of energy flow, the advantage of vegetarianism in densely populated countries. 20-A2.1sts Explain that science and technology have both intended and unintended consequences for humans and the environment (SEC3) [ICT F3-4.1] - Discuss the influence of human activities on the biogeochemical cycling of phosphorus, sulfur, iron and nitrogen: – waste and sewage disposal - Discuss the use of water by society, the impact such use has on water quality and quantity in ecosystems, and the need for water purification and conservation: – agricultural systems



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project AGRICULTURE Activity	GRADE 9 SCIENCE	SCIENCE 20	BIOLOGY 20
	PROCEDURAL KNOWLEDGE	PROCEDURAL KNOWLEDGE	
BUILD COMPETENCIES Food secure      		Unit D: Changes in Living Systems 20-D1.2s Conduct investigations into relationships among observable variables and use a broad range of tools and techniques to gather and record data and information - Use library and electronic research tools to collect information on a given topic, such as: – protection of the environment as a priority over economic interest – sustainable development initiatives (PR-NS4) [ICT C1-4.1, C3-4.2] 20-D1.4s Work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results - Elicit feedback from others on an environmental issue (CT-NS1) - Participate in a variety of electronic group formats to gather and share information about environmental issues (CT-NS1) [ICT C5-4.2] 20-D3.3s Analyze data and apply mathematical and conceptual models to develop and assess possible solutions - Demonstrate and assess the effect of environmental factors on population growth curves (AI-NS2, AI-NS6) [ICT C7-4.2] - Apply the growth curve for open populations to identify the long-term impact on Earth's carrying capacity and the demands on natural resources for a growing human population (AI-NS2, AI-NS4, AI-NS6) 20-D3.4s Work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results	Unit A: Energy and Matter Exchange in the Biosphere 20-A3.2sts Explain that science and technology have both intended and unintended consequences for humans and the environment (SEC3) [ICT F3-4.1] - Describe how human activities can have a disrupting influence on the balance in the biosphere of photosynthetic and cellular respiratory activities: – fossil fuel combustion – depletion of stratospheric ozone – forest destruction 20-A3.4s Work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results - Work cooperatively as a group to investigate, synthesize and present information on the effects of changes to stratospheric ozone levels on society, agriculture, plants and animals (CT-SEC1, CT-SEC2, CT-SEC3) [ICT C1-4.4, C7-4.2, F2-4.7]