

Lesson 1

Crops: Growing Problems

[Lesson Duration: 45 minutes]

National Education
Standards Alignment

Social Studies

Science

Health



Lesson Overview

Students will explore how crops are grown in industrial agriculture and how those practices impact human health and **ecosystems**. This lesson also covers the importance of soil, freshwater, and biodiversity in agriculture. In later lessons, students will learn in more detail about ecological alternatives to industrial crop production.



Learning Objectives

- Describe the importance of soil, freshwater, and biodiversity in agriculture.
- Explain how food crops are grown in industrial agriculture.
- Describe and analyze the impacts of industrial crop production on ecosystems and human health.



Essential Questions

- How does industrial crop production impact human health and ecosystems?
- If the prevailing practices in industrial agriculture continue, what kind of **food system** can we expect in the future?



Materials

- Paper for drawing
- Student handout
- Presentation slides
- *Crops and Ecology* primer
- FoodSpan Infographic



Resources

- *Crops and Ecology* primer (www.foodsystemprimer.org/food-production/crops-and-ecology/)
- Growing Solutions film (www.foodspan.org/films/growing-solutions.html)



Teacher Note:
Refer to Lesson B
for background on
the industrialization
of agriculture.

Warm-up: Visualizing Industrial Agriculture

Science, Social Studies
[10 minutes]

Ask students to draw a picture or write a description of what they imagine when they think about crop production. After a few minutes, show students the images of industrial crop production on the **Monoculture slide** and ask students to compare and contrast:

- What is most surprising about the real images?
- How, if at all, does your impression differ from reality?
- If there was a difference, why do you think our impressions differ from reality?
- What do you think are some of the advantages of growing crops industrially?

Explain that these pictures show what is known as monoculture, meaning that one crop is grown by itself, rather than with a diversity of other plants as typically happens in natural ecosystems. Ask: *What do you think are the consequences of having only one plant species growing over a large land area? Is that what occurs in nature?* Note that biodiversity, or having a variety of species in the same ecosystem, can help with pest management, soil fertility, and other needs on the farm. Without biodiversity, industrial agriculture needs to rely more on agricultural chemicals and other inputs to be productive.

Main Activity: How Are Crops Grown in Industrial Agriculture?

Science, Social Studies
[10 minutes]

Display the **Monoculture slide** and ask: *What do farmers use to help the crops in these photos grow? If students need prompting, ask:*

- How do farmers prevent crops from being damaged or destroyed by pests?
- What can be added to the soil to enable plants to grow faster?
- How do crops get water besides from rain? (**irrigation**) What is required to transport water through irrigation systems?
- What machines do farmers use to manage cropland? What powers those machines?

As students create a list, use guiding questions to emphasize the following inputs into industrial agriculture: pesticides, fertilizers, freshwater, and fossil fuels. Note that except for freshwater, these inputs are not necessarily required for crops to grow, but are used heavily in industrial monocultures.

“Land, then, is not merely soil; it is a fountain of energy flowing through a circuit of soils, plants and animals.”

– Aldo Leopold



Teacher Note: Refer to Lesson 6: Turning Toward Sustainability for more on the importance of biodiversity in agriculture.

Main Activity: Industrial Crop Production, Health, & Ecosystems

Science, Health

[20 minutes]

Students will work in groups to create flowcharts showing the links among industrial crop production, ecological impacts, and human health.

Display the following list from the **Ecological Impacts slide**. Explain that these are some potential negative consequences of industrial crop production:

- **Soil erosion**
(primer section: *Soil*)
- Decrease in bee populations
(primer section: *Pesticide Use*)
- Emergence of pesticide-resistant weeds
(primer section: *Pesticide Use*)
- Aquatic **dead zones**
(primer section: *Nutrient Pollution*)
- Depletion of phosphorus and fossil fuels
(primer section: *Fossil Resources*)
- Depletion of groundwater
(primer section: *Freshwater*)

Divide students into groups of three or four and assign each group one of the above ecological impacts. If there are more than 20 students in class, assign the same impact to multiple groups. Distribute the **Ecological Impacts Handout** and the **Crops and Ecology primer**.

Have students read the corresponding section of the primer (listed above in parentheses) and create a flow chart answering the following questions:

1. *What agricultural input(s) are involved in this impact (pesticides, fertilizers, freshwater, fossil fuels)? List as many steps as you can think of between each input and the ecological impact.*
2. *How can this ecological impact affect human health? List as many steps as you can think of between the ecological impact and its effects on human health.*

For example, here are possible answers for the group working on the impact, *decrease in bee populations*:

3. Pesticide use on crops kills insects → Bees that pollinate crops are exposed to pesticides and die → Decrease in bee populations
4. Decrease in bee populations → Fewer bees to pollinate crops → Crop yields decline → Food prices rise → Low-income populations are unable to afford enough food → Rise in malnutrition

Have each group give a brief presentation on their flowchart. Give them the option of acting out their flowcharts.



Teacher Note: Ecological approaches to growing crops are further explored in Lesson 6 and the short film, *Growing Solutions* (see extension, on the next page).



Share Your Knowledge: How does industrial crop production affect human health and the environment? Ask students to tweet their reflections and tag **#industrialag** and **#foodspan** to join the conversation.

Wrap-up: Reflecting on the Future of Agriculture

[5 minutes]

Have students write a journal entry in response to the prompt: *If current practices in agriculture continue, what kind of food system can we expect in the future?* Optional: Have students share their responses.

Extensions:

Revisiting the Infographic (Social Studies)

Distribute copies of the **FoodSpan Infographic** (students may already have their own from previous lessons). Ask students to identify parts that represent industrial crop production. Ask: *Do these accurately and fully represent what we learned about industrial crop production? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Film: Growing Solutions (Science, Health, Social Studies)

The Johns Hopkins Center for a Livable Future's original short film, *Growing Solutions* [<http://www.foodspan.org/films/growing-solutions.html>] (42 minutes), shows how farmers are innovating to protect and regenerate the resources needed for a secure farming future, especially in the face of climate change. The film features a farmer who's growing topsoil; seed-saving high schoolers; a farmer training program for military veterans; a communal system for water conservation; and a perennial style of farming that mimics the prairie. A discussion guide is provided.

"If we are going to live so intimately with these [pesticides]—eating and drinking them, taking them into the very marrow of our bones—we had better know something about their nature and their power."

– Rachel Carson