FOOD Ed.

FOOD EDUCATION FOR CHANGE

UNIT 2: FOOD AND THE ENVIRONMENT

L.16

THE INDUSTRIAL LANDSCAPE

Note to Teachers

The last lesson used wheat as an example to look at the ways in which new farming techniques, transportation technology, and regional specialization produced our modern industrialized farm system. This lesson will focus on three characteristics of that system – monoculture, dependence on chemicals, and Concentrated Animal Feeding Operations (CAFOs) – that have an extremely high environmental cost.

A key goal here is to return to a recurring question central to these lessons: how do these practices reshape our relationship with the natural world?

Goals *In this lesson, students will*

- appreciate the effectiveness of graphic and visual evidence.
- develop a basic understanding of some key practices of conventional agricultural and the environmental costs of industrialized agriculture.
- appreciate that further technological change helped to further distance farmers and eaters from a dialogue with nature.

Objectives

- Students will use a technique often known as a “silent conversation” to share and evaluate their observations and ideas.
- Students will draw and integrate information from visual and written sources.
- Students will collaboratively teach one practice to their peers.
- Students will reflect on the question: what kind of relationship to the natural world does conventional agriculture reflect?

Materials

- Handouts of images
- 11 x 17 or other large sheets of paper

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Please use this margin to notate how to best adapt this curriculum to your students.

Preparation

Where possible, assign the accompanying reading as homework, so that students here can focus on the process laid out below. Divide the students so that each reads one of the three sections. If homework is not possible, adjust the instructions below to introduce the text below at step 4.

Instructions

I. Practices and their Consequences

1. Divide students into groups on the basis of which of the three texts they read for homework. Ideally, no group will be larger than three students so that they can all read and write on the sheet of paper simultaneously.
2. Distribute accompanying images (the handout includes four images for each group) and a large sheet of paper to each group.
3. Explain to the students that this exercise is known as a Silent Conversation. It asks them to record their thinking on paper and respond to each other without speaking.
4. Give students approximately 10 minutes. Ask students to write down everything they notice about the pictures on the large collective sheet of paper.

   Here, they are focusing on what they see rather than what they think it means. Emphasize that careful observation is the foundation of strong analysis. Students may need encouragement to think of images as being as rich as a text.

   Students will build a collective list, silently reading and building on what their peers have written.
5. Once your students seem to have exhausted the images, ask them to return to the text.
   1. With the images in mind, ask students to search for:
      i. Corroboration of what they have noticed in the images. Does the text provide evidence for students' observations of the images?
      ii. Ideas or information beyond what the images provide. How does the text add to the story provided by the images?
   2. Once again, ask students to write their responses on the large sheet of paper. Using arrows or other marks, make sure that these responses are connected, where appropriate, to their observations about the images.
   3. Students should again work silently as they re-read the texts (or read them for the first time). Give the students about 10 minutes, or more if they are engaging the texts for the first time.
6. Now, in conversation, ask students to look over what they have written. Then, ask them to distinguish:
   - Which responses *define or describe* the phenomenon covered by their images and texts. (e.g., monoculture, chemical dependence, or CAFOs)
   - Which responses *identify the environmental consequences* of these practices?

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As they discuss their responses, encourage students to deepen, expand, and refine their responses where they can. Give students approximately 10 minutes to work.

7. These small groups are now ready to prepare a short presentation designed to teach their characteristic of industrial agriculture to their peers.
    1. Encourage students to organize their ideas, reminding them to draw evidence from both text and images.
    2. Ask students to write out what they wish to say.
8. Ask each group to teach the others. Encourage students to ask questions after each presentation and then open the floor to discussion.

   How do students respond to what they hear?
9. Agriculture began through a close dialogue with nature, but historical phenomena such as the Columbian Exchange gave humans a greater sense of control over it. How would your students characterize the human's relationship to nature as represented by industrialized agriculture?

   Critics of conventional agriculture would tend to argue that it disregards nature as a partner to humans in agriculture.

9. Close the class by highlighting the positive outcomes that you have noticed in the process of the Silent Conversation.

II. Lab

1. Today's lab today will focus on corn, one of the crops grown in our monoculture system.
2. Begin by introducing students to the many uses of corn in our society: it is used as food for humans, food for animals, but also fuel for our cars, corn syrup for processed foods, even bio-based plastics. Only a tiny proportion of the corn crop is used for human food and most of that is as corn syrup, used in everything from soda to the batter on frozen fried chicken (where the sugars in corn syrup help to produce an appetizing golden color).

   Most corn is produced in large monoculture systems, using hybridized seeds dependent on chemical fertilizers and pesticides. Growing corn and other commodity crops in this way has diminished species diversity, as farmers tend to buy their corn from a few huge seed breeders. Seed breeders tend to select seeds on the basis of traits like productivity and pest resistance.

   Despite the dominance of commodity corn that is grown for non-food

   uses, the world of corn is actually extremely diverse. Students may remember the following image of native Mexican corn from the lesson on the domestication of plants and animals—a good reminder of the incredible variety available in a single crop.

   There are several different basic types of corn – dent, flint, sweet, flour, popcorn. Within these categories, there are still hundreds of varieties of corn grown across the world—though these represent a fraction of the corn varieties once available.

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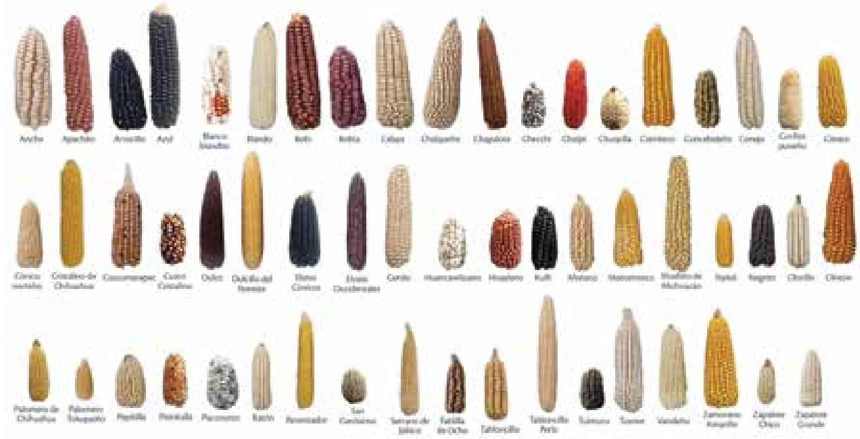

Photo: International Maize and Wheat Improvement Center (CIMMYT)

For example, at Stone Barns Center, farm director Jack Algiere has been working for nearly 15 years to bring back a type of corn, known as Otto File (Eight Rows), that is native to the Northeast U.S. but had not been grown in the area for hundreds of years.

When Stone Barns Center opened, a seed collector sent Jack an ear of the corn with a note to please try to repatriate it – it had been brought to Italy during the Columbian Exchange and grown there for polenta. Jack embraced the mission and cultivated it alongside squash and beans, as is the indigenous custom. After years of seed saving and careful tending, the corn is now a prized crop at Stone Barns and is even growing at a limited commercial scale – all from one single ear and the interest of an adventurous farmer.

Corn, in short, most often serves as an example of our conventional agricultural system. Otto File, by contrast, is an example of a variety selected for taste and an attempt to add to the diversity of seeds available.

See the recipe for Otto File Polenta.

This program is made possible by generous support from Unilever.

THE INDUSTRIAL LANDSCAPE

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CHICKEN NOODLE SOUP

16 students

Equipment List

- 2 large pots
- Strainer
- 2 wooden spoons
- Induction burner
- 16 cutting boards
- 16 knives
- 2, 1 tablespoon measuring spoons
- 1 teaspoon measuring spoon

Food Items

- 2 Tbsp grape seed oil
- 2 chicken breasts
- 10 carrots
- 3 onions
- 6 celery stalks
- 4 cloves of garlic
- 5 fresh thyme sprigs
- 2 bay leaves
- 1 Tbsp black peppercorns
- 1 tsp salt
- 1 chicken carcass
- 1 Tbsp olive oil

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AIM: How does industrial farming change the human relationship to nature?

HOMEWORK: Read one of the following texts, then choose two quotations you believe express an important idea. Copy out the quotation into your journal, and then summarize what the quotation says and why it is important to the larger passage in two to three sentences.

1
MICHAEL POLLAN
from
THE OMNIVORE'S DILEMMA

(NY: Penguin, 2006), 38-40.

A corn field

Use the space below to note key ideas, themes, or surprising takeaways from the reading.

EXCERPT 1: MONOCULTURE

When George Naylor's grandfather was farming, the typical Iowa farm was home to whole families of different plant and animal species, corn being only the fourth most common. Horses were the first, because every farm needed working animals (there were only 225 tractors in all of America in 1920), followed by cattle, chickens, and then corn. After corn came hogs, apples, hay, oats, potatoes, and cherries; many Iowa farms also grew wheat, plums, grapes, and pears. This diversity allowed the farm not only to substantially feed itself. . . but to withstand a collapse in the market for any one of those crops. It also produced a completely different landscape than the Iowa of today.

"You had fences everywhere," George recalled, "and of course pastures. Everyone had livestock, so large parts of the farm would be green most for the year. The ground never used to be bare for this long." For much of the year, from the October harvest to the emergence of the corn in mid-May, Green County is black now [because corn only grows during the summer]. . . The fences were pulled up when the animals left, beginning in the fifties and sixties, or, when they moved indoors, as Iowa's hogs have more recently done; hogs now spend their lives in aluminum sheds perched atop manure pits. . .

Corn isn't solely responsible for remaking this landscape: It was the tractor, after all, that put horses out of work, and with the horses went the fields of oats and some of the pasture. But corn was the crop that put cash in the farmer's pocket, so as corn yields began to soar at midcentury, the temptation was to give the miracle crop more and more land. . . By the 1980s, the diversified family farm was history in Iowa, and corn was king. . .

Corn had pushed the animals and their feed crops off the land, and steadily expanded into their paddocks and pastures, and fields. Now it proceeded to push out the people. For the radically simplified farm of corn and soybeans doesn't require nearly as much human labor as the old diversified farm. . . "Growing corn is just riding tractors and spraying," Naylor told me. . . So the farms got bigger. . .

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2
MICHAEL POLLAN
from
THE OMNIVORE'S DILEMMA

(NY: Penguin, 2006), 41-47.

3
ANNA LAPPÉ
from
DIET FOR A HOT PLANET

(NY: Bloomsbury, 2010)

Tractor spraying a field of corn

CAFO chicken production

EXCERPT 2: CHEMICAL DEPENDENCE AND POLLUTION

Fritz Haber, a German scientist, developed ammonium nitrate, the key ingredient in explosives. Also an excellent source of nitrogen for plants, agricultural scientists after World War II began to use sodium nitrate for fertilizer.

The chemical fertilizer industry (along with that of pesticides, which are based on poison gases developed for [World War II]) is the product of the government's efforts to convert its war machine to peacetime purposes. When humankind acquired the power to fix nitrogen, the basis of soil fertility shifted from a total reliance on the energy of the sun to a new reliance on fossil fuel. For the Haber-Bosch process works by combining nitrogen and hydrogen gases under immense heat and pressure in the presence of a catalyst. The heat and pressure are supplied by prodigious amounts of electricity, and the hydrogen is supplied by oil, coal, or most commonly today, natural gas—fossil fuels. . .

Liberated from the old biological constraints, the farm could now be managed on industrial principles, as a factory transforming inputs of raw material—chemical fertilizers—into outputs of corn. Since the farm no longer needs to generate and conserve its own fertility by maintaining a diversity of species, synthetic fertilizer opens the way to monoculture. . .

One problem with factories, compared to biological systems, is that they tend to pollute. Hungry for fossil fuel as hybrid corn, farmers still feed it far more than it can possibly eat, wasting most of the fertilizer they buy. . . Some of [the extra] evaporates into the air, where it acidifies the rain and contributes to global warming. . . Some of it seeps down into the water table. . . As for the rest of the excess nitrogen, the spring rains wash it off Naylor's field, carrying it into drainage ditches that eventually spill into the Raccoon River. From there it flows into the Des Moines River. . . [eventually ending up] in the Gulf of Mexico, where their deadly fertilizer poisons the marine ecosystem. The nitrogen tide stimulates the wild growth of algae, and the algae smother the fish, creating a "hypoxic," or dead, zone as big as the state of New Jersey—and still growing. By fertilizing the world, we alter the planet's composition of species and shrink its biodiversity.

EXCERPT 3: INDUSTRIAL LIVESTOCK PRODUCTION

Today, most livestock production in the United States occurs in these factory farms, called Concentrated Animal Feeding Operations (CAFOs). CAFOs are defined by the Environmental Protection Agency (EPA) as facilities that confine animals for at least forty-five days a year and do not raise their own feed. "Large" cattle CAFOs house one thousand or more animals, and "large" hog CAFOs house twenty-five hundred or more. Poultry operations aren't technically deemed "large" until 125,000 or more birds are in confinement.

By 2000, CAFOs not only reigned in the United States but also were rapidly expanding across the planet . . .

In CAFOs, livestock are taken off pasture and traditional sources of nourishment and raised, instead, on diets of soybeans, corn, and other feedstuffs. The result?

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- Globally, one third of the world's cereal harvest, including half of all corn and 90 percent of all soy, is now diverted to feed animals on factory farms.
- In the United States, 80 percent of soy and as much as two thirds of our corn goes to feeding animals, not people. Nearly 50 percent goes to supplying domestic feed, and another 19 percent is exported, with much of that going to feed livestock abroad.
- More than two thirds of available agricultural land worldwide is used for animal production, from raising livestock to producing feed.
- Roughly a quarter of the world's fish catch ends up as feed for livestock or farmed fish.

Producing these feed crops has a serious climate toll. Environmentalists are particularly concerned about carbon dioxide released from rainforests that are destroyed to make way for pasture and cropland in hotspots like the Brazilian Amazon, one of the world's most vital carbon sinks. Today as much as three-quarters of Brazil's greenhouse gas emissions stem from deforestation, largely the result of agribusiness expansion. . . .

In industrial livestock operations, [manure is also a problem] . . .

The sheer volume of waste in industrial scale systems is too much to cycle back through the system, a challenge made all the more difficult because CAFOs tend to be far from where feed is grown. Instead, manure from hog CAFOs is mixed with wastewater and stored as a liquid in manure "lagoons". . . and these cesspits can be massive, a typical hog CAFO can be home to one that stores millions of gallons and be as large as several football fields.

In cesspits and manure holding tanks, microorganisms break down organic matter anaerobically—that is, without oxygen. As they do, they decompose and convert the manure, as well as other waste, like bedding material, into methane, carbon dioxide, and other gases [that cause global warming]. . . .

Livestock waste presents other big problems, too: There's the issue, for instance, of manure runoff leaching into surrounding waterways—worrisome when it is common for wastewater to include phosphorus, ammonia, pathogens, and other pollutants.

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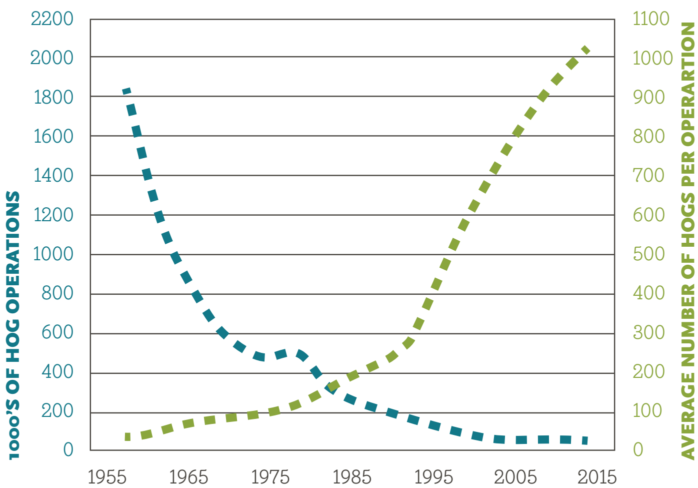
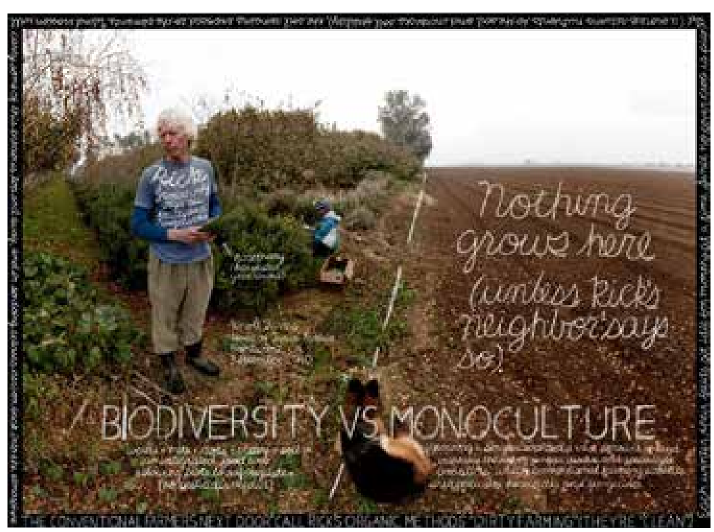
THE INDUSTRIAL LANDSCAPE

MONOCULTURE



This graph shows the decline in the number of U.S. Hog Farms from 1955-2015. During the same period, the average number of hogs per farm increased from 37 to 1,044.

Brent Kim Johns Hopkins Center for a Livable Future, 2014. From http://www.foodsystemprimer.org/food-production/industrial-food-animal-production/



http://lexiconofsustainability.com/biodiversity/

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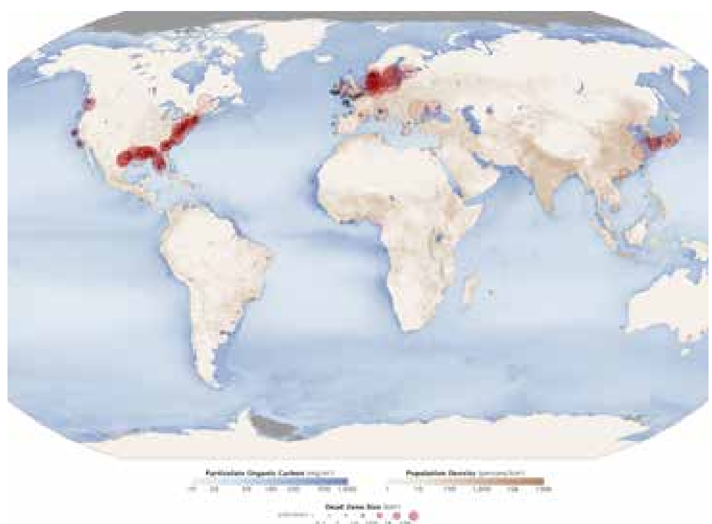
CHEMICAL DEPENDENCE AND POLLUTION



Dead zones around the world

from NASA at http://eoimages.gsfc.nasa.gov/images imagerecords/44000/44677/dead_zones_lrg.jpg

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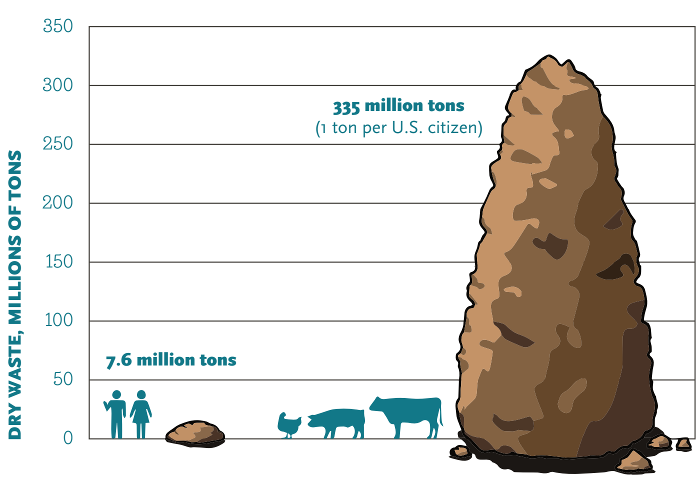
CONCENTRATED ANIMAL FEEDING OPERATIONS



CAFO waste pools

THE INDUSTRIALIZING FOOD SYSTEM

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CHICKEN NOODLE SOUP

YIELD: 1 large pot

Ingredients

QUICK CHICKEN STOCK

- 2 tablespoons grape seed oil
- 2 chicken breasts
- 6 carrots, halved
- 2 onions, quartered
- 4 celery stalks, cut into thirds
- 4 cloves garlic, smashed
- 5 sprigs fresh thyme
- 2 bay leaves
- 1 tablespoon black peppercorns
- 1 teaspoon salt
- 1 chicken carcass

CHICKEN NOODLE SOUP

- 1 tablespoon olive oil
- 1 onion, chopped
- 2 celery stalks, chopped
- 4 carrots, chopped
- 1 pot chicken stock
- 1, 12 oz. box of egg noodles
- 1 pound of chopped cooked chicken breast from the stock
- Salt and pepper to taste

Directions

QUICK CHICKEN STOCK

1. Warm oil in a large pot. Add chicken breasts to pot, skin side down. Sauté until brown.
2. Add remaining ingredients to pot and fill with water.
3. Bring to a boil, and then reduce to a rapid simmer.
4. Remove chicken breasts after about 20 minutes. Continue cooking the stock for about 45 minutes.
5. Strain out chicken carcass and vegetables.

CHICKEN NOODLE SOUP

1. In a large pot over medium heat, warm oil. Cook onion, celery and carrots until tender about 5 minutes.
2. Add chicken stock to pot and bring to a boil.
3. Add noodles and chicken. Reduce heat to a simmer and cook for about 15-20 minutes, until noodles are cooked.