TEXAS FARM BUREAU®

Go 'O' or No?
Organic or Traditional Food Production?

By: Mary Beth Bauer

10th-12th Grade AP Environmental Science, AP Biology, Chemistry, Environmental Systems, & AP Psychology

Length of Lesson: *Note: These are suggested times, but the full lesson length will depend greatly on classroom structure and student pace. Day 1: 30-45 minutes; Day 2: 50-60-minute class period; Days 3,4,5: 50-60-minute class period

Audience: Advanced Placement Environmental Science (Grades 11-12); Environmental Systems (Grades 10-11)

AP Environmental Science Learning Objectives:

EIN-2.C: Describe changes in agricultural practices
EIN-2.D: Describe agricultural practices that may cause environmental damage
STB-1.E: Describe sustainable agricultural and food production practices

Environmental Systems TEKS:

- 2(E) follow or plan and implement investigative procedures, including making observations, asking questions, formulating testable hypotheses, and selecting equipment and technology
- 2(F) collect data individually or collaboratively, make measurements with precision and accuracy, record values using appropriate units, and calculate statistically relevant quantities to describe data, including mean, median, and range
- 2(I) organize, analyze, evaluate, build models, make inferences, and predict trends from data
- 2(K) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports
- 5(A) summarize methods of land use and management and describe its effects on land fertility
- 9(G) analyze how ethical beliefs can be used to influence scientific practices such as methods for increasing food production

TEXAS FARM BUREAU®

National Agricultural Literacy Outcomes:

- Theme 2: Plants and Animals for Food, Fiber and Energy (High School Grades 9-12)
  T2.9-12 b. Compare similarities and differences between organic and inorganic nutrients (i.e. fertilizer) on plant growth and development; determine how their application affects plant and animal life.
- Theme 3: Food, Health and Lifestyle (High School Grades 9-12)
  T3.9-12.f. Explain how food production systems are influenced by consumer choices.
  Theme 5: Culture, society, Economy and Geography (High School Grades 9-12)
  T5.9-12.j. Provide examples of how changes in cultural preference influence production, processing, marketing, and trade of agricultural products.

Lesson Objectives:

1. Describe the characteristics of organic and inorganic fertilizers.
2. Design and implement an investigation comparing the productivity of selected plants when grown with different types (organic and inorganic) of fertilizers.
3. Compare and contrast the advantages and disadvantages of organic and traditionally produced crops.
4. Relate consumer choice to changes in agriculture.

The Plan (5-E Model)

Day 1: Engage and Explore

a. Provide variety of organic and not-organic food sources for students to view (and eat if all safety protocols are followed).
   - Discuss any differences in appearance and taste.
   - Discuss family buying habits – organic or not.
   - Discuss what the students think organic means.

b. Assign pairs of students the following terms. Their job is to find the definition and an example of each and share with the rest of the class during the last 20 minutes of class:
   - Fertilizer
   - Organic fertilizer
   - Inorganic fertilizer
   - Organic crop
   - Food productivity
   - Organic farming
   - Parts of a fertilizer label
   - Green revolution

Day 2: Explain and Elaborate

a. Assign lab groups the inquiry task of designing and setting up an experiment that compares the productivity of a plant* when grown with organic fertilizers as opposed to inorganic fertilizers. Design must include the controlled variables and a specific measure of productivity as well as specific procedures for setting up the experiment. Instructor must approve the experiment.
b. Materials available include the following: vegetable plants or ryegrass seeds (*teacher preference), soil, appropriately sized containers, light source, one organic fertilizer, one inorganic fertilizer, measurement equipment for fertilizer and water.
c. Students will set up the experiment and record any initial observations/measurements. This may not happen until Day 3, depending on how the first part of Day 2 goes.

Day 3-4: Explain and Elaborate

a. Students will watch each of the following You Tube videos:
    a. https://www.youtube.com/watch?v=SNe8R2iQOgY (Organic vs Chemical Farming)
    b. https://www.youtube.com/watch?v=1dKUhUN5Yx4 (Organic vs Conventional Farming)
    c. https://www.youtube.com/watch?v=Pi jtoHENW4 (Conventional vs Organic Farming … Which One)
b. Students will read the following History of Organic Farming:
    a. https://www.sare.org/Learning-Center/Bulletins/Transitioning-to-Organic-Production/Text-Version/History-of-Organic-Farming-in-the-United-States
c. Student groups will then prepare a short video using iMovie, Flipgrid, or another platform. The purpose of the video is to both share the pros and cons of organic and conventional food production AND to take and support their personal stand on the issue. Students will have 2 days to prepare and submit videos; these will be previewed by the instructor and watched and discussed during class.

Day 5: Evaluate

a. When either ryegrass has grown enough to measure or food production has occurred (if using vegetable plants), students will complete the experimental portion of the lesson.**
b. Students then will complete the lab write-up using their data. (*Note: See a lab write-up rubric below)
c. Finally, students will write a 3-5 paragraph persuasive paper that relates their original video stance on organic vs. conventional with their experimental results.

**Other lessons pertaining to agriculture/food production/sustainability will be completed in the intervening days between starting the investigation and finishing the investigation.

Other lessons could include:

- Cost of Food activity (found in the old Project Wild books)
- IPM activities found here: https://www.ipm.iastate.edu/module-1-introduction-ipm
- Texas Farm Bureau Plant Pests lesson found here: file:///C:/Users/jwalker1/Downloads/PlantPests_OnlineLesson.pdf
- Food Evolution video found on Amazon (watch/discuss/write about it/create a viewing guide)

TEXAS FARM BUREAU®

Lab Write Up – Organic vs Conventional Fertilizers

5 pts	Title Page
5 pts	Purpose
5 pts	Hypothesis
5 pts	Materials
5 pts	Specific procedures
5 pts	Safety requirements
5 pts	Independent, dependent, and controlled variables
10 pts	Data chart
10 pts	Descriptive paragraph of qualitative observations (plant/food color, quality, etc.)
20 pts	Graphical representation of data
25 pts	Conclusions and Analysis – must include the answers to the following questions:

- What did your results indicate concerning productivity with organic vs inorganic fertilizer?
- Copy and interpret the fertilizer label from the conventional fertilizer.
- Copy and interpret the fertilizer label from the organic fertilizer.
- Describe at least two specific sources of error and explain how they could be mitigated.
- Can these results be applied to all food crops? Why or why not?