



HOW TO



FEED THE



WORLD

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Introduction

You're busy. Every good teacher is. This curriculum was written so that instead of having to write entire lesson plans, test questions, and writing assignments, you can spend time where your input most matters: with the students.

Of course, you may pick, choose, augment, or even ignore what has been provided. It is our hope, however, that what we have provided simplifies your work load, as the curriculum contains content that improves reading comprehension, writing skills, assessment practice, and develops critical thinking skills.

The materials for each of the 12 chapters as well as the Conclusion are as follows:

Fact Gathering and Information worksheet

- 25 fill-in blanks, so grading percentages are easy to calculate and consistent across chapters.
- The questions are written in sequential order, starting from the beginning of the chapter and on until the end. This helps develop reading comprehension and understanding of the material, as it forces a student to follow how one idea leads to and builds on another.
- The sequential order also acts as an outline aid to students who have trouble focusing or paying attention, as each correct answer acts as a guide to where information about other questions can be found or is located.
- The questions focus on important themes and vocabulary words, thus helping students practice finding and understanding what the important parts of a textbook they are reading for content or taking notes on are.
- Study guides can be completed in class or at home. Correcting the study guides in class can lead to great discussions.
- Completed study guides provide material to review, study, and learn for the exam. Completed and corrected study guides will be especially helpful to students who have yet to learn good study habits or have trouble focusing in on what is important when it comes to content.



Geography

Each chapter section contains a mapping exercise.

- Reports indicate students and adults struggle with world geography. (Recently, Time magazine reported that late night talk show host Jimmy Kimmel asked people to find Korea on a map, and, "It didn't go well.")

As this book talks about feeding the world and supply chains, it is imperative that students grasp the distances and distribution of resources on the globe. This simple exercise reinforces how we are separated and connected all at once.

- A visual and graphic depiction of where areas being discussed are located may aid some students in understanding more fully the anecdotes and information presented in the chapter.



Critical Thinking Practice, SAT Preparation, and Assessment

- Each chapter and the conclusion will have 5 Standard Test questions. Questions will include those that are found on the SAT and other formal assessments, such as main idea, detail, inference, tone, extrapolating from a graph, etc.
- These questions are HARD, but they should not be skipped over. Teachers may want to use class time discussing these questions, as even if one does not take the SAT, the reasoning behind these questions teaches critical thinking. The WRONG answers are as important as the correct ones.
- Explanations for the correct as well as the incorrect answers will be given in depth so that when a teacher is leading a class discussion, the reasoning can be as much of the focus as the correct answer. It may well be that a teacher uses these questions as teaching tools rather than for assessment.
- The questions in the student study guide will be prefaced with the following note — **Remember:** *Some of these questions will involve thinking critically about information you learned in the chapter. Choose the correct answer, eliminating the ones you know to be incorrect.*



Investigation and Internet Research

False news (and claims of) is everywhere, yet increasingly, all information is being sourced from the Internet. For that reason,

- Each chapter and conclusion will have a section where students are given questions or topics to fact check, look up, investigate, or research using the Internet.
- It is up to the teacher what topics are appropriate for their class and how much time will be allowed when investigating them.
- Research may be done in pairs, small groups, or as homework.



Writing Focus

- Each chapter will have three topics that are suitable to one or two paragraph answers.
- Topics will range from informative, explanatory, making (supporting or opposing) an argument, to opinion.
- A teacher can assign topics depending on class level, ability, and time.

Answers will vary, but when appropriate, teachers will be given keywords to look for when grading the writing samples.

Questions for Class Discussion

Each chapter and the conclusion will have a section only in the Teacher's Guide where some questions are provided that could be part of a class discussion.

- It is entirely up to the teacher what questions if any are appropriate to their class and their students' abilities.

Further Advancement/ Different Teaching Modalities

- When appropriate, alternative assignments that are relevant to the chapter will be suggested.
- These suggestions will only be in the Teacher's Guide, and it is up to the teacher if they want to use none, one, or all.

Chapter One



Fact Gathering and Information

Chapter Title: **1. Inhabitants of Earth.**

What are some of your personal life choices that may affect global population?

2. not smoking **3. eating a healthy diet** **4. exercising regularly** and **5. following the doctor's advice** .

To decide how many children to have and how to live demands a **6. degree of education** and **7. economic power** .

For the most part, world population has been growing steadily since the first **8. agricultural revolution** about 10,000 years ago.

England was the first country to go from **9. high mortality** and **10. high fertility** to **11. low mortality** and **12. low fertility** .

Although Mexico's life expectancy rose from 57 years in 1960 to 77 years in 2014, fertility dropped from 6.8 to 2.2 babies because of government-sponsored **13. family planning programs** .

The biggest population increases are expected on the **14. African** continent.

By the end of the century, **15. Europeans** are projected to account for less than 6% of the world's population.

If a fertility decline happens fast enough, a country (South Korea, for example), may enjoy a **16. demographic dividend** .

The severe shortage of health care in Malawi is in part due to doctors and nurses who were trained there **17. migrating or leaving the country** .

All developed nations became increasingly **18. urbanized** as they transitioned from agricultural to industrialized **19. economies** .

20. Urban residents consume much more meat.

The driving force behind today's unequal population growth is due to the **21. high fertility** in **22. Asian** and **23. African** countries.

24. Malthus argued that unchecked population growth would lead to food shortages and famines.

Boserup argues that **25. population pressure** leads to intensification, new technologies, and eventual development and prosperity.



Geography

These countries were mentioned in this chapter. Mark their correct locations on the map.

Print this page if necessary.

- | | | | |
|---------------|------------|-------------|-------------|
| United States | Mozambique | Germany | Afghanistan |
| Canada | China | Australia | South Korea |
| England | India | New Zealand | Malawi |
| Japan | Niger | Singapore | Thailand |
| Mexico | Italy | Haiti | Angola |
| Myanmar | | | |





Critical Thinking Practice, SAT Preparation, and Assessment

1. The author's primary purpose was to
 - a. warn about the consequence of unchecked population.
 - b. discuss the reasoning and assumptions behind a theory.
 - c. present and analyze population data.
 - d. describe sub-Saharan Africa fertility rates.

Answer choice: **C**

This is a main idea question. Look at the first words of each answer: warn, discuss, present, describe.

A is weak because the author does much more than warn.

B The author discusses, but she didn't stress a big theory.

C It is not "too big" or "too small" for a main idea. It conveys exactly what the author set out to do, as she wasn't arguing a particular position side.

D This is "too small" for a main idea, as it focuses in on a detail.

2. A population optimist
 - a. would agree with Robert Malthus.
 - b. would argue that climate change is solely due to megacities.
 - c. would push building a lunar space station.
 - d. would talk about the development of new and hardy crops.

Answer choice: **D**

This is a vocabulary/inference question.

If one knows that an optimist is someone that sees the glass half full as opposed to half empty, one knows to look for a positive answer.

A Malthus (page 22) argued that unchecked population would lead to food shortages and famines.

B One should know from general comprehension of this chapter that climate change is affected by many more factors than just megacities.

C A lunar space station has nothing to do with population numbers. In fact, the first one will likely hold only a few people!

D Developing new and hardy crops is a positive way of dealing with increasing population.

3. Medical experts born and trained in Malawi who then emigrate to another country are most likely to be considered
 - a. the "best and the brightest."
 - b. a "brain drain."
 - c. the "X generation."
 - d. a "moral majority."

Answer choice: **B**

When one emigrates, one leaves one's country and permanently settles in another. Medical experts are usually (hopefully!) some of the best and the brightest, and when they leave, it is a "brain drain." Though, of course, medical experts can also belong to the X generation (follows Baby



Investigation and Internet Research

■ What is the population of your city, state, and country? Is it growing or shrinking?

■ Are there any mega cities located near you?

■ What is your country's fertility rate?

In the book, it states that England's mortality rate after industrialization dropped in large part due to the major decline in infectious diseases such as cholera, small pox, and typhus.

■ Describe how one of these diseases is spread.

■ Are there vaccinations for these diseases?

■ Have there been any cases of these diseases reported in your area?

continued next page



Writing Focus

1. At the very beginning of the chapter, the author writes: *The world's growing population is more than a matter of numbers.* Explain what the author means by this.

Answers will vary. Key words: fertility, environment, economy, policies, education

2. Without out any other information, you are told that someone has seven children. Most likely, are they from sub-Saharan Africa or Canada? Defend your answer using material from the chapter.

Sub-Saharan Africa. Key words: young population, high fertility

3. Discuss Megacities. Define, name at least three, and list some of the problems they might create or face.

Megacity: more than 10,000 inhabitants. Key words: congestion, unbridled spread of infectious diseases, pollution, urban heat island

boomers, precedes Millennials, typical birth years from early to mid-60s to early 1980s) and the moral majority (the majority of people regarded as having firm moral standards).

4. Refer to Figure 1.2 for this question.

If the population for 2090 is 8 billion, one reason the author might give for this number is

- an Ebola virus pandemic.
- no access to birth control.
- a new, cheap food supply.
- the growth of megacities.

Answer choice: **A**

First, find 2090 on the graph and note how 8 billion is on the curve marked low. In other words, the projected population number of the United Nations has decreased slightly. The only answer that would cause a decrease in population is a pandemic. **B** and **C** would most likely cause an increase in population, and the growth of megacities (**D**) is most often the result of a population increase.

5. The population of Northern America and Oceania is younger than its European counterpart due to

- fertility.
- immigration.
- infant mortality.
- industrialized economies.

Answer choice: **B**

This is a question that one might need to work backwards from the answers if one is not sure (though it is clearly stated in the chapter on page 15). Both North America and Europe have industrialized economies, so that answer can be eliminated. As North America and Europe are both developed, one would think that their infant mortality is about equal, so that answer, too, can be eliminated. With the same reasoning, one would assume that the people in these countries are equally fertile. Younger people immigrate.

Questions for Class Discussion

Choose one or all depending on specific class needs.

- How many children do you wish to have? Why? What might affect your decision?
- Some television reality shows depict very large families or teen mothers. How do you feel about these shows in the context of world population?
- Should the government fund birth control or tie aid to certain policies?
- Previously, you researched the population of your area. Why do you think the population has been stable, increasing, or decreasing? Is this acceptable to you? Should something be done about it?
- How many generations back, if ever, was your family part of a migration? What do you feel about immigration today? Should visas be meted out by education levels, economic hardships, or country or origin?

Further Advancement/ Different Teaching Modalities

- Make an informative poster about cholera, typhoid, small pox, or the bubonic plague.
- On a large world map, have students draw lines to the United States or set pins from the origins of their ancestors.
- Witness a Debate:
One or two students play the part of doctors who were provided with a government scholarship for their training. The country is now war-torn or with severe poverty.
One or two students play the part of uneducated workers who are being prosecuted for their religion.
One or two students play the part of government officials from the country the doctors and workers are from.
One or two students play the part of immigration judges.
Do the judges allow entry? Why would they or why would they not? Have the class vote- how many agree with the judges?

Chapter Two



Fact Gathering and Information

Chapter Title: **1. The Green, Blue, and Gray Water Rainbow**

2. Water scarcity is when there is not enough quality water for what it is needed for.

The volume of water on Earth is approximately **3. constant** over time due to **4. constant recycling**.

All the sources of water that are useful or potentially useful to humans are **5. water resources**.

The two major categories of water sources are **6. surface resources** and **7. groundwater resources**.

Surface and ground water sources are known as **8. blue-water** resources.

Moisture that seeps into soil during rain and is sucked up by plants for growth is referred to as **9. green-water**.

Treated wastewater or waste water from sinks and showers that could be used for irrigation is considered to be a **10. grey-water resource**.

11. Transpiration water is water that passes through a plant and is released back into the atmosphere as water vapor.

A crop's **12. harvest index** is the ratio of grain to total biomass.

Transportation water loss is a function of the plant physiology but it is also very sensitive to **13. climate conditions**.

Water that was used during a plant's growth but is no longer contained in the actual food is called **14. virtual water**.

The volume of water needed to produce a final product is called the **15. water footprint**.

16. Drought occurs when precipitation is lower than normal conditions for the time of year.

One way to help deal with water scarcity is to improve **17. soil health**.

One way of dealing with increased rainfall variability is to develop and use **18. rainwater harvesting systems**.

19. Irrigation is a method for delivering water to plants at a regular interval.

The primary purpose of large scale dams built in the United States was **20. water supply**.

Some costs equated with dam construction are the displacement of people as well as the **21. fragmentation** of the stream network.

When an aquifer is recharged, rainwater percolates down through the overlying soil. Water from the **22. Ogallala aquifer** is being mined much faster than it can be recharged.

continued next page

When excess nutrients from fertilizers applied to agricultural fields are carried downstream into coastal and freshwater ecosystems, they can create **23. hypoxic zones**.

Excess nutrients cause more **24. algae** to grow, and when they decay, they deplete even more oxygen in the water, thus creating the dead zones.

Farmers around the Mexico City basin stopped using **25. blue-water** for irrigation.



Geography

These countries and places were mentioned in this chapter. Mark their correct locations on the map.

Print this page if necessary.

United States	Israel
China	India
Bangladesh	Gulf of Mexico
Saudi Arabia	Mexico

Draw in these rivers:

Ohio, Mississippi, Yangtze, Colorado, Columbia, Missouri





Investigation and Internet Research

- Look up the Three Gorges Dam in China. List three positive and three negative comments about its construction.
- Look up the average rainfall for your area and state. How it has changed over time?
- Find your city's and your school's source of water.
- What states make up the Corn Belt?
- What states does the Ogallala aquifer lie under?
- Find a water footprint calculator on line. Use the personal one. Next, find a food one. Write down the water footprint amount for four different foods.



Critical Thinking Practice, SAT Preparation, and Assessment

1. What phrase best describes the situation when a salmon cannot longer go upstream to spawn?
 - a. rainfall harvesting
 - b. recharging of an aquifer
 - c. transpiration
 - d. fragmentation of a stream network

Answer choice: **D**

This is a detail question that is checking understanding of defined terms. **A** is wrong because rainfall harvesting is when one harvests or uses rainfall for specific purposes.

B is incorrect because it has nothing to do directly with streams.

C is incorrect because transpiration has nothing to do with streams.

Transpiration is the water that passes through a plant and is released as water vapor.

D A dam is something that creates stream fragmentation and thus would stop a salmon from going upstream to spawn.

2. Most likely, the authors wanted the reader to
 - a. review the hydraulic cycle.
 - b. understand water supply.
 - c. weigh the merits of building dams.
 - d. fear hypoxia.

Answer Choice: **B**

This is a main idea question. Looking at just the first words of each answer: review, understand, weigh, and fear helps us get an early "feel" for the right answer. The chapter is not filled with fear and dooms day observations about the end of mankind. It is not written as a pro or anti editorial piece. It lays out information. Most likely, the answer is **A** or **B**.

A is too narrow, although the hydraulic cycle is defined.

B fits perfectly, as the chapter focuses on our water sources and how they are used. One **MUST** continue reading answer choices because there may be a better fit, this one being so broad.

C can be eliminated due to the first word, and building dams was only a small part of understanding the water supply.

D can be eliminated due to the first word. Hypoxia is a small detail, and even if one does not remember what it is, the word fear should have made one hesitate before choosing this answer.

3. Most likely, what would have the greatest water footprint?
 - a. tomatoes grown in your backyard
 - b. a hamburger patty because of the amount of water a cow needs to drink

continued next page

- c. tomatoes grown in a greenhouse
- d. a hamburger patty because of the amount of water needed to grow the food the cow needs

Answer choice: **D**

The water footprint is the volume of water needed to produce the final product. 462 gallons to produce a hamburger patty- 98% of which is needed to grow what the cow needs to eat.

4. All of a sudden and for the first time the wells in a small 50-year-old subdivision go dry. A likely explanation might be that
 - a. a near-by dam collapsed due to heavy rainfall.
 - b. the wells were shallow and dug over 50 years ago.
 - c. near-by farmers are pumping up larger amounts of groundwater than usual for irrigation.
 - d. the land above the aquifer has collapsed because of the amount of water that has been drained.

Correct Answer: **C**

The answer comes right out of the book (the bottom of page 40 where it discusses the 2012 drought in Northern Indiana). If one didn't know, one should have at least been able to eliminate **A**, as a ruined dam would produce flooding rather than wells going dry.

B may well be true, but it doesn't answer why now.

C During a drought, farmers will need to use greater amounts of water.

D We are not given any information about an aquifer, but if the wells are shallow and have been drawing from it without problems, then it is very unlikely that enough water has been removed for the land to sink.

5. The authors would most likely agree with what statement?
 - a. Only the people living above the Ogallala aquifer should use the water.
 - b. Scientists need to learn how to remove salt from ocean water so it can be used for irrigation.
 - c. We must prepare ourselves for changes in precipitation and other factors that make up our climate.
 - d. The price of water should be raised so that people use less water.

Answer choice: **C**

This question asks the reader to get a sense of the author's sense of view. **A** is incorrect because the author's overall concern is the world's water sources- not to whom it belongs.

B The authors' stress the importance of scientists and research (better plants, better irrigation, etc.), but their scope is much broader than a simple fix. Most likely, they would not agree to this until they pointed out the harm this might do to ocean ecosystems.

C This is a perfect fit, especially as they explain how just as much rain might come in shorter time periods now.

D They mention block water pricing in Israel, and one might feel that this is how it should be, but once again, the authors focus on an entire system, not just pricing.



Writing Focus

1. Explain why some shrimp farmers in Alabama might be concerned about agricultural runoff.

Keywords: hypoxia, Mississippi River system, excess nutrients

2. Explain green, blue, and grey water, giving examples of each.

Keywords: blue: surface and ground; green: sucked up by plants for growth; grey: treated

3. Do you think people should pay for water? How? Should every gallon be the same price? What if the water is going to a school or hospital? What if it is for a factory or farm?

Answers will vary.

Further Advancement/ Different Teaching Modalities

■ Make a poster of the water cycle, with an insert explaining at least five water related vocabulary words from this chapter.

■ Debate the Foxconn factory being made in Wisconsin, making sure to bring up water use. (Give students ten minutes to prepare, not knowing what side they will be assigned!) Then choose two by random drawing, their sides by a coin-toss, and the rest of the class judges. If you're up for it, have the students switch sides half way through the debate!

■ Listen on YouTube to Woody Guthrie singing his song about the "Great Coulee Dam." And/or, contrast how people felt then about dams compared to some of the concerns people have now. Make your own song or short ditty about the wonders of water.

Questions for Class Discussion

Choose one or all depending on specific class needs.

■ Some states have laws about collecting rainwater. For example: Under a new Colorado law, House Bill 1005 (2016), residential homeowners are now able to use two rain barrels, with a combined capacity of 110 gallons, to capture precipitation from their rooftops. The collected precipitation is required to be used on the property where it is collected and may only be applied to outdoor purposes such as lawn irrigation and gardening. The law guarantees collection of precipitation from rain barrels does not interfere with existing water rights and that the use of a rain barrel does not constitute a water right. The state engineer is required to track adoption and usage among homeowners.

Do you agree? Why would this law be enacted? Does our state have a law about rainwater collection?

■ A dairy farm has been in existence for 100 years. 10 years ago, a subdivision was built close by. Now the non-farm owners are protesting their wells going dry and want the farm to stop operating. Who is right?

■ Why might an agronomist research increasing a crop's harvest index?

■ At times, some states regulate watering lawns or washing cars. How do you feel about this? How would you deal with a neighbor who is breaking the rules?

■ Should there be laws about protecting the environment even if it means greater food costs in the supermarket or more government regulation?

■ Have you ever used grey water?

Chapter Three



Fact Gathering and Information

Chapter Title: **1. The Land that Shapes and Sustains Us.**

Even if our attitude has changed about land our **2. reliance** upon it has not.

3. **Owning land** is no longer a precursor to wealth and influence.

By thinking of our land as vast and plentiful, when in fact, it isn't, we are putting ourselves and **4. future generations** at risk.

When the United States was being colonized and settled, **5. sustainability** of farmland was of less concern because new land was always available.

During the **6. Dust Bowl**, over 100 million acres were lost to drought and erosion.

The expense of installing **7. conservations practices** to minimize the loss of soil sediment and nutrients is staggering.

Some 98 percent of the population worked in agriculture 200 years ago, and today it is less than **8. 2 percent**.

The primary reason for disappearing prime farmland is **9. suburban sprawl**.

It takes roughly **10. 500 years** to create one inch of soil.

All three types of farmland: **11. cropland**, **12. rangeland**, and **13. pasture land** are all **14. decreasing**.

Data is collected on both **15. land use** and **16. land cover**.

A trend that cannot be allowed to continue is the disproportionate loss of **17. higher-quality farmland**.

We **18. do not** have enough farm and rangeland to support future generations.

A **19. free market** won't meet the needs of future generations because those who will depend on the farmland are not here to participate in today's land markets.

20. Irreversibility is when one can't convert former farmland back into productive farmland again.

It took **21. government intervention** to get farmers to give up less profitable cropland and convert it to a less intensive use during the Dust Bowl.

We can't just convert any piece of land into farmland because it may act as a giant **22. air filter** or protect a **23. watershed**.

One can advocate for more government funding for **24. conservation** and **25. farmland** protection.



Geography

These countries and places were mentioned in this chapter. Mark their correct locations on the map.
Print this page if necessary.

- | | | |
|----------|------------|----------------------|
| Chicago | Texas | Russia |
| Arkansas | Oklahoma | California |
| Colorado | New Mexico | New York |
| Kansas | Iowa | Adirondack Mountains |





Critical Thinking Practice, SAT Preparation, and Assessment

1. The overall tone of this chapter is
- cautionary but optimistic.
 - gloomy and negative.
 - approving but pessimistic.
 - cheerful and hopeful.

Correct answer: **A**

This is a typical “tone” question where one is expected to sense the overall tone of a passage. Note how the words “but” and “and” are important in the answer choices.

A sounds good, but one must read every answer choice because one won’t know the best answer until all answer choices are read. The chapter warns the reader by saying there is not enough land and the free market won’t work, but it also mentions advanced data collection, altered crop practices, and government involvement.

B leaves out the positive actions mentioned above.

C approving of what? What has happened in the past? Of owning air space? Of our reliance on land? Pessimistic leaves out all the positive aspects. Never do the authors say the situation is hopeless.

D misses the warning in the entire chapter- that farmland is finite, and we must not lose it, as concrete doesn’t revert back to good soil quickly.

2. What is matched with the correct farmland?

- a grazing animal: rangeland
- a field of watermelons planted in rows: pasture land
- a herd of dairy cows: cropland
- a field of tomatoes: wetlands

Answer choice: **A**

This is a combination definition/fact (detail) question. Examples of each type of farmland are given on page 54.

A is correct because rangeland is open country used for grazing or hunting animals.

B Pasture land is land covered with grass for grazing animals.

C Cropland refers to fields planted in crops, such as tomatoes, watermelons, or corn.

D Wetlands aren’t farmland until they are drained, as stated in the same paragraph as the definition of farmland.

continued next page



Investigation and Internet Research

■ Look up some photographs of the Dust Bowl. Do they help show what an ecological and manmade disaster the Dust Bowl was?

■ Investigate farmland protection for your state. (Key words: farmland protection state name) Write down three facts you learned.

■ Look up the most recent Federal Farm Bill. List three facts you learned.

■ What is the smallest plot of land allowed for a new house in your county? (keywords: Zoning commission or zoning board) Is a farmer allowed to sell off ten acres?

■ What is the average price of farmland in your county? If your county has no farmland, then farmland in your state. Compare this price to a subdivision lot.



Writing Focus

1. A family has farmed the same 200 acres for 300 years. It has a 20 acre woodlot of old growth trees. The family plans to sell the trees for lumber as well as ten ten-acre lots. Should the sale be permitted? What are the benefits and negatives? What if cash is needed for medical care? What if the family no longer wishes to farm?

Answers will vary.

2. Should a farmer be forced to plant cover crops to reduce wind erosion? Or a land owner not be allowed to drain a wetland area? How much regulation is needed? If there is compensation, who pays it and at what price?

Answers will vary.

3. Explain irreversibility.

Keywords: permanent, short-term goals

3. The authors would most likely agree with which of the following statements:
- The GI bill which provided money for returning soldiers to purchase a home had a negative outcome.
 - All proposed transportation corridors should be fought.
 - Because people often only think in terms of short term gains, some government regulation is necessary.
 - Houses should only be built on plots of 10 acres or more, as this reduces the amount of concrete and saves woodlots.

Correct Answer: **C**

A Despite mentioning that suburban sprawl largely began after the GI bill of 1944, the authors never say that people should not live in subdivisions or that it was a bad bill. They are not criticizing something that allows people to own homes. Rather, they focused on the loss of prime farmland. One may think this is the right answer, but if one keeps reading...

B The authors only criticize proposed transportation corridors that lead to more undisciplined sprawl and paved-over farmland.

C This is the perfect fit, as the authors spend time talking about short term gains and how it was government intervention that helped stop practices that led to the Dustbowl.

D The authors talk about how this size lot is too small to contribute to any form of rural economy, and as they are supporting farmland preservation, it is a poor answer choice.

4. This chapter can be summed up as

- a story of colonization in the United States and how the government allocated land.
- a discussion about how we relate to land and why it matters.
- a history of wealth in the United States and how people now own airspace.
- a warning against strip malls and why people should not live in suburbs.

Answer choice: **B**

This is a main idea question. Note that it is not first, as is often the case when there is a series of questions about a passage, but it can be used to help one know if they are on the right track when understanding the chapter.

A This is too "narrow" or "small," as why colonists came for land and how the government allocated it (the Homestead Act of 1862 for example), it doesn't deal with farmland being finite and important.

B Although the key word farmland is missing, this is the correct answer. One can tell by reading the other answer choices and eliminating them. Our relationship to land matters because of the importance of farmland.

C This is a typical main idea wrong answer- if you only read the first part of the passage, one might be tempted! But the focus is not on wealth- it's on farmland.

D Once again, the point of the authors is NOT that people shouldn't live in the suburbs- it is that we must plan where we build so as to care for our farmland.

continued next page

5. One reason we are seeing an exponential increase in soil erosion and runoff is because
- planted ground cover helps to stop weeds from growing.
 - the soil acts a filtration system.
 - labor-saving technologies have been developed which allow for fewer people to farm more acres.
 - the increased intensity of rainstorms brought on by climate change.

Answer choice: **D**

A The phrase is true, but it has the opposite effect- it helps stop soil erosion. Don't get sloppy and pick an answer just because it is true!

B The phrase is true, but it doesn't explain the increase.

C The phrase is true, but despite it taking fewer people, there is nothing here about the amount of land being farmed and why there is more runoff.

D is the best answer. It is explained on page 52, but even if one did not remember, eliminating answer choices should work. It is a logical explanation that provides a specific answer to the question.

Questions for Class Discussion

Choose one or all depending on specific class needs.

- How much land does your family own compared to past generations?
- Eminent domain in the United States refers to the power of a state or the federal government to take private property for public use while requiring "just" compensation to be given to the original owner. Should farmland be taken?
- When does the free market work best? Are there some things that should be under government regulation? How about schools, fire protection, parks, farmland?
- If land was available for the taking and the Homestead Act was still active, would you try for your own 160 acres?
- Should we allow foreign countries to purchase our farmland? (Example: Saudi Arabia has land in the US southwest, irrigated by water from the Ogallala aquifer. This happens in other countries, too, with large parts of arable farmland being bought and used to produce food for countries other than what it is grown in.)

Further Advancement/ Different Teaching Modalities

- Listen to The Great Dust Storm sung by Woody Guthrie. Write a poem or song about lost farmland.
- Visit a Farmer's market and ask a vender some questions about their farmland.
- Attend a zoning meeting, or ask someone from the planning commission to speak to the class.
- Visit a state preserve.

Chapter Four



Fact Gathering and Information

Chapter Title: **1. Our Changing Climate.**

In the developed world, we depend on **2. global supply chains** for our food.

Remarkable **3. climatic stability** played a role in bringing about the first agricultural revolution.

Average global temperatures have quickly but nonuniformly **4. increased** in the last 50 years.

5. Precipitation events (incidents of rain, snow, sleet, and hail) are changing, too.

6. Earth system models predict a warmer future everywhere in the world, as well as rain, snow, and sleet falling in more **7. concentrated** events with more days between these events.

8. Climate change makes the “database” of generational and historical information less valuable.

The harvest rate, or amount of food a crop provides, is known as **9. yield**.

Hotter weather shortens the amount of time in a plant’s critical **10. “grain filling”** phase, thus leading to less harvest at the end of the season.

The amount of **11. carbon** a plant can hold changes with temperature.

As global temperatures rise, the carbon that is lost through **12. respiration** increases faster than the amount the plant can take it in.

Massive injections of carbon into our atmosphere can reduce the nutritional value of crops, as they develop with **13. lower protein concentrations**.

Although there are some short-term benefits in some places due to climate change, a fifth of the studies summarized by the Intergovernmental Panel on Climate Change predict harvest losses of over **14. 50 percent** by the end of the century.

15. Adaptation is a human advantage that some of the studies did not take into account.

Productivity falls by nearly **16. 20 percent** at 35°C (95°F).

17. Live-stock production (about one-third of agricultural gross domestic product) is also vulnerable to climate.

Fossil fuels formed millions of years ago, and when they are burned, they release **18. CO₂** (carbon dioxide) into the atmosphere.

Carbon dioxide and other **19. greenhouse gases** thicken and insulate our atmosphere, trapping heat and warming the Earth’s surface.

continued next page

RCPs or **20. representative concentration pathways** project future changes in atmospheric CO₂ amounts.

There are stark differences in the scenarios or projections because the future depends on **21. societal decisions** well outside the control of climate science.

Most greenhouse gas emissions come from **22. burning fossil fuels**.

Nearly half of emissions from the agricultural sector comes from carbon losses associated with **23. land clearing**, while a quarter of agricultural sector emissions comes from livestock (particularly cattle).

There is a need for **24. sustained climate mitigation** efforts because it is not enough to cut emissions for a few years.

Climate change is more a **25. political challenge** than a technological one.



Geography

These countries and places were mentioned in this chapter. Mark their correct locations on the map.
Print this page if necessary.

- | | | |
|---------------|----------|-----------|
| Canada | Tanzania | China |
| United States | Syria | Indonesia |
| Costa Rica | India | Brazil |
| Colombia | | |





Critical Thinking Practice, SAT Preparation, and Assessment

- The main purpose of this chapter is to
 - convince the reader that climate change is real.
 - provide an overall explanation of climate change with special attention given to consequences and agriculture.
 - discuss how poor farmers in Africa and countries with civil unrest will suffer more than those in countries with wealthy economies.
 - explain that climate change is a technological problem with dire consequences.

Answer choice: **B**

A. The authors aren't writing to convince. (Look at all first words in the answers.) They state that climate change is ongoing right now, and they discuss how it relates to agriculture, as well as its untreated consequences. It is not an opinion piece. There is no, "We believe, think, feel."

B. This fits, with no other answer choice being better, but as always, one must read every answer choice, now weighing it against this one.

C. They do discuss this, but it is only a detail (though a large one!) that fits within the discussion of climate change as a whole. It leaves out greenhouse gases, possible solutions, etc. that are all key elements.

D. One is told on page 75 that climate change is ironically more a political challenge than a technological one. Don't get tricked by the dire consequences!

- From the graph on page 73, one can tell that
 - there will be definitely be more days with temperatures over 90 degrees around the world.
 - the low emission projection for the 2050s is equal to the high emission projection of the 2080s.
 - days with temperature over 90 degrees in Indianapolis will increase greatly if emissions are high.
 - the researchers used city data because temperatures are not measured in rural areas.

Answer choice: **C**

A *Around the world* is a scope beyond the graph. This is an example of why you read answer choices carefully! Note that the phrase is at the end! Also, definitely is wrong. The graph is potential scenarios.

B The low emission for 2050 is 60. The high emission projection for the 2080s is over 100. They are not equal.

C The scope fits, and it is what the graph shows.

D Common sense tells us that temperatures are taken in rural areas, but we can't tell anything about recorded temperatures in other places besides Indianapolis.

- Why do the authors describe greenhouse gases as Earth's winter coat?
 - Just as a winter coat traps in heat and keeps us warm, so do the greenhouse gases.
 - Greenhouse gases cause large landmasses to heat up faster than islands in the ocean.



Investigation and Internet Research

■ Look up weather patterns for your area and state. How have they changed? How many hot days are you currently experiencing compared to past years?

■ Look up the Intergovernmental Panel on Climate Change (IPCC). Write down three facts.

■ The authors mention David Lobell. Do you think he is a reliable source? Give three reasons why or why not.

■ The US corn belt is mentioned. What states make up the corn belt?

■ Look up Maldives. Explain why this country is especially concerned with climate change.

■ Find maps or charts that show amounts of deforestation in Brazil, Indonesia, or another country.

■ Look up iron and zinc deficiency. List three effects or signs.

continued next page



Writing Focus

1. Explain why a small scale farmer in Tanzania might be affected more by climate change than you.

Possible keywords: no midrange forecasts, no research, no new crop varieties, no access to global food chain for other food products, lower nutrition due to stressed crops

2. Explain what might happen to the nutritional value of many crops and the consequence when there is a massive injection of carbon into our atmosphere.

Keywords: lower protein concentrations, suffer even greater deficiencies

3. Sum up Brazil's practices in the Amazon. Did they practice sustained climate mitigation efforts?

Key points: did not practice sustained climate mitigation efforts, but for some years due to incentives, cultivation production went up while emissions were reduced.

- c. Greenhouse gases reflect infrared wavelengths year-round.
- d. Clearing land is akin to taking off one's coat, and the result is more carbon in the atmosphere.

Answer choice: **A**

A Greenhouse gases thicken the atmosphere, thus increasing its insulating properties and keeping the heat in.

B This is true, but it doesn't answer the question.

C Greenhouse gases do not reflect infrared wavelengths. They absorb them! A classic "opposite" answer.

D This answer just takes little details from the chapter and puts them together without making sense. Though clearing land is mentioned in the chapter, it is not compared to taking off one's coat.

4. The authors list all but what as roadblocks to adaptation?

- a. civil conflict
- b. unequal access to new crop varieties
- c. subsidized crop insurance
- d. the withdrawal of the US from the Kyoto Protocol

Answer choice: **D**

Be careful! When one is tired or not focused, one may forget to choose the answer that is the exception!

A The authors give this example of conflict in Syria- people left one of the world's premier dryland agriculture research stations when it was destroyed due to civil unrest.

B The authors mention how it is the richer countries that develop the new drought-resistant seeds and that poorer countries account for only 3 percent of global spending on agricultural research.

C This is the first example on page 60. If one knows one's crop is insured (and subsidized- meaning that part of the cost is paid for by the government), why adapt?

D This is mentioned (page 76), but not as an example of a roadblock to adaptation.

5. What might one do to help chart an alternative, low-emissions future?

- a. Vote for leaders who enact policy change.
- b. Insist that every country develop new crop varieties.
- c. Start planting tomatoes in sandier soils.
- d. Fight incentive-driven land-based mitigation policies.

Answer choice: **A**

A Yes, it fits, but read all the answer choices, comparing its worth to this one.

B The authors stress that it is a global problem, and if that is case, richer countries may have to help out poorer countries that might not have the resources to develop new crop varieties.

C One would do this only if the soil one is currently planting tomatoes in is becoming drenched to the point where the tomatoes are rotting. It also doesn't really deal with helping chart an alternative, low-emission future.

D The authors want you to do the opposite, as research has shown (page 75) that if these policies were implemented on a global scale, the average farmer in the US would experience a real income gain.

Questions for Class Discussion

Choose one or all depending on specific class needs.

- Travis Mills, the fourth quadruple amputee service member moved from Texas to Maine. Why? (Hint: think about how pigs and chickens cool off) (Too difficult to dissipate heat and stay cool in Texas, dangerous risk of overheating)
- What's the hottest weather you've ever experienced? Were you lethargic? At what temperature are you most productive?
- Should the US start regulating and forcing lower greenhouse emissions even if other countries don't? By how much?
- Why do the authors write that agriculture is one of the industries most exposed and vulnerable to climate change?
- Should people eat less meat? If so, what kind? We have special taxes on cigarettes; should we have special greenhouse taxes for beef?
- Does the US and other industrialized countries have the right to say to poorer countries that they can't practice deforestation? How would you convince someone or a country not to engage in the practice?
- Why do you think so many people actively deny climate change? How could you convince them of one way or the other?

Further Advancement/ Different Teaching Modalities

- Have half the class wear white T-shirts, the other half black. Have them sit outside for five minutes or where the sun is shining in (or run a lap). Who gets the warmest? Now ask them if the Earth will get warmer at a faster rate as the snowcaps melt.
- Make a poster explaining the greenhouse effect.
- Sit in a greenhouse and feel the trapped heat!
- As a class, fill in a carbon footprint calculator on line.
- Contact your senator and representative. Ask what they are doing in preparation for climate change.

Chapter Five



Fact Gathering and Information

Chapter Title: **1. The Technology Ticket.**

One reason we have avoided the Malthusian trap is **2. agricultural revolutions.**

The first agricultural revolution came with people transitioned from hunting and gathering to **3. settled communities** around agriculture.

The second agricultural revolution came about due to discoveries from plant sciences, chemistry, engineering, and genetics that generated **4. innovations and technologies.**

The third revolution, known as the **5. Green Revolution**, reduced people experiencing hunger from a billion to 795 million.

The dire prophecies preceding both the second and third agricultural revolutions were stopped by **6. technological advances.**

Liebig and Sprengel showed that plants need **7. mineral nutrition.**

They also argued that plant growth is mainly controlled by the scarcest mineral resource, or the **8. law of the minimum.**

Using fertilizer was a great leap forward. After the initial demand was met locally by using human and animal manure, ash, and, bones, **9. manure or guano** was imported from overseas.

As natural sources of minerals declined, artificial **10. synthesized fertilizers** were developed, as well as synthetic **11. chemical pesticides.**

With the understanding of genetics and the passing down of traits, plant breeders developed **12. hybrid** varieties.

Farm labor is costly, and so when **13. farm machines and tractors** were invented, farmers were eager to use them.

The **14. Green Revolution** was not centered around the environment, but rather expanding agricultural production.

After World War I and II, the solution to avoiding catastrophic famine was a **15. modernization of the agricultural** sector.

In poor and undeveloped countries where yields per piece of land were not increasing due to new technologies not being used, farmers expanded **16. cropland** by cutting down forests.

Because of specific conditions in Africa and a diverse staple crop, local hybrids still need to be **17. developed.**

Most of the early beneficiaries of the Green Revolution technologies were **18. large-scale farmers.**

continued next page

When developing “silver bullet” pesticides like DDT, one must watch out for unknown toxicity as well as creating **19. “super-pests.”**

Due to the nutrient-rich **20. runoff**, overfertilizing and improper fertilizer application by farmers as well as homeowners with lawns can result in water pollution and algae growth.

Doing away with modern agriculture and going all “organic” would prompt widespread **21. famine and massive food shortages.**

22. **Precision agriculture** allows a farmer to target specific fertilizer and pesticide needs even within a single field.

23. **Nanotechnology** can improve how fertilizers and pesticides are released.

GE, or **24. genetically engineered crops** can reduce pesticide usage, be more drought resistant, and have enhanced nutritional value.

In order to make the green revolution greener (protecting our environment and growing food sustainably) we must **25. innovate.**



Geography

These countries were mentioned in this chapter. Mark their correct locations on the map.

Print this page if necessary.

- | | | |
|-------------|-----------------|-----------|
| Peru | Bangladesh | Nepal |
| Chile | Burma (Myanmar) | Pakistan |
| Philippines | India | Sri Lanka |
| Mexico | Indonesia | Thailand |





Critical Thinking Practice, SAT Preparation, and Assessment

1. The author writes that in 2005, there were 63,000 square miles of lawns in the United States. The author also says this is the same size as the state of Texas. The author does this because he wants the reader to
 - a. realize that agricultural practices are contributing to hypoxia and chemical pollution of the environment.
 - b. grasp how serious the fertilizer runoff problem is, especially as the water goes directly into storm drains and bodies of water.
 - c. understand that part of the solution to making a greener green revolution may lie in developing drought resistant grass.
 - d. be amazed at how much land is not being used for crops, especially as there are people lacking proper nutrition.

Answer choice: **B**

A Although agricultural practices are contributing to hypoxia (overgrowth of algae which depletes the oxygen, thereby suffocating all marine life) and chemical pollution of the environment, the author is talking about lawn size, not agricultural practices.

B Texas is huge! So, if all the lawns add up to this huge mass, then all the little lawns add up to a big problem. The runoff from an area this size is enormous, and, as the author points out, straight into storm drains and bodies of water.

C He mentions the development of drought resistant crops, but when he mentions lawns, it is in the context of runoff and agricultural practices not being all to blame.

D One may be amazed that lawns add up to the size of Texas, but he doesn't mention it to make you think of converting it to crop size. Instead, he writes about how lawns are overfertilized and have excess herbicides and insecticides, again making the runoff a serious problem- one that you personally can have an effect on!

2. When Cyrus McCormick got a medal at the 1851 London World Fair it was because his machine
 - a. used precision agriculture.
 - b. made farming more efficient.
 - c. did not require animals to pull it.
 - d. was the first to use nanotechnology.

Answer choice: **B**

A Even if one has no recollection of who Cyrus McCormick (page 82) was or what his machine (a reaper that combined both mowing and threshing) did, the year 1851 should key one in that answers A and D can be eliminated, as those two techniques were part of the technology ticket for the future.

B Yes, it did, but one still needs to read all the answer choices to make sure this is the best fit, as it is never explicitly stated in the book why he got the medal (though it does state immediately before that early farm machines made farming more efficient).



Investigation and Internet Research

■ Many different foods and grains were mentioned in this chapter. Do you know what they look like? Find pictures of the plants as well as what they are harvested for: millet, sorghum, cassava, yam, and cowpeas. Which ones have you tasted? Seen for sale?

■ Find pictures of Cyrus McCormick's reaper, as well as a modern tractor and combine. What does a combine do? What is the price of a combine today? Was the cost in your expected price range?

■ Look up the International Maize and Wheat Improvement Center that was mentioned on page 85. Write down five facts about it that you found interesting.

■ Find information about corn, Vitamin A, and preventing blindness. Is corn high in Vitamin A a GE crop?

■ Find images of people harvesting guano as well as some facts about worker conditions. Write down three things that you found interesting.

■ Look up DDT. Why was it banned?

continued next page



Writing Focus

1. How did education change the life of the chapter's author?

Keywords: father, agronomist, scholarship

2. Explain the benefits of precision agriculture. Why isn't it adopted by every farmer?

Keywords: targeted approach, precise chemical, water, and fertilizer amount; cost, requires technological infrastructure

3. Do the math! How many less people experienced hunger when the amount of people was reduced from one billion to 795 million? Write out the equation (with numbers) that shows how you got your answer.

Calculation: $1,000,000,000 - 795,000,000 = 205,000,000$

C The reader is told that early farm machines combined activities into one process, and that the reaper combined both mowing and threshing. A few sentences after the reader is told McCormick got a medal, one is told that next came the self-propelled combine and the tractor.

D Nanotechnology is still being developed today.

3. When the author says that we must innovate, he means

- we must find alternative food sources.
- we must study the previous agricultural revolutions.
- we must make changes, especially by introducing new methods or inventions.
- we must develop hybrid rice for Asian countries.

Answer choice: **C**

This is a definition question, and even if one is unaware of what innovate means (make changes in something established, especially by introducing new methods, ideas, or products), one can hopefully eliminate answer choices.

A Alternative food sources makes it sound like we need to eat something completely different. The author focused on improving technology, getting more out of our land and seeds rather than changing our diet. He doesn't mention brand new foods.

B Although he talks about past revolutions, he only brings up the past to show how we have advanced, and that is always by new methods and inventions.

C After discussing all kinds of old and new technology, this is what the author says we need to do.

D The author discusses developing hybrid rice for Asian countries as a success story. It has already been done (page 85). In fact, the author says that local hybrids are mostly needed in poor African countries.

4. What is not true about organically grown crops?

- In general, yields from organic farms are lower than those from conventional farms.
- Organically grown food commands a premium price in the market.
- Regular households would not suffer as prices would decrease as supply increased.
- More natural lands would have to be converted to agricultural lands in order to maintain the food supply.

Answer Choice: **C**

A This is true, so don't get lazy and choose it! You're looking for the one that isn't true! Yields from organic farms are 8 to 25 percent lower.

B This is true, and we want what is not true.

C Regular households would suffer, as they are already spending most of their income on food, and as stated in answer choice B, prices would go up. Also, as the supply would be less, prices would increase, thus hurting them further.

D This is true, and think of the ecological damage that comes from clearing forests, as well as the increased cost in farmland.

Note that the author is not speaking against organically grown crops or farms. There is a market for what they produce. He is pointing out that we cannot rely solely on organic.

continued next page

5. The author's primary purpose in writing this chapter was to
- insure that the reader understands what a green revolution is.
 - develop a timeline of the discovery, application, and development of synthesized fertilizer.
 - convince the reader that genetically engineered crops are a sustainable solution.
 - provide a broad history of agricultural revolutions and how the next one might progress.

Answer Choice: **D**

Hint: Look at the first words: insure, develop, convince, provide.

A Although the author wants the reader to understand what a green revolution is, the author does much more, explaining all the revolutions and how technology is going to be part of it. Think of the chapter title!

B Once again, although fertilizer is discussed, it is only in context of how it fits in all the agricultural revolutions.

C People fall for "emotional" answers. Genetically engineered crops are getting a lot of bad and good press, and if one feels powerfully about the issue, one may fall for an answer that was written to purposefully draw them in without thinking critically about the answer. Although the author feels they are needed and part of the revolution, convincing the reader of how great they were was not his primary purpose.

D The author hopes and wants the green revolution to become greener. He provides technological ways it can happen, after he goes through the earlier revolutions and the technology that helped them advance.

Questions for Class Discussion

Choose one or all depending on specific class needs.

- McCormick got a medal for his reaper. What recent invention do you think deserves a medal? What recent invention saves the most time or labor?
- Are you willing to reduce your lawn size? Should states or any government regulate lawn size?
- How do you feel about GE crops? Aren't all crops GE in a way, as plants have been bred since humans changed to an agricultural society? What about crops that have been tweaked to have higher vitamin or mineral levels? To be resistant to certain pesticides or herbicides?
- Some African leaders rejected maize food aid from GE crops, despite the fact that it meant millions would go hungry and famine would follow. What is your initial reaction upon hearing this? And after hearing this: Some leaders thought it was poison, others were worried that if planted, it would cross with their local crops, forming a hybrid and then they could no longer export their own crops. And after hearing this: One solution was to _____? (grind the maize before donating it).
- How do you think drones will help farmers?
- What food colors are you most comfortable with? Would you eat blue beans?
- Imagine in the future, with GE crops, something can be added so that no one longer suffers from iron deficiencies or is a cancer inhibitor. Is this worth pursuing?

Further Advancement/ Different Teaching Modalities

- Write a skit encouraging people to eat yellow corn (use information collected while doing internet research).
- Perform an experiment where you take strawberries, cherries, apples, or whatever is around (or even a picture), and mark one as organic. Show them both, with a set price. Then continue raising the price of the one labeled as organic. How much more, if any amount, are people willing to pay for the one marked organic?
- Bring in items made from some of the foods listed in the chapter (millet, sorghum, cassava, yam, and cowpeas) and taste!

Chapter Six



Fact Gathering and Information

Chapter Title: **1. Systems.**

2. Supply chains are complex systems.

When getting food from farm to fork, the challenge today is finding space in our supply chains that respect one's preferences, needs, circumstances, and the **3. environment.**

The supply chain starts with **4. inputs**, such as fertilizer, seeds, and equipment.

Standard farm crop and livestock products are referred to as **5. commodities**, which the farmer sells to processors and handlers who transform them into food products, which are then sold to the **6. retailer** or food supplier.

Today, due to an increased demand for unique or differentiated products, some features have to be developed **7. before** the processing stage.

The concentration in the food distribution industry is so high that a small set of **8. procurement managers** have an outsized influence over our food supply.

9. Traditional attributes are nutritional content, taste, texture, affordability, and safety.

10. Credence attributes, such as antibiotic free, certified organic, food miles, carbon footprint, welfare production practices, etc., are unseen.

In order to document credence attributes, **11. tracking and tracing** systems must be in place.

12. Margin is the extra amount of money we will pay for the credence attributes we value.

The **13. United States Department of Agriculture** (USDA) created a National Farmers Market Directory.

Even though a farmer may get a premium price at a farmer's market, they may not find it worthwhile to sell there due to the cost of packaging, delivering, and **14. time** spent selling.

15. Community Supported Agriculture (CSA) programs are direct sale programs that connect farms and producers to a customer base.

16. Conventional agriculture delivers the cheapest, most secure, and most abundant food supply in the history of humankind.

The large volume of (six items) **17. corn, soybean, wheat, milk, live cattle, and lean hogs** form the basis of much of the US diet.

Conventional agriculture has freed up large swaths of the population to accomplish goals apart from meeting our **18. caloric needs.**

continued next page

Conventional agriculture is less physically taxing and allows us to spend **19. less** on our food.

Planting **20. cover crops** to prevent erosion and promote soil organic carbon are a sustainable change, but they are costly and the benefits can take years to accrue.

When we buy our food, the price we pay seldom reflects the **21. external costs** to the environment or humankind that may be incurred in the production and processing.

Organic sounds sustainable, but without using herbicides, weed control may disturb the soil and release a **22. greenhouse gas**.

23. Controlled-environment agriculture (CEA) grows food in indoor set-ups, and often close to cities.

While the potential profit of CEA farms can be high, the operations are **24. capital intensive**, start-up costs are high, and there is a lot of risk.

Each system- organic, local, or conventional- has a cost, but we must come to an agreement on what we need for the **25. sustainability** of our food systems.



Geography

There are no countries to find for this chapter, but you are not off the hook!

Below or on a separate sheet of paper, put an X in the center of the page to mark your location. Next, look up where the closest ten McDonalds restaurants are. Mark them with circles, placing them in their relative location. Finally, look up the closest Farmer's market or nearest place to local food access. (Use the Local Food Directory.) Mark that (those) location(s) with a square.



Investigation and Internet Research

- Look up #2 yellow corn. Write down two facts.
- Go to the USDA website. Write down who founded it and one other fact you find interesting.
- Look up the product Soylent (it is a drink.) Does its supply chain involve farmers? Has its supply chain ever been interrupted?
- Look up an explanation for Futures Market. Would you be interested in being a trader?
- Look up images of AeroFarms.



Critical Thinking Practice, SAT Preparation, and Assessment

1. What attributes are matched correctly?
 - a. traditional: carbon footprint; credence: color
 - b. traditional: size; credence: texture
 - c. traditional: affordability; credence: antibiotic free
 - d. traditional: food miles; credence: certified organic

Answer Choice: **C**

This is a detail question. Traditional attributes are things such as nutritional content, color, size, shape, taste, texture, affordability, and safety. Credence attributes can't be directly observed. Antibiotic free, certified organic, food miles, carbon footprint, locally grown, animal welfare production practices, and sustainable production are all credence attributes.

On this type of question, both traditional and credence attributes must be correct for the answer to be correct. If looking first at traditional, one could eliminate **A** and **D**.

2. When McDonalds decides to source chicken that is raised without antibiotics that are important to human medicine, the entire food chain reacts because
 - a. McDonalds controls a large amount of food sold in the fast food segment.
 - b. McDonalds is not a chain restaurant.
 - c. McDonalds favors egg suppliers using alternative housing systems.
 - d. McDonalds will lose customers due to the need to increase prices.

Answer choice: **A**

A McDonalds and Yum! Brands Inc. control more than 25 percent of all food sold in the fast food restaurant segment, so any action McDonalds takes is going to affect the entire supply chain. Producers will have to change their practices.

B Easy elimination! This is not true!

C This has nothing to do with the question topic.

D We don't know if McDonalds will have to raise prices, or even if they will have to pay producers more. We just know that because they buy so much, they can "command" certain practices.

3. The overall tone of this chapter is
 - a. biased toward anti-biotic free livestock.
 - b. dismissive of tracking systems.
 - c. encouraging to chemical-free producers.
 - d. respectful of all systems.

Answer Choice: **D**

One needs to look for the overall tone- not how one specific topic is addressed. Look at the first words: biased, dismissive, encouraging, respectful. These words make answer choices A and B very weak.

A One may want (or not) anti-biotic free livestock, but the authors only mention it as one part of a McDonalds' supply chain.

continued next page

B They are not dismissive. Rather, they say that they are needed unless we are just going to trust uncertified labels or what people tell us.

C This answer is too narrow of a scope, as they do much more than deal with chemical-free producers.

D The authors take great care in explaining all supply chains, even those that don't feed many people, as they are interested in sustainability, met needs, and choice.

4. #2 Yellow corn is grown because

- the farmer can use the most efficient techniques at hand to grow as much food as is profitable per square foot of land.
- it can be grown without using herbicides and thus has a lower impact on the environment.
- it has been genetically modified to produce a higher protein content.
- buyers can choose the producer offering the corn at the lower price.

Answer choice: **A**

A 90 million acres of field dedicated to this corn! And, with a single crop, the farmer can do exactly what the answer says.

B We are never told how much herbicide has to be used for this type of corn over any other.

C We don't know this, but if one thinks about the ongoing controversy about genetically modified crops, it is very unlikely.

D This is the hardest one to eliminate because it is true, but buyers can only choose the producer offering the corn at the lower price because farmers decided to grow the corn in the first place. Farmers don't plant it to get the lowest price! They plant it because they know they can sell it, and they can produce it in an efficient manner.

5. Refer to the graph on page 105 for this question. Most likely, the reason for the number 155 is

- controlled-environment agriculture.
- conventional agriculture.
- organic agriculture.
- community supported agriculture.

Answer Choice: **B**

The authors have facts and figures to back them up that due to conventional agriculture our calorie needs are being met. This is a graph question (can you find the figure 155 and understand that it is people being fed, and that number is very high compared to the other numbers), but it is also checking reading comprehension- did the student understand the terms defined and explained?

A This would be hydroponic or vertical indoor systems.

B This is the huge fields of corn, soybeans, or wheat.

C This would be without pesticides or herbicides so labor intensive.

D This would be programs where communities are connected to producers.



Writing Focus

1. How do you think online shopping will affect locally grown or produced food? (There is no right or wrong answer here, but you have to explain your reasoning.)

Answers will vary.

2. You're the mayor. A CEA wants to move into an abandoned building. Do you give them a tax break to start? Defend your answer.

Possible keywords: employment, waste

3. Explain how aviary houses are an example of the complexities we face with respect to the design of our food system.

Possible keywords: unexpected consequences

Further Advancement/ Different Teaching Modalities

- Have students interview a manager at a grocery store or restaurant. Ask them where they procure their food.
- Investigate the supply chain for your school cafeteria.
- Make a poster about antibiotic resistance from the farm to the table (the CDC has information about this, as does other internet sites.)

Questions for Class Discussion

Choose one or all depending on specific class needs.

- Have you ever been to a Farmer's market? Would you pay more for a locally grown apple (or other food item)?
- Do you think food products should be required to have tracking labels and places or origin? How about if it is bacon- A US hog, but processed in another country? Or a tomato grown in another country but processed in the US? Is the tracking system worth the added cost to the food?
- Should food products have to have labels about how much plastic went into packaging them?
- Would students at your school want to plant a garden for produce to be used in the cafeteria? Is it worth the work hours when it is very easy to buy one's meal?

Chapter Seven



Fact Gathering and Information

Chapter Title: **1. Tangled Trade.**

123 countries established the **2. World Trade Organization** (WTO) in 1995.

The Global Trade Analysis Project (GTAP) measures the impact of international trade agreements on (4 items) **3. imports, exports, employment, and economic welfare.**

GTAP showed that for most countries, the **4. expected gains** would be large enough to offset the likely losses.

The increased **5. interdependence** that has come from global trade has increased our standard of living.

The Nobel Peace Prize was awarded to Cordell Hull, who argues that countries trading with one another are **6. less inclined to go to war.**

In the case of the **7. North American Free Trade Agreement** (NAFTA), US corn producers were winners, but the opposite occurred in the case of manufacturing.

Although global trade may have some negative consequences, we need it to ensure **8. global food security.**

Statistics on (2 items) **9. exports and imports** help us measure the importance of international trade.

In 2011, nearly **10. one-third** of US crops were exported, an amount that is far more than any other broad sector of the American economy.

According to George Box, the Simplified International Model of agricultural Price Land (SIMPLE) model may be wrong but **11. useful.**

The tripling of global crop output from 1961 to 2006 was unprecedented and due to three important forces: **12. growth in population, technology, and income growth.**

The projected growth in global crop output from 2006 to 2050 is expected to be only half as fast due to **13. population growth.**

It is estimated that by the mid twenty-first century, for the first time in history, **14. income growth** will become a more important driver of global food demand than population.

15. Agricultural producers are protected in many countries due to the reluctance to rely excessively on imports and to ensure adequate food during times of war and shortage.

Instead of being taxed, producers are provided with **16. subsidies.**

Once a country has begun subsidizing its farm sector, the next step is to **17. limit agricultural imports.**

continued next page

The importance of **18. international trade agreements** cannot be overemphasized because they are the only factors pushing back against the natural tendency to restrict farming imports and freeze the current pattern of production.

The **19. Tarriff Rate Quota** (TRQ) system is a means of regulating trade while avoiding the use of import quotas.

With TRQs, when a certain level of “in-quota” imports is reached, the **20. tariff** (a tax or duty to be paid on a particular class of imports or exports) jumps to a higher level.

Agricultural production is different from producing specialized manufactured goods because it requires (two items) **21. suitable land and climate**.

22. Trade gives us an important buffer against unforeseen weather events.

Without ways to stop **23. counterproductive trade policies**, the world is in for a rough ride in an era of increasing crop supply shocks due to climate volatility.

We need **24. flexibility** in our labor markets.

This means we must invest in **25. people** by providing training for new jobs and investing in our education system.



Geography

When the WTO became established, 123 countries came to agreement around international trade. Without looking at any resources, try to fill in 123 country names on the map, regardless of whether they are part of the WTO or not. *Print this page if necessary.*

To start, and as a hint, you can find and mark these countries mentioned in the chapter:

Switzerland	Mexico	Korea	Brazil
Uruguay	Mozambique	New Zealand	India
Japan	Canada	Vietnam	Australia
China			

How close to 123 did you get? _____





Investigation and Internet Research

■ Go to the WTO website. How many countries are in the WTO today? Write down two other facts you find interesting.

■ List some tariffs the US (or your home country for those students reading this book outside of the US!) have imposed over the years or currently. Can you find out when the first tariff was set?

■ You go to a foreign country and buy 1,000 dollars worth of goods to bring back for personal use as well as gifts for other people. Do you have to pay a tariff or a duty tax when you return to the US? (Hint: To start, go the US Department of Homeland Security, US Customs and Border Protection website and type in Customs Duty Information.)

■ Find out when Congress enacted the first tariff against foreign produced sugar.



Critical Thinking Practice, SAT Preparation, and Assessment

1. What is not an example of agricultural protectionism?
 - a. banning rice imports
 - b. disallowing imports of GMOs (genetically modified organisms)
 - c. high tariffs on sugar imports
 - d. accepting food aid

Answer choice: **D**

Watch the not!

A, B, and **C** are examples of agricultural protectionism provided in the book on page 124.

D is the only answer where one is accepting something without any kind of restriction.

2. Most likely, in 2050, the author feels that the circle graph on page 123
 - a. will remain the same.
 - b. will show Asia having 52% of the current share of international crop purchases.
 - c. will show Canada and the US decreasing their international crop purchases down to less than 1%.
 - d. will show Africa having 28% of the current share of international crop purchases.

Answer choice: **D**

This is a detail question combined with a reading and interpreting graph question. The detail is in the sentence, located right above the heading Trade Policy in Crisis. It says, In short, we might think of Africa in 2050 as the East Asia of today- at least when it comes to agricultural imports.

A Might be eliminated just knowing that things may change over time, and 2050 is many years in the future.

B One is told that due to population growth, Europe and China (where the rate is slowing) are unlikely to be buying a lot more crops in the future than they do today.

C One may think this with all the discussion about trade wars and tariffs, but it is very unlikely that any country will ever go down to less than 1%. How we will get cherries and other seasonal fruits all year round?

D This is a close fit and compared to the other answers, the best response.

3. The main purpose of this chapter was to
 - a. discuss benefits of international trade.
 - b. explain how and why the WTO started.
 - c. show support for tariffs and quotas.
 - d. convince the reader that trade is very contentious.

Answer choice: **A**

Start with the first words: discuss, explain, show support, convince. The chapter is not written in an argumentative style, so one should be cautious about answer choice **D** even before reading the answer choices.

continued next page

A The author does this, mentioning the Nobel Prize winner, how it is a buffer due to climatic variability, etc. Still, one MUST continue to read, as there might be a better answer choice.

B The chapter starts with this, but the WTO was set up for international trade, and that is mainly what the chapter is about. If it was about the WTO, we would know rules, regulations, how it is staffed, etc. We wouldn't have all the discussion about tariffs, quotas, subsidies, and weather.

C Tariffs and quotas are explained, but the author points out how at times they impede trade and how some may provide immediate benefits but are quite damaging in the long run.

D This is a line right out of the book, but convincing one of it is not the main purpose of the chapter. The reader is told several times that international trade provides benefits. That trade is very contentious is presented as a fact, not as an argument that needs to be supported.

4. Why does the author suggest that divorcing health care and retirement benefits from employment might make workers more flexible?
- When people are divorced, they often find themselves with less income.
 - Companies have trouble finding workers when they offer good retirement benefits.
 - Workers would have less fear of switching jobs because they would not lose critical benefits.
 - Universal health care is already in place, so companies no longer need to offer it.

Answer choice: **C**

This question isn't that hard, but it is heavy on words. The weary student may not want to weigh through all the text, but they should! They must!

A This may be true (or not), but it doesn't answer the question. The use of the word divorced was only to trip up the careless reader. The question is not about individuals who are divorced. It is about separating healthcare and retirement benefits from employment.

B The opposite is true. Companies with attractive retirement packages are more likely to get employees who do not want to leave and risk the loss of their benefits. This means that the workers are less likely to be willing to adapt, be retrained, and find new employment, even as one can see the industry dying, or going under due to volatile climate changes.

C True. The author writes that creating a safeguard so benefits move with workers when they change jobs is not only a valuable safety net but also increases the speed with which workers can adjust.

D Think for a moment- would you be more likely today to work for a company that offers medical benefits as opposed to one that didn't? Is there good medical care available to everyone right now, no matter their circumstances?



Writing Focus

1. Explain farm subsidies. What are they? Why and how did they start?

Keywords: protecting agricultural producers; commercialized agriculture brings shift from taxing farmer to subsidizing.

2. Why, in the case of processed food, has potential trade been supplanted by foreign direct investment?

Keywords: (page 119) import raw, but produce in domestic facilities to avoid shipping and adapt to local preferences

3. Do you think the US should be part of the WTO? There is no right answer, as it is your opinion, but you must defend your answer.

Answers will vary.

Further Advancement/ Different Teaching Modalities

■ Find ten different items that were imported- food or manufactured that you are wearing, recently ate, or are using.

■ How flexible are you? Go one day without dairy (includes food items containing!), meat, or items made with (pick one) corn, rice, or flour. How difficult was it to compensate?

■ Draw on a map an ancient trade route, making sure to have an informative title.

5. Why aren't Thomas Friedman's words, "the world economy is flat," completely true when it comes to the global agricultural economy?
- Agriculture production requires suitable land and climate, factors that cannot themselves be produced.
 - No countries are dominant when it comes to agricultural production.
 - Severe weather events can create major crop losses.
 - The world economy is highly competitive when it comes to specialized manufactured goods.

Answer choice: **A**

A A country with little arable land cannot be as competitive in agriculture production than a country with great land mass and rich soils. Common sense, as well as stated in the book. An excellent answer, but one must keep reading!

B This is not true. We know very well that Greenland is not a big producer of corn, wheat, and soybeans! Also, the words seem to support "the world is flat," and we are asked to find out why the words aren't completely true when it comes to agricultural production.

C This is true, but how does this show that "the world economy is flat" isn't completely true when it comes to global agricultural policy? The tired student may think, "This is true," and mark it as correct even though it does not answer the question.

D This fits exactly "the world economy is flat," but specialized manufactured goods are things like cell phones, not agricultural products.

Questions for Class Discussion

Choose one or all depending on specific class needs.

■ When discussing the statistician George Box, the author writes that the pithy observation "all models are wrong" is followed by "some models are useful."

- What do you think the word pithy means? (concise, forcefully expressive, compact)
- What do you think about both his comments?

■ Who do you think supports NAFTA most: farmers or manufacturers? Why? What politicians from what states do you think voted for it?

■ How did you feel when you read that a person in Mozambique puts less burden on global food production than a person in Indiana?

■ How does a government show that it values its people?

■ How are most people employed in your area? Will they be able to adapt if change happens?

Chapter Eight



Fact Gathering and Information

Chapter Title: **1. Spoiled, Rotten, and Left Behind.**

The long and complex **2. supply chain** starts from when the farmer plants the seed or breeds livestock to when a person takes a bite out of food.

3. Harvest loss is when loss occurs from planting time up to and through harvest time.

4. Postharvest loss is when there is food loss along the storage, processing, and transportation part of the supply chain.

Harvest loss and postharvest loss make up the entirety of **5. food loss**.

Food loss occurs in the **6. beginning and middle** of the supply chain.

7. Food waste happens at the end of the supply chain

8. The Environmental Protection Agency (EPA) estimates that food waste in the US is the largest single component going to municipal landfills.

In 2010, the year's worth of calories from food waste in the US amounted to enough calories to feed more than **9. 70 billion people** for a day and had a purchase value of \$162 billion.

Not all food should be **10. salvaged**.

To be **11. food insecure** means that a household faced difficulty at some time during the year in providing enough food for all household members.

Developed countries experience a higher prevalence of food waste, whereas developing, poorer countries suffer more from **12. food loss**.

A general attitude is related toward food waste, but access to **13. technology** is related to food loss.

Higher-quality harvesting, better transportation systems, and more effective storage systems means less food loss during **14. harvest and postharvest periods**.

We must become aware of the food waste and then intend to do something about it because we are far, far above the **15. optimal amount** of food waste.

Unlike the dates for infant formula, many sell and use by food dates are not **16. required**; the sell by date is set by food manufacturers as a guide to retailers.

Some GMO crops- the FLAVRS AVR tomato, for example- can reduce food waste, as they have a gene inserted that stops production of an **17. enzyme** that causes the tomato to soften and rot.

continued next page

In **18. commercial-scale agriculture**, the nonuniform “ugly” produce can be processed into juice and jam.

Retailers donating to foodbanks may get a **19. tax benefit**.

Composting is a **20. scalable technology**, meaning it has the potential to handle a growing amount of work.

When farmers don’t have access to storage technologies, they can sell their crop for a low price at harvest or store it and suffer huge losses due to **21. insects and mold**.

All over the developing world, losses to insects range from **22. 30 to 50 percent**.

23. Hermetic storage means airtight storage.

A **24. Purdue Improved Crop Storage** (PICS) bag is a triple-layer heavy plastic bag that can be squeezed down to whatever amount is available.

When one thinks of the effort and depletion of soil and water that goes into farming, one can see that food waste and food loss harms the **25. environment**.



Geography

These countries were mentioned in this chapter. Mark their correct locations on the map.

Print this page if necessary.

United States	India
Canada	Mali
Australia	Ethiopia
New Zealand	Democratic Republic of the Congo

Mark with an X the 4 countries most likely to suffer food loss rather than experience food waste.

Countries most likely to suffer food loss rather than experience food waste:

- India
- Mali
- Ethiopia
- Democratic Republic of the Congo





Investigation and Internet Research

- Look up a PICS bag demonstration from Uganda on YouTube.
- Look up FSIS and find information about food product dating. Write down three things you find new or interesting.
- Look up some images of misshapen fruits or vegetables. Would you buy them? Feel comfortable eating them?
- Look up the food digester in Yaphank, New York. Write down three pieces of information about it.



Critical Thinking Practice, SAT Preparation, and Assessment

1. What is an example of food waste?
 - a. a discarded half-eaten orange
 - b. corn dropped by the harvester
 - c. lettuce rotted due to a faulty refrigerator truck
 - d. wheat eaten by locusts

Answer choice: **A**

Food loss is harvest and postharvest losses, and it is what happens when food is lost along the supply chain and before it hits the dinner table. Food waste comes after it reaches your dinner table. Only answer choice **A** fits this requirement, as **B**, **C**, and **D** all happen before the food hits the dinner table.

2. The main idea of this chapter is to
 - a. define food loss and food waste by providing examples.
 - b. discuss a solution to food waste.
 - c. explain what happens to uneaten food and potential ways to deal with it.
 - d. argue that with less food spoilage there will be no food insecurity.

Answer choice: **C**

A is too small. It focuses on just the first part of the chapter. In addition, the word define doesn't really fit. The chapter discusses and explains (first words from the answer choices B and C).

B is too small, too, though this time it focuses on the last part of the chapter.

C Takes what both A and B have to offer.

D The tone of the chapter is informative rather than argumentative. Also, we are never told if the amount rotting would be enough to satisfy the world's needs. (And by now you should know that there a huge number of factors that comes into this, including as clearly stated in this chapter, the role of geography and technology.)

3. Why is hermetic storage so important?
 - a. It prevents harvest loss.
 - b. Insects can't get in, and those that are in are asphyxiated.
 - c. It increases the rate food can be composted.
 - d. It allows the farmer to sell his grain at harvest time.

Answer choice: **B**

A Harvest loss comes during planting and harvesting. Storage comes after harvesting.

B No other answer fits as correctly and as perfectly as this one. It is right out of the book.

C Composting occurs with food that has been discarded, and hermetic storage helps the farmer keep his crop from being eaten.

D. A farmer uses hermetic storage so he doesn't have to sell his crop at harvest time when prices are at their lowest.

continued next page

4. When looking at the graph on page 137, one can see that in the supply chain,
- South and Southeast Asia suffer a far greater food loss during distribution than does North America and Oceania.
 - North America and Oceania have a far greater amount of food waste than South and Southeast Asia.
 - South and Southeast Asia suffer a smaller percentage of food loss during storage than do North America and Oceania.
 - North America and Oceania suffer equal amounts of food waste when adds ag production and storage losses together.

Answer choice: **B**

Take time to understand the graph! Black bars are SSEA- South and Southeast Asia. Grey bars are NAO- North America and Oceania.

A is incorrect. Distribution is the only time in the supply chain when the percentage of food loss is about the same.

B is correct. North America and Oceania have a whopping almost 40% of food waste compared to the 10% that South and Southeast Asia has.

C is incorrect because storage is where the greatest percentage of food loss occurs for South and Southeast Asia. One might know this because of the talk later in the chapter about hermetic storage, PICS bags, etc.

D Don't bother to add them! The black bar is higher on both, so how can they come out equal?

5. What is it about PICS bag that makes it scalable?
- The bag has a triple-layer of heavy plastic.
 - The bag can hold up to 100 kilograms of cowpeas.
 - The bag is like a composter in that it is used for digesting food.
 - The bag can be squeezed down so that it fits exactly the amount of available crop needing to be stored.

Answer choice: **D**

This may be a hard question for those who don't remember how scalable was used in the chapter. A scalable technology is one that can be decreased or increased according to need. A huge combine cannot be made smaller! A composting bin or a PICS ban can be altered to fit. Even if one is unsure, one should read all the answer choices and work on eliminating answers.

Information in the book about the PICS bag is on page 146.

A. Yes, this is true, but so is Answer choice B. If A, why not B? Keep reading!

C is just wrong. PICS bags are used for storage, not digesting food!

D fits exactly! In the book it says, "The beauty of the PICS bag is that, like the home composter, it is scalable. One can make the container as big as the equipment available to handle it or as small as is needed.



Writing Focus

1. Describe the FLAVRSAVR tomato and then tell if you think it should be served in school cafeterias around the United States. Your decision to serve or not will not be wrong, but you must defend your reasoning.

Keywords: gene inserted, enzyme

2. Explain what the author meant when he wrote, "The end result is that those who need the food the most will lose it. And those who have it, will waste it."

Keywords: food waste, food loss, technology

3. Think back over the last three days. Describe some or all of the kinds and amounts of food you have or have seen by others being discarded.

Answers will vary.

Further Advancement/ Different Teaching Modalities

- Mark on a map the location of local foodbanks and food pantries. Call and ask how much of their food comes from local restaurants, farmers, or supermarkets. Ask what kinds of things they donate.
- Interview a grocery store manager and ask about the amount of food they discard.
- Look in a garbage can (look! Don't touch!) in a movie theater or other public venue. Do you see food waste?
- Look on line for information about classroom composting and make a composter for your classroom.

Questions for Class Discussion

Choose one or all depending on specific class needs.

- Should children (and adults for that matter!) be forced to eat everything on their plates?
- Are leftovers thrown away or reserved at your home?
- Would you pay higher taxes for a while for the city to invest in a digester? How could you even begin to make that happen?
- How many of you compost at home?
- So far, there have been a wealth of professions mentioned in this book when it comes to food. Can you list some?
(examples: farmers (small, large-scale), agronomists, seed developers, soil scientists, weather scientists, inventors- farm equipment, storage, etc., entomologists, economists, weather scientists, nutritionists, gene splicers)
Which one sparks your interest?
- Why might someone in one of the above sciences be a good candidate for the astronaut pool?
- How many of you have ever canned or otherwise preserved food?

Chapter Nine



Fact Gathering and Information

Chapter Title: **1. Tipping the Scales on Health.**

Health effects due to **2. obesity** have a real and lasting impact on communities, on nations, and individuals today and across future generations.

In feeding the world, it is not enough to simply have the **3. calories** available.

The challenges of **4. good health** when there is access to food is different from those who don't have access to it at all.

An economic decision-making framework is: do something if **5. the benefits outweigh the costs.**

All **6. diets** involve benefits, costs, and trade-offs.

7. Costs refers to more than money. It includes things like time, mental effort, and social costs.

8. Eating healthy must be made efficient.

9. Diminishing marginal benefits (or increasing marginal efforts) is when as you continue to exert effort on some activity, the returns from that activity begin to decline.

When it comes to diet plans, remember to do something only when the **10. benefits exceed the costs.**

Processed foods are hard to give up because taking them out of your diet will decrease the "reward" (good feeling after you eat) in your diet, and they are **11. convenient.**

To create a health-oriented, efficient food plan, one must focus on the most important factors of being healthy because with modest effort we can **12. achieve a large return.**

13. First-order factors in improving health, such as eating to reduce obesity, are those that yield the biggest and most robust benefits.

The **14. principle of parsimony** roughly says that if you have multiple competing theories, go with the simplest one.

The concept of robustness makes two points, the first being that a theory or dietary philosophy is robust if it is supported by numerous **15. independent studies under a multitude of different assumptions.**

The second point is that a theory or dietary philosophy is robust if it **16. does not require absolute adherence** to every last detail to be effective over the long run.

One of the most robust and simple theories of weight loss is the **17. "calories in versus calories out"** theory.

We evolved as a species to **18. seek out calories** rather than to avoid them.

continued next page

19. Food palatability has to do with how good food tastes.

"A change in **20. "food environment"** usually refers to the increased availability of manufactured or processed products (unnaturally good-tasting foods).

Manufactured foods engineered to have increased palatability and to increase sales have unnatural combinations of **21. fat and sugar**.

22. Calorie density is related to satiety (feeling sated or full) because foods that tend to have low calorie density also tend to be more filling.

The three things that maximizes benefits while minimizing costs for the average person are to **23. eat a diet with minimally processed, nonmanufactured foods as possible**, eat calories rather than drink calories, and **24. include protein in your diet** to increase the feeling of fullness and to preserve lean mass.

One should look at their target weight and then **25. act like the person you want to be**, adopting a food lifestyle and exercise regime that is consistent with that end goal.



Geography

On a separate piece of paper or in the space below, mark your current location and then draw a line to a real-life location (your home, a gym, a store, a beach) that is less than 25 miles from where you are. Use google maps to calculate a more exact figure for the distance. Then, use a calorie counter (several are available on the internet) to figure out and write down how many calories you would burn walking or biking there.

Answers will vary.



Critical Thinking Practice, SAT Preparation, and Assessment

1. In the sentence on page 151, “Nutrition advice is often based on scientific studies conducted by researchers trained to think about minutiae rather than the practical challenges that people face on a day-to-day basis,” the word minutiae most likely means
- minute by minute decision making.
 - theoretical.
 - the small, precise, or trivial detail of something.
 - the global perspective, or big picture.

Answer choice: **C**

This is a vocabulary question, and **C** provides the correct definition. If one does not know this word, one can eliminate answers through critical thinking. The sentence is in the part of the book where the author is talking about economic decision making and costs. He tells you, “Nutrition studies don’t tell us how to balance trade-offs. They don’t outline the costs and benefits of following a particular dietary plan.” They may tell you to reduce salt or eat more iron, but they don’t tell you what the cost is of doing it (time, stress, money, guilt, etc.) They focus on the small, rather than the big picture. Think minute (small) (minuta in Latin means small), and D becomes weak, as does **B**. If researchers are telling you what to eat or what not to eat, they aren’t being theoretical.

A was the choice for the tired and confused reader, written so that it sounded relevant.

2. Most likely, what statement would the author most agree with?
- Nutrients tend to take care of themselves if one eats food from nature rather than processed foods.
 - One’s goal should be great physical fitness, as exercise burns up calories.
 - No one should ever eat a candy bar as it has been engineered to be unnaturally good-tasting.
 - Because it reduces the number of calories in, crash diets are efficient ways to reduce obesity.

Answer choice: **A**

A essentially paraphrases what is on the bottom of page 162. Natural foods will provide the right dosages in the right combinations of macro or micronutrients, and the author is presenting this as a positive fact.

B is not what the author says at all. He stresses the cost and benefit, and if one only concentrated on physical fitness, at one point, the cost is too high. Remember his 80/20 analogy! You can get 80 percent of the benefit from only 20 percent of the possible effort.

C also goes against what the author wrote. The author himself admits to his weakness for gummy bears. He allows 1,000 of his daily calories to come from a variety of sources.

D Again, this goes against what the author wrote. In fact, he said that highly restrictive diets tend to fail in terms of both parsimony and robustness on practical grounds.



Investigation and Internet Research

■ Look up the amount of sugar in a can of mountain dew. How many apples could you eat instead? Boiled eggs? Celery?

■ The author mentions Occam’s razor on page 156. Look up Occam’s razor. Write down a simple definition. (If you want, you can listen to Merriam Webster’s Word of the Day podcast on 3/29/2017).

■ Take a guess at two of the most overweight countries and two of the least overweight countries. Then, look up those categories on line and see if the countries you guessed are mentioned.

■ Go to Amazon and type in diet books. Why might someone be unsure of what to buy?

■ Pick a food. Then find an article that pushes consumption of that food. Now try to find an article that refutes the first or says something different. Write down the title of each article or copy the http number.

continued next page



Writing Focus

1. Your friend is going to go on a low carb diet. Should they? Tell why or why not. Your answer will not be wrong, but you must defend it.

Possible keywords: CIT (carbohydrate-insulin theory of obesity)

2. Is it necessary to eat GMO-free foods to reduce obesity? Explain.

Possible keywords: first-order effects

3. Alan Aragon (page 163) advises one to act like the person you want to be. Explain what he means. Then come up with some incremental steps you can take.

Keywords: food lifestyle and exercise regimen consistent with end goal

3. What food is most likely to have the greatest calorie density?
- potato chips
 - apple slices
 - carrot sticks
 - orange sections

Answer Choice: **A**

Hopefully this was easy! What answer choice stands out? **A** is the only processed food. Calorie density is how many calories per unit of food. When something is calorie dense, it has a lot of calories, and often, it is not satiating (filling). The author writes about this at the top of page 161. One gets fuller eating 300 calories of apples, than one does of doughnuts.

4. Why might the author suggest that the vegan diet is a poor diet?
- It does not include fresh fruits and vegetables.
 - The diet calls for an excess amount of processed foods.
 - It is too robust.
 - The time and social costs are too high.

Answer choice: **D**

Watch the emotional tug one may feel when one hears the word vegan. One may feel very positive or very negative. Emotions have nothing to do with the question. It is what the author might think. What do we know about the author- he writes that we should not be eating an excess of processed foods, and that we should be eating fresh fruits and vegetables. Vegans most likely eat a lot of fresh fruits and vegetables, as they are on a plant-based diet, and so A is a very weak answer choice. If A, why not B? Both are incorrect.

C is for those who are pulled in by the word robust. But a robust diet is a good thing- it is one that (page 156-157) "does not require absolute adherence to every last detail to be effective over the long run." Being a vegan (eating plant-based foods only) is incredibly difficult because of what is mentioned in the best answer choice:

D The author talks about costs: monetary, social, and time. Vegan foods may cost more because they are not mass produced and the market for them is still relatively low. It costs socially because in many restaurants and at parties or get together with friends, there may be limited eating options so one may not want to go or will not be invited. The time to find and prepare the food, making sure that one gets enough protein and correct balance of nutrients, may be prohibitive for some. The idea of cost fits with what concerns the author and what he would bring up when discussing a particular diet.

continued next page

5. When the author writes that “achieving 95 percent makes no sense at all,” he means
- that one should always try for 100 percent.
 - that moderation is not enough.
 - that the costs are outweighing the benefits.
 - that there is no optimal way to eat healthily.

Answer choice: **C**

The author discusses this on page 153. He says going for 95 percent may be counterproductive in the long run. It takes too much effort. One can get burned out on an eating plan. On page 152, he says that due to the law of diminishing returns, it may not be worth getting to 100 percent. He says a few hours of shopping and food prep may get you to 80 percent. But to get to the 90 percent, you have to double the time spent getting to the 80. To get to 95, you may have to triple or quadruple the number! With that in mind,

A is clearly wrong, as the effort and time will be too great.

B is actually the opposite of what the author calls for. The author believes that diet plans should have moderation.

C fits the entire thrust of the chapter.

D goes against the entire thrust of the chapter. There is indeed an optimal way to eat healthy- it is a personal choice that involves incremental steps rather than not giving up or not trying at all.

Further Advancement/Different Teaching Modalities

- Write a skit that will encourage a young child to choose a healthy food item or drink over candy or a high calorie soda.
- Make a poster that provides information about Type 2 Diabetes.
- Calculate the food calories from three different student lunches. Or, use published calorie amounts for three meals from a restaurant. Then, calculate how many miles one would need to ride, bike, swim, or run to burn off the calories.

Questions for Class Discussion

Choose one or all depending on specific class needs.

- Some cities are banning extra-large soft drinks. How do you feel about this? How do you feel about taxing extra-large soft drinks?
- Some schools are banning vending machines, but for some schools, vending machines provided huge sums of money to athletic departments. What is the policy at your school? How do you feel about this?
- Should schools be required to offer vegetarian, vegan, kosher options? What if this meant higher costs?
- Should advertising be limited for high density low in nutrition foods? What if you are representing a state with a high sugar or corn fructose production?
- With all the advertisements bombarding you about food, is it hard not to over eat? Should these ads be banned? From television, billboards, magazines?
- Should restaurants have to post calorie counts? How about packaged foods from the grocery stores? Do the numbers affect what and how you personally eat?
- You witness someone shaming someone or someone shames you publicly for eating gummy bears. How should you respond?

Chapter Ten



Fact Gathering and Information

Chapter Title: 1. **Social License to Operate.**

Due to **2. consumers** exercising discretion, McDonald's buys pork from farmers who practice group housing rather than **3. gestation stalls.**

In addition to legal licenses, there are also **4. social** licenses.

Social licenses to operate are **5. granted** and **revoked** based on concepts, values, tools, are practices that represent a way of viewing reality for an industry and its stakeholders.

At one time, **6. finances** were the primary driver of decisions, but social licenses to operate adds a new dimension to acceptance.

Our ability to influence decisions and control social licenses is both a **7. right** and a **privilege.**

Using our power to revoke and grant social licenses to operate carries **8. consequences.**

In one remains too stubborn in the righteousness of their beliefs, our capacity to feed the world may become **9. diminished.**

Food represents **10. status** symbols which vary across cultures and regions.

Food is something far more than a means of sustenance as it has become an indicator of **11. wealth** and **power** and of **12. culture** and **belief systems.**

Although much of our direct involvement in food production has **13. diminished**, for many the interest has been reallocated to **14. how it is produced and brought to the marketplace.**

The role of animals that elicits the most debate is when animals are **15. consumed as food.**

For many, eating animals classified as **16. livestock** is more acceptable than eating those they classify as pets.

One may be more willing to eat an animal if one has no **17. personal attachment** to it.

To stay in business today, livestock producers must meet required legal standards as well as the regulations of their **18. buyers.**

Traditionally, interest groups pursued change through **19. legislative channels**, but now they are pursuing change through the **20. market system**, too.

When people refused to buy milk with rBST, milk producers were "forced" to adjust their production practices to meet the **21. demand** of their customer.

Wealthy consumers may be blind to the fact that their demands will raise the price of food, thus drastically raising the **22. financial stress** of a poor person.

continued next page

As perceptions of animals differs around the world, it can **23. disrupt world food production** because it spills over into **24. trade** negotiations.

Our position on food production can yield positive advances, but the challenge is to **25. maintain balance**.



Geography

It was mentioned in this chapter that horses, dogs, cattle, and pigs are commonly eaten in some countries and not in others. Mark on the map with an H, D, C, and P a few countries where these animals are commonly consumed. *Print this page if necessary.*

Answers will vary. A few correct locations are:

Horses: China, Mexico, Russia, Italy, Kazakhstan, France.

Dogs: China, South Korea, Vietnam, Nigeria

Cattle: USA, all South American and European countries.

Pigs: USA, all South American and European countries





Investigation and Internet Research

■ Look up gestation crates. Describe a typical size and how they are used. Do you live in a state or country with restrictions on them?

■ The author states that most children can draw a chicken but not a soybean. Draw what you think a soybean looks like, then next to it draw a picture of a soybean after you look it up on the internet. Now ask a student outside of the class to draw a soybean. What did they come up with?

■ The author states that food has become a status symbol. Look up five very expensive food items. What are they? How much do they cost? Have you ever tasted them?

■ The author says that use of the improper fork may be perceived as a signal of lack of prestige or class. Draw a table setting for a formal dinner and label what is what.

■ Look up five revolting or disgusting foods. Who decided the food is revolting or disgusting? Is it portrayed in a way that is disrespectful to a different culture? Rewrite the description in a way that does not impose one's own values.



Critical Thinking Practice, SAT Preparation, and Assessment

- When one uses the phrase “politics practiced through the market,” one means that
 - one's vote can be bought.
 - one is pursuing political change by what one buys.
 - one is choosing to make a legislative change.
 - one is not voting with their money.

Answer choice: **B**

This idea of “voting” with one's money is discussed on pages 172 and 173. Just like with rBGH or gestation stalls, producers will stop using them if enough consumers object and boycott the products.

A is another topic completely, as it deals with voting for a particular candidate if one is paid or given something. It was written for the careless reader who connected the word market with the act of buying something. **B** is correct, as one is seeking to create change through the market system. Yet one must read all answer choices! There just might be a better answer! **C** is incorrect, as this is the opposite of what one is doing. Again, the careless reader would be caught here, as the author explains that change through the market system is different from the traditional legislative process.

D is incorrect, as the author explains that one is pursuing change through the market system- by what one buys.

- If one had to sum up this chapter in one line, one might say,
 - “It is about eating pets versus livestock.”
 - “It is about how social licenses can affect markets.”
 - “It is about McDonalds pleasing its customers.”
 - “It is about the importance of food security.”

Answer choice: **B**

The explanation of social license is covered throughout the chapter, with examples given, and how it can create change through the market system rather than the legislative one. One would hope for an answer with the term social change or something close to it.

A is incorrect, as this topic is discussed only because it is, as the author states, one of the most contentious issues when it comes to social license. She brings it up to show how social licenses can differ depending on one's culture, values, emotional attachments, etc. It is a lengthy detail, but it is a detail.

B fits perfectly, but one must continue reading.

C is a detail, just as **A** is. It is an example, showing how although McDonalds was not breaking in laws buying pork raised in gestation stalls, they were not granted a social license to operate that practice. People wanted pigs raised in group housing.

D omits the focus of the chapter- social license to operate. Food security might be threatened if one pushes one's own agenda so rigidly that trade is blocked, but that is mentioned as part of the challenge when it comes to accepting cultural differences.

continued next page

3. One negative consequence of prohibiting all consumption of dog or horse meat might be
- less people keeping pets.
 - lower prices for beef and pork.
 - an increase in insect consumption.
 - financial stress on a poor farmer.

Answer choice: **D**

As abhorrent as it may seem to one if dogs or horses are eaten, it is a cultural norm in many places. Eating dogs or horses has nothing to do with people keeping pets (though many dogs and horses are kept as pets) (in some places, crickets are kept as pets!), and so answer choice **A** is a poor answer. In fact, the author pointed out that one is less likely to eat a dog or horse if it is perceived as a pet rather than livestock.

B is incorrect because we are asked for a negative consequence. Is the fixed price lower or higher than before the ban? If the price is lower, it may be better for the consumer but most likely hard on the producer. If the price increases, the consumer may not be able to afford it.

C is not a strong answer because people may very well eat more insects, but we have no idea. Is it a negative consequence if they did? Would you?

D is the best answer, with the words taken straight out of the book (page 174). Wealthy consumers may be blind to the fact that their demands will raise the price of food.

4. Our ability to influence decisions and control social licenses is both a right and a privilege, but it is a
- challenge because we don't see things the same way.
 - responsibility that many do not take seriously.
 - requirement that makes drastic demands on the poor.
 - duty resting solely on those registered to vote.

Answer choice: **A**

First- underline the word but in the question stem. The answer has to be some type of contrast or something not in total agreement with the first part of the sentence. This answer comes right out of the book (page 167, half-way down the page). The author spends time talking about how food is part of our culture, down to what we eat on holidays, and even how it is a status symbol. She repeatedly stresses that people (from our culture and different cultures) view their food production differently, and we must respect differences. Answer choice A seems to fit well, but one must continue reading.

B may be true, in that one may feel that it is a responsibility that many do not take seriously, but the author actually gives examples on how social licenses have created change. She never gives out numbers about how many don't care.

C This answer is for the one who doesn't think about the question deeply, as it takes something the author tells us but uses it in an incorrect context. Drastic demands may be made on the poor when wealthy push their agendas without thinking of how their choices may affect food supply.

D is incorrect because any voting that is mentioned is never a literal going to the ballot in the legislative process. It is used as an analogy- we vote with our dollars- with what we buy.



Writing Focus

1. You decide to do a semester abroad in your junior year. The very first night at your host family in Peru, they have prepared a special dinner for you- guinea pig. You once kept guinea pigs as pets. Write a paragraph where you first explain the situation and how you handle it.

Answers will vary.

2. Explain the difference between a legal license and a social license.

Keywords: Legal- regulated by a governmental body, part of the legislative process. Social- granted and revoked based on concepts, values, tools, and practices that represent a way of viewing reality for an industry and its stakeholders.

3. Dogs should never be eaten. Write a paragraph or two defending or attacking this statement.

Answers will vary.

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Further Advancement/ Different Teaching Modalities

■ On page 172 the author has some statistics about how people classify animals as pets or livestock. Make up a survey using the same animals listed. Ask ten people. Does your data come close to the author's data? Add to the survey by asking if one has ever eaten or would consider eating one of the animals listed.

■ The author says that there are many books for children about animals, but she makes no mention of those about a soybean or a corn kernel. Write a children's book about a soybean or a corn kernel.

■ How might one create a social license to operate within your own school cafeteria? If it created higher prices, how would that impact the student body?

■ Debate selling horses from the US to overseas market where they are slaughtered for consumption.

5. An example of a social license to operate might come from
- people voting to enact new government regulations.
 - people reading books with photographs of soybeans.
 - people only buying eggs from free range chickens.
 - people using sniffer dogs at airports.

Answer choice: **C**

A A social license to operate is not part of the legislative process, so A cannot be correct.

B is also incorrect. Although the author mentions that very few can draw a picture of a soybean, that information is given only to compare it to how most of us can picture animals, and thus are more connected or emotionally attached to them.

C If no one buys a product, the message is, "no one is willing to pay for your stuff" (page 172). If people refuse to buy eggs that are not free-range, even if the government does not require it, places like McDonalds will only purchase eggs from farmers raising free-range chickens, thus the social license is that eggs must come from free-range chickens.

D does not come close to answer choice C. What social license to operate could come out of using sniffer dogs?

Questions for Class Discussion

Choose one or all depending on specific class needs.

- What foods do you consider holiday foods?
- What foods do you consider status foods? (Coffee from McDonald's vs Starbucks? Kopi Luwak coffee- perhaps the most expensive in the world, as it has gone through the digestive system of the civet cat)? Is it worth the price? Shopping at Whole Foods vs Walmart?)
- Have you ever judged someone by what or how they eat?
- Why might what you order and your table manners matter when it comes to a job interview?
- Have you ever tried to influence a company or anyone with your buying habits? What would it take for you to boycott a store or a particular food item?
- Should pork (or any other food item) be banned due to religious dietary restrictions? Should it have to be slaughtered in a special way?
- Your aunt wants to force everyone to only buy and eat organic food. She says this because she is concerned about everyone's health. What do you say to her?

Chapter Eleven



Fact Gathering and Information

Chapter Title: **1. The Information Hinge.**

The right course of action is not **2. predetermined.**

3. Communication informs our decisions.

Communication around **4. food and agriculture** is not yet as good as we need it to be.

Today, one single farmer can feed **5. 155 people,** and less than **6. two percent** of the American population works in agriculture.

The communication challenge between the general public and agriculture intensified with the advent of the **7. Internet** and the rise of the **8. food movement.**

On the Internet, one can portray any issue they want to their **9. advantage.**

The food movement denotes people who are engaged or interested in their **10. food and where it comes from.**

11. The agricultural sector was slow to engage and slow to take people's concerns seriously.

The reaction to **12. Robert Bakewell** and his increased lamb size shows that contentious communication around agricultural issues is not new.

Due to how the issue has been misrepresented, many people fear that that **13. GMOs** are not safe to eat.

The Internet makes it too easy to pick up sound bites, images, or solitary articles that boil an issue down to a **14. single sentence or sweeping generalization.**

The ways in which scientific discoveries are communicated may have massive **15. ramifications.**

16. Social media algorithms, such as those used by Facebook, create an echo chamber of our own opinions, showing us what we "want" to see.

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17. Marketing techniques have created a segment of the population that is nervous and fearful toward the food and agricultural industry, and vice versa.

The goal is communication that begets more reliable information and communication that aids us in **18. working with one another.**

The first thing one can do to achieve this goal is to **19. check the source of information.**

The second thing one can do is check out the **20. other side of the argument.**

Third, don't become overinvested in **21. social media as a reliable source of information.**

Fourth, don't always trust **22. anecdotal evidence.**

Fifth, remember that being **23. famous** does not make one an expert about food security.

Sixth, beware of anything that openly attempts to **24. manipulate the emotions.**

Communication is the **25. hinge** upon which decisions, both good and bad, rely.



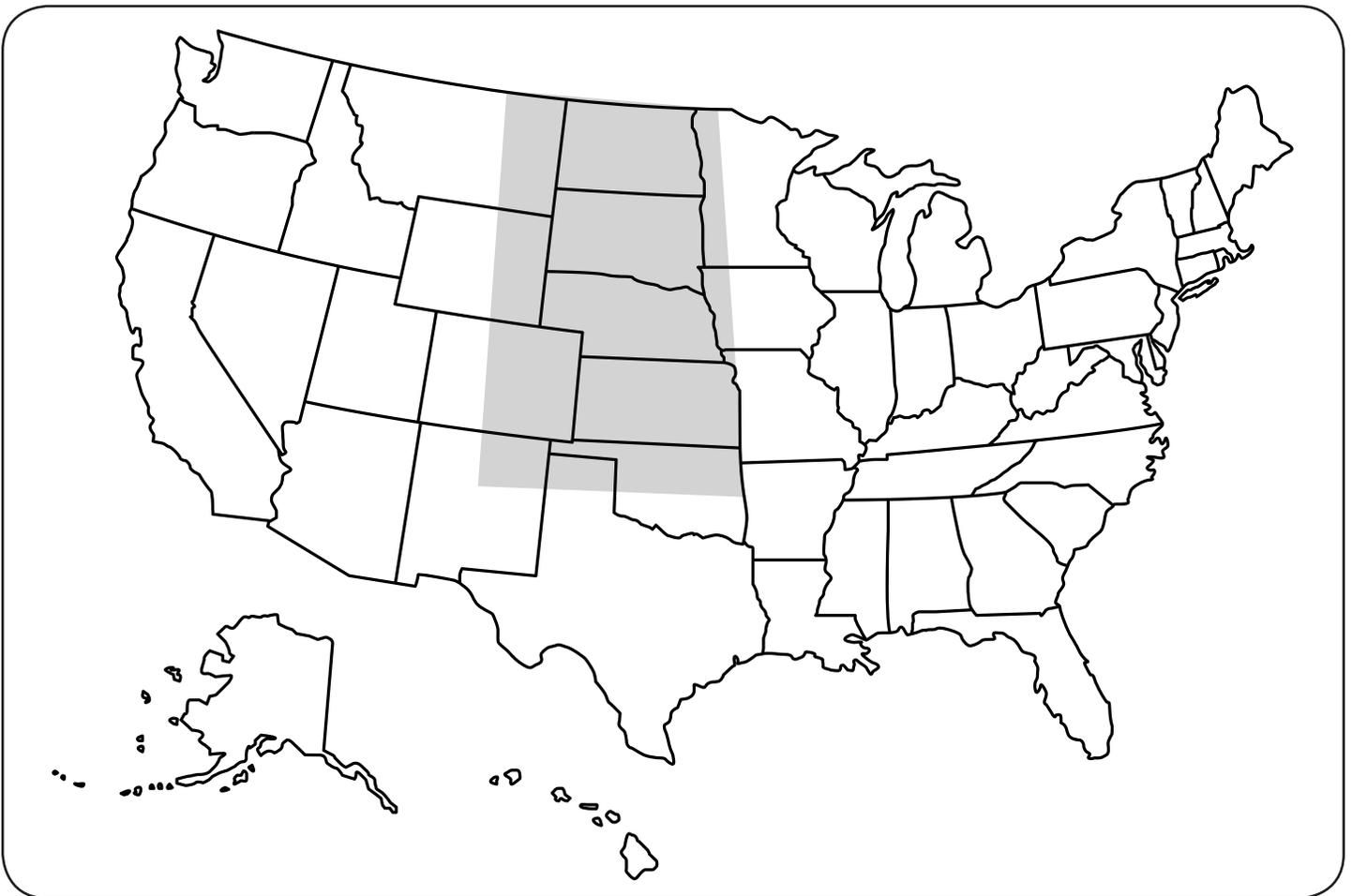
Geography

How much of 4th grade can you remember? Find and mark South Dakota and other states that make up the Great Plains on the map. Try first and then check and correct your answers by looking up Great Plains on the Internet.
Print this page if necessary.

States that make up the Great Plains:

All of Kansas, Nebraska, North Dakota, South Dakota

Parts of Colorado, Iowa, Minnesota, Montana, New Mexico, Oklahoma, Texas, and Wyoming.





Investigation and Internet Research

- Look up the Pacific Northwest Tree Octopus. How might your reaction differ from one not carefully checking sources?
- Find egg price data for five different times.
- Check your newsfeed on your phone or computer. Were the posts you were shown similar to items you posted or “liked?”
- Type in GMOs, click the image bar and describe one negative image and one positive. Which “side” had more images? What was the most “untrue” image you saw?
- Look up battery cage vs. cage-free eggs. How do the images make you feel? How hard was it to find an informative dialogue?
- Look up Robert Bakewell. Write down three facts you find interesting.



Critical Thinking Practice, SAT Preparation, and Assessment

1. Most likely, when one looks up GMO foods on the internet and sees a syringe sticking out the side of a fruit, the image was posted by
 - a. someone famous.
 - b. someone using anecdotal evidence.
 - c. someone with a reliable source of information.
 - d. someone trying to manipulate your emotions.

Answer Choice: **D**

This question deals with the six things the author feels are necessary when it comes to communicating between the general public and the agricultural sector.

- A** is incorrect because anyone could have posted the image. Most likely, if it was someone famous, they would make sure they put their name on it.
- B** is incorrect, as anecdotal evidence is when someone tells you a short or amusing story based about a real incident or person.
- C** is incorrect, as GMO foods are not shot up with hypodermic needles after they have been harvested.
- D** is correct, as the image is to make one feel queasy and afraid of what they are putting in one’s mouth. In other words, manipulating one’s emotions by a scary picture.

2. The author brings up the 2015 egg prices to
 - a. defend the practice of caging chickens.
 - b. bring attention to the avian influenza epidemic.
 - c. push for a wage increase for California’s lowest wage earners.
 - d. show how some regulations put undue burden on the poor.

Answer Choice: **D**

The author discusses this issue on page 187. The author does not defend or condemn the practice of caging chickens (**A**). She deals with the topic in a purely informational manner. She explains that the rising egg prices (with eggs usually being a cheap source of protein) puts an undue burden on the lowest wage earners. This is different than pushing for an increase (**C**). With good conversation, a way of preparing for this and protecting the poor may have been developed. **B** is just a detail that added to the price increase.

3. In the sentence, “To be clear, contentious communication around agricultural issues is not new,” the word contentious means
 - a. checked for incorrect information.
 - b. reviewed by a reliable source.
 - c. causing or likely to cause an argument.
 - d. backed by scientific data.

Correct Answer: **C**

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The author stresses that communication is the hinge to global food security. She also provides examples of how information can be one-sided, false, emotionally manipulating, etc. If one is unsure of the meaning of contentious, one should be able to come up with answer choice **C** because it stands out from **A**, **B**, and **D**. **C** is the only “negative” answer choice. If the correct answer was A, then why not B, and why not D?

4. What answer is most likely not part of the food movement?
- an attempt to provide fresh fruit in school cafeterias
 - city regulations for bicycle paths
 - an inquiry into the amount of plastic needed to package food
 - the use of certain pesticides

Correct Answer: **B**

One is tired, and this is question number 4. Do not skip over the word not in the question stem! The food movement (page 180) denotes the many people across the nation who are becoming or already are passionately engaged or interested in their food and where it comes from. **A**, **C**, and **D** are all relevant to the food supply chain, while the correct answer has nothing to do with it. If one was tired and did not read all the answer choices, one might answer **A** and feel (falsely) that they had chosen the correct answer.

5. One can conclude from this chapter that the author
- is angry about how GMOs have been misrepresented.
 - is hopeful that different interest groups can understand each other.
 - is against the Internet and the food movement.
 - is despairing of every reaching world food security.

Answer choice: **B**

Look at the words: angry, hopeful, against, and despairing. Angry and despairing are too strong, and they don't fit the balanced tone of the chapter. The author points out good and negative points about both the Internet and the food movement. She also points out that people in the ag sector were slow to realize what they needed to be communicating.



Writing Focus

■ The author talks about sound-bites. Write two tweets (not more than 280 characters). The tweets must be on the same subject, but one should be pro, while the other is con.

Answers will vary.

■ Write a paragraph or two where you explain if agricultural scientists are “playing God” the same way Robert Bakewell did. Defend your answer with reason and not emotion!

Answers will vary.

■ Write a paragraph or two about California's 2008 Proposition Two. How would you have voted? Why? How might one insure that low wage-earners could afford protein?

Answers will vary.

Further Advancement/ Different Teaching Modalities

- Make a split poster- one side pro GMO, the other anti. Use star power, emotions, anecdotal evidence, or reason!
- Ask someone two generations removed from you how they communicated. How did they obtain their news? What print media and/or advertisements do they remember?
- Have the class make up rules for what can be posted on the internet. How can one be sure that these rules are followed? Do the rules infringe on the First Amendment?
- Walk through a grocery store in groups of three or four. What is the cheapest source of protein one can find? (Or, check on Amazon!)

Questions for Class Discussion

Choose one or all depending on specific class needs.

- Off the top of your head, what ads have you seen that are emotionally powerful? Is it wrong for a company to use emotional advertising?
- Off the top of your head, what is a product or an agenda that someone famous is pushing? It is wrong for this person to be doing this?
- What news sources lean a specific direction (liberal vs conservative)? Is this wrong?
- How do you find your news and form your opinions? How do you know you are being given appropriate, reasoned, and factual information?
- Are you part of the “food movement?” How so?
- Have you ever even thought about the price of eggs?
- The author talks about learning from her grandmother that food is never to be wasted. What have you learned from a grandparent or anyone else two generations above you?

Chapter Twelve



Fact Gathering and Information

Chapter Title: **1. Achieving Equal Access.**

When one eats a **2. monotonous diet**, one may fail to obtain sufficient protein and micronutrients for robust health and physical growth.

Because much of the brain's capacity and structure are determined by age three, and the brain's development is correlated with a child's outward physical growth, **3. stunting** is used to measure malnutrition.

Due to critical time periods when brain systems are developing, reducing malnutrition is often targeted at children during the **4. first thousand days following conception.**

Some researchers have suggested that ridding the planet of **5. iron, zinc, and iodine** deficiencies would raise the world's IQ by ten points.

Although caregivers can sometimes compensate for lack of good nutrition, **6. catch-up** is extremely difficult and diminishes over time.

7. Poverty driven by early malnutrition tends to perpetuate itself across generations.

A common myth is that malnutrition reflects **8. lack of food.**

One must have enough food, and the **9. right kind** of food.

A second misunderstanding is that food insecurity arises from widespread **10. food shortages.**

Acutely hungry people need **11. land to grow food or money to buy it.**

12. Chronic malnourishment occurs when people cannot obtain a consistent supply of essential nutrients.

Recent food famines and food crises can be traced to **13. war or armed conflict.**

The problem confronting the majority of hungry or malnourished people is either **14. insufficient access to nutrition** or **15. insufficient purchasing power** to obtain food, or both.

16. Food deserts are areas where budgets are tight and options to buy healthy and fresh foods are limited.

In urban food deserts of high-income countries, problems such as obesity, heart disease, and diabetes, arise from consumption of **17. highly processed and nutritionally weak foods.**

A **18. budget share** is the proportion of a dollar of income that a family spends on some category of purchases.

19. Nutrition transition refers to people shifting from inexpensive diets low in calories and nutrients toward diets higher in calories and then more costly diets that are more **20. nutritionally balanced and contain protein from animal sources.**

continued next page

21. Food balance data measure how much food is available to people living in a particular country at a particular point of time.

Rising incomes and rapid innovations in agriculture are factors that help explain the **22. shift in diets** over time.

Worldwide nutrition transition will place a **23. strain** on agricultural systems and the natural systems on which they depend.

24. The World Health Organization (WHO) argues in favor of policies that focus on influencing the production, marketing, and availability and affordability of foods.

Data collected by MODIS shows that **25. children’s weights and heights** are correlated with the “green” satellite signal.



Geography

These countries were mentioned in this chapter or part of a graph. Mark their correct locations on the map.
Print this page if necessary.

- | | |
|------------------------------|---------|
| Nepal | Denmark |
| United States | Mexico |
| Japan | India |
| Egypt | Malawi |
| Democratic Republic of Congo | |





Critical Thinking Practice, SAT Preparation, and Assessment

1. The main point of this chapter is to
 - a. discuss how equal access to the right food is needed.
 - b. explain why there is not enough food to feed the world.
 - c. show how micronutrients can increase IQ.
 - d. prove that war and armed conflicts harm children.

Answer choice: **A**

This being a main idea question, the first word of each answer stem is often an indicator of a strong or poor answer. Discuss (strongest), explain, and show are all okay, but prove (D) doesn't fit. Also, the mention of war and armed conflict was only a detail, as they were examples of places where famines and food crises still exist.

A is a general description of most of the chapter, but as always, one must read the rest of the answer choices and decide what is best.

B is untrue, as we are told that there are enough food calories; it is the access that is uneven.

C is only a small detail that was used to explain the importance of getting access to the right food (zinc, iron, and iodine).

2. According to the graph on page 197,
 - a. Malawi has a higher budget share for food than the Democratic Republic of Congo.
 - b. the United States has a higher budget share for food than Mexico.
 - c. Denmark has a lower budget share for food than Egypt.
 - d. India's budget share on food is close to China's, but India spends more on beverages.

Answer choice: **C**

A is incorrect, as the opposite is true. Malawi, with a budget share of 48.9% spends less of each extra dollar on food than the Democratic Republic of Congo which spends 63.4%.

B is incorrect, as the United States spends less (only 5.7%) of each extra dollar on food than any other country.

C is correct, as Denmark spends less (11.1%) than Egypt (29.1%).

D is incorrect, as the graph does not separate food from beverages.

3. One reason there are chronically malnourished people in the world is because
 - a. there are insufficient food calories produced each year.
 - b. people don't have land to grow food or money to buy it.
 - c. the majority of people are not aware of the need for micronutrients.
 - d. most food banks are located in wealthy countries.

Answer choice: **B**

If one had not read the chapter carefully, **A** would seem to pop out as the correct answer. **A** is incorrect, as indeed, there are currently sufficient food calories produced.



Investigation and Internet Research

■ List five countries that spend the least amount of their budget dollars on food and five countries that spend the most (hint: keywords: food budget dollars different countries) Write down the amount next to the country, and the year the data was taken from.

■ Look up foods high in iron, zinc, and iodine.

■ Look up symptoms for iron, zinc, and iodine deficiencies. (You may have already looked up symptoms for iron and zinc as an Internet Research question for Chapter Four.)

■ Farmers in Nemat's village in Nepal grow mostly corn, potatoes, and wheat. Where did these three food crops originate?

continued next page



Writing Focus

■ Explain why childhood nutrition is so important. Your answer should detail three points.

Keywords: stunting, not all foods created equal, catch-up is extremely difficult

■ Why were food prices more important to American consumers in 1917 than they are to average Americans today?

Keywords: food budget share

■ Define an urban food desert. Propose a way(s) to help prevent one.

Keywords: processed, unprocessed foods, and fresh foods

B is almost verbatim out of the chapter and the correct answer.

C again deals with a detail (think zinc, iron, and iodine), but the phrase “majority of people” should make one cautious. One can be well nourished and not know about micronutrients!

D is also there for the person who never read the chapter. The focus was achieving equal access, and a discussion of food banks did not enter the dialogue.

4. What helps makes the author optimistic about global food security?
- sustainable restaurants
 - the World Health Organization (WHO)
 - nutrition transition
 - technology

Answer choice: **D**

On page 205, the author writes, “If you pause for a minute to think about how rapidly technology is evolving, it is impossible not to be optimistic about the potential for a twenty-first-century technological revolution in agriculture if we invest in it.” A discussion about MODIS and what it shows and how it can be used is previous to and follows this statement, thus showing that the best answer is **D**.

Although the author would be pleased with sustainable restaurants (**A**), and indeed provides an example of one, he saves his greatest and most enthusiastic accolades for technology. WHO (**B**) is mentioned, but not as the means of preventing global food insecurity. **C** (nutrition transition) is there for the person who did not read the chapter. Nutrition transference describes changing eating habits. It has nothing to do with increasing global food security.

5. If someone is obese and suffering from diabetes,
- they might be living in a food desert.
 - they are likely from Nepal.
 - they most likely live in an area of armed conflict.
 - they are from an area with low-calorie availability.

Answer choice: **A**

A is the best answer, as urban food deserts are places in cities where there is little access to fresh and unprocessed foods, the consequence being obesity and diabetes arising from eating high-calorie processed foods.

Although the chapter starts off with an anecdote about Nepal, **B** is incorrect. If one read the anecdote carefully, one would see that a “skinny” and “undernourished” person would be more likely.

C is incorrect for the same reason **D** is. If one is obese, one is getting calories. It is just that one is getting the wrong type. Food crises arise in war torn areas; typically, there is not an excess of calories.

Questions for Class Discussion

Choose one or all depending on specific class needs.

- Do you live in a food desert? How easy is it for you to find fresh food?
- Look up Tonga and weight. Where does this country fit in regards to “nutrition transition?”
- Should there be a shift in Western diets (page 203)? Are you willing to shift? By how much?
- When you visit family or friends, what is an appropriate gift? Have you ever considered bringing home a 100-pound sack of rice?
- There was a push in the 1920s to add iodine to salt due to the “goiter belt” in the Midwest. Should food have added minerals and vitamins?
- Were you aware that pictures are taken of nearly every inch of Earth each day? How do you think people in undeveloped regions would react if they were told about the NDVI (Normalized Difference Vegetation Index) and warned of an impending drought?
- Quickly look up the long-term effects of what happened to Dutch babies born after World War 2 but in utero while their parents were starving. Discuss how this applies to some of the topics you read about in the chapter.

Further Advancement/ Different Teaching Modalities

- Investigate WIC (Special Supplemental Nutrition Program for Women, Infants, and Children). Debate pros and cons.
- Ask a grandparent or an elder what the cost of bread, a candy bar, or milk was when a child. Then ask them how much of their dollar budget they spent on food. Do they feel they are paying more today of their household income or less?
- Make a list of three high calorie processed foods or drinks. Look up the current price on line and then calculate how much one pays for each calorie.
- Imagine you are planning a meal at a sustainable restaurant you own in your neighborhood. Make a menu with a few dishes pictured or described.

Conclusion



Fact Gathering and Information

Book Section: **1. Conclusion.**

The challenges presented in the book are complex in their own right, but they are also **2. interconnected.**

The growing population spills over into **3. environmental** impact.

With growing numbers, we no longer have the luxury of using land and water in ways taken for granted by **4. past generations.**

Water and land are **5. finite** (or limited) resources, and water is not **6. evenly** distributed.

Once farmland is **7. degraded** through human activities, it is extremely difficult to reclaim it.

There is an interplay between **8. changing climate** and agriculture, with farmers having to adapt.

9. Technology is what enabled us to feed today's population, and it remains **10. key** to developing more sustainable farming innovations and smarter food production methods.

Our **11. food systems** are complex and diverse, with food arriving at our plates in different ways and in different forms.

Farmers may choose to grow certain crops because there is an ideal **12. match** between soil, climate, equipment, and abilities.

International trade plays an important role when it comes to **13. food security.**

14. International trade is a buffer against unforeseen weather and economic events.

15. Food waste, an unplanned decision made by a well-fed nation of people, happens at the very end of the food supply chain.

16. Food loss happens throughout the food chain and is desperately fought by farmers.

Food is one of the primary contributors to our **17. health.**

18. Obesity is on the rise, and so are the related health problems that come with it.

The problem of what one should choose to eat can be evaluated using an **19. "economic approach."**

As a society, we have the capacity and power to grant and revoke **20. social licenses to operate.**

With that power, comes the ability to do great things and/or **21. great harm.**

There are problems with our current state of **22. communication** around food and agriculture, but there are also solutions that enhance our flow of knowledge.

continued next page

The ultimate challenge is achieving **23. equal access** to food.

The problems in this book are tough but **24. surmountable**.

Everyone can help, whether **25. young** or old.



Geography

The *six degrees of separation* concept posits that any two people on Earth are six or few acquaintance links apart. Think about all the food and food supply chains you are connected with- what you eat, how you get it, who you share it with. Now mark six countries that you definitely are linked to when it comes to food at the level at or below six degrees of separation.

Next, mark six countries you are least likely to be linked to. Is this possible?

Ask your students if they have considered such things as: aid relief, agricultural research, educational youtube videos, and scientists in Antarctica who are sent food packages from loved ones, etc.

Print this page if necessary.





Investigation and Internet Research

- Look up two contributors (pages 235-239) and write down two facts about them that are not found in the paragraph describing them in the book.
- Go through the Notes (pages 221-233) and choose one journal or book cited as a source. Look up the source. Does it seem legitimate? Why or why not?
- Find an article about new issues or technologies in agriculture. Sum it up in two sentences.



Critical Thinking Practice, SAT Preparation, and Assessment

1. When one puts down this book, the authors intend for the reader to feel
 - a. fearful of the continuing trend of population growth.
 - b. concerned about the lack of respect toward others beliefs.
 - c. interested in studying agricultural technology.
 - d. optimistic and capable of engaging in change.

Answer choice: **D**

Look at the first words: fearful, concerned, interested, optimistic. Answer choice **A** with fearful is a little strong for the tone of the book. Each chapter has ended with a challenge, not a call of defeat. Also, population growth is only one part of the book. We want an answer choice that can encompass all or most of the book.

Yes, one should be concerned (**B**), but again respect and social licenses to operate are only part of the entire challenge. If not **A**, why not **B**?

The authors would love anyone who chooses to do this after reading this book, but again, the focus has been on the challenges of feeding the world, not how technology is created or who invents it.

D fits exactly, as the editors talk about eager students and everyone having a unique talent or attribute.

2. What did the authors want to convey when they wrote that it is easy to glibly suggest that farmers grow something else?
 - a. One is speaking cautiously, as one has no idea of what the impact will be on international trade.
 - b. One is speaking carefully, as farmers have unique abilities that are not easily transferred.
 - c. One is speaking thoughtlessly, as the crop grown may ideally match the soil, climate, and equipment where it is grown.
 - d. One is speaking hastily, as one has not been told at what latitude the farmers are located.

Answer choice: **C**

This is a question that one may miss simply because it is so word heavy and one is too tired to read it carefully. The truth is that it is a simple vocabulary question. Glib means readily fluent, often thoughtlessly, superficially, or insincerely so. Think a glib talker or a glib answer.

If one is aware of this, **C** stands out as the correct answer. It is too easy to suggest that farmers switch what they grow, and if they are best at it, why should they? It makes more sense to engage in international trade.

One may be able to eliminate **A** if one sees that easy doesn't fit with cautiously.

B has the word carefully- a word that matches cautiously. As in answer choice **A**, easy doesn't fit with carefully.

D has the word hastily. This one is the hardest to eliminate, as one has to understand the flow of the chapter. The sentence is found at the page of 212, and the discussion that follows concerns international trade being part of global security as some land areas are just better suited to particular crops.

continued next page

3. What might be covered in a follow-up chapter to this book?
- a lesson on negotiating techniques
 - the history of China's policies to control population growth
 - religious objections to gene splicing
 - technologies that allow seeds to grow at accelerated rates

Answer choice: **D**

The book ended on an optimistic note- people meeting the challenge. The only answer that covers going forward and advancement is **D**.

4. What proverb or saying best matches the main point of the conclusion?
- No man is an island.
 - You catch more bees with honey than you do with vinegar.
 - All's well that ends well.
 - Common sense is genius dressed in its working clothes.

Answer choice: **A**

Remember- Over and over, one is told that we have a challenge in front of us, but we have solved problems before. Working together there are things we can do. **A** works well, and is the correct answer, but one must continue reading.

B sounds like it has something to do with farming, but there is nothing in it about working together.

C goes too far. The authors are not saying that all will end well. They are saying it CAN end well, as humans are up to the challenge.

D does not fit at all. We need to work at securing global food security and access, but it is going to take more than common sense. We have to invest in research, and we have to be able to communicate so as to promote a unified understanding.

5. What is not true about trade?
- It can help maintain prices so that farmers are more diligent in harvesting their crops.
 - It can repair soil damaged by the effects of global warming.
 - It has potential for reducing the amount of food that is wasted or lost.
 - It can help keep perishable crops from piling up in storage where they may spoil or are eaten by insects.

Answer choice: **B**

Trade does all the things listed in **A**, **C** and **D**. Global warming is mentioned during discussions about Climate change, but trade is never mentioned as a way of repairing damaged soil.



Writing Focus

1. A lot of different jobs or occupations were mentioned in this book that all have a part in insuring global good security. For example, meteorologist, inventor, seed developer, communicator, etc. Out of all the kinds of work and jobs mentioned in the book, what type of work most sparked your interest? Write a paragraph describing some of the things you think the job entails and why it interests you.

Answers will vary.

2. Did the book have an impact on you? What part surprised and/or interested you the most? Would the book have had the same impact if it had been written in a threatening tone vs a challenging one?

Answers will vary.

3. In the introduction, one is told that no one was paid to contribute to the book, and that no one's research was funded as a result. Does knowing that affect how you feel about the book? Why or why not?

Answers will vary.

Further Advancement/ Different Teaching Modalities

- Listen to this webinar: <https://islandpress.org/video/feeding-our-world-combating-food-waste-and-unequal-access>
- Look at this website: <https://ag.purdue.edu/feedtheworld/>
- Listen to this podcast: <http://heritageradionetwork.org/podcast/how-to-feed-the-world/>
- Make your own podcast about this book.
- Take photographs or draw pictures, one for each chapter.
- Choose a grade level- anywhere from kindergarten to high school. Make up a lesson plan that focuses on one or as many as you want chapters of this book. The lesson plan can include a lecture, skit, song, art project, etc. Teach your lesson plan to the appropriate grade or explain it to your classmates.

Questions for Class Discussion

Choose one or all depending on specific class needs.

- Was this a good selection to use as a text book?
- Did you find the SAT type questions easier to do as you began to familiarize yourself with the format and practiced your critical thinking skills?
- Americans are always being criticized for their geographical ignorance. How would you rate your geographical awareness before and after completing the geography assignments?
- Have your eating habits changed since reading the book? Any changes when it comes to the amount of food that you discard?
- Do you feel optimistic or pessimistic when you think of your well-being and the next generation's well-being in the years to come?
- What role does the government have in all of this? Should it have a role? Will you register to vote and then vote?



College of Agriculture

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