Name: _____ Date: _____

Environmental Science: Chapter 15 Food and Agriculture

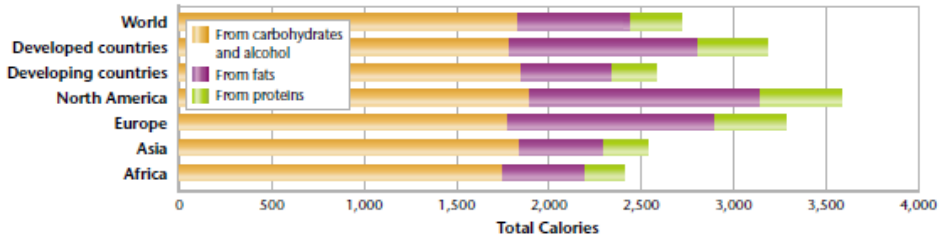
15.1 Feeding the World

- 1985 the lack of _____, loss of _____, and war caused the crops to _____ in Ethiopia
- _____is widespread starvation caused by shortage of food.
- By 2050 farmers will need to feed about _____ million people (_____more than today)

A. Humans and Nutrition

- Humans use food as a source of _____ and as source of _____ for building and maintaining body _____.
- Energy in food is expressed in _____ (Cal)
- Major nutrients we get from food are _____, _____, and _____
- _____ is a condition that occurs when people do not consume enough Calories or don't eat a sufficient _____ of foods.
- Example: protein-energy malnutrition is when humans don't consume enough essential _____ _____, vitamins, and minerals.

1. Sources of Nutrition
   - _____ is the type and amount of food that a person's eat
   - A _____ diet is one that maintains a balance of the right amounts of _____, minerals, and vitamins.
   - In most of the world people eat large amounts of _____ (rice, potatoes, and bread).



2. Diets Around the World
   - People in more _____ countries tend to eat _____ food
   - People in _____ countries tend to eat larger proportion of _____ and _____.

B. The Ecology of Food

1. Food Efficiency
   - The _____ of a given type of agriculture is a measure of the quantity of food _____on a given area of land with limited inputs of _____ and resources.
   - Generally more _____, water, and _____are used to produce a Calorie of food from _____ than from _____.

- Only about _____ of the energy from plants gets stored in the animals
- The efficiency of raising plants for food is one reason why _____ around the world are largely based on _____.

2. Old and New Foods
   - _____ the amount of food that can be produced in a given area
   - Researchers are interested in organisms that can thrive in various climates and do not require large amounts of _____, _____, or _____ _____.
   - Glasswort a salad green may become an important food source because it can grow in _____ soil
   - _____ has been harvested and eaten by humans for centuries.

C. World Food Problems
- Many consume about a _____ of our calories from animals, not grain

1. Poverty
   - _____ today is almost entirely a result of _____
   - The world's hungry are nearly all farm workers and _____ _____ (farmers who grow only enough food for local use)
   - Most of the world hungry live in extreme poverty (income of less than _____/day)
   - The world's hungry live mainly in _____, Asia and mountains of South America.

2. More Income and More Food
   - The number of people living in _____poverty has declined by _____ billion since 1980.
   - _____ production has increased but it has not _____ as fast as the world's population.
   - Increasing the _____ of subsistence farmers will go a long way in producing more grain and abolishing _____.

D. The Green Revolution
- *The Green Revolution* (1950-1970) is when Mexico increase _____ production _____ and India doubled its production of rice without increasing the _____ of farmland used.
- New varieties produce _____ yields if they are supplied with enough _____, fertilizer and pesticides.
- Most of the increase in production came from _____ farms
- Research today is devoted to developing _____ that produce high _____ on poor soil using little _____.
- Distributing the seeds and technology to scattered _____ _____remains a problem
-

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Section15.1: Feeding the World **Active Reading**

Read the passage below and answer the questions that follow.

Between 1950 and 1970, Mexico increased its production of wheat eight-fold and India doubled its production of rice. Worldwide, increases in crop yields resulted from the use of new crop varieties and the application of modern agricultural techniques. These changes were called the green revolution. Since the 1950s, the green revolution has changed the lives of millions of people.

However, the green revolution also had some negative effects.

Most new varieties of grain produce large yields only if they receive large amounts of water, fertilizer, and pesticides. In addition, the machinery, irrigation, and chemicals required by new crop varieties can degrade the soil if they are not used properly. As a result of the overuse of fertilizers and pesticides, yields from green revolution crops are falling in many areas. Grain production in the United States has decreased since 1990, partly because the amount of water used for irrigation has decreased during the same period.

IDENTIFYING MAIN IDEAS

Write the letter of the term or phrase in the space provided, that best completes each statement.

_____ 1. Between 1950 and 1970, the green revolution led to
- a. increases in crop yields worldwide.
- b. the failure of new crop varieties.
- c. water shortages in the United States.
- d. grain shortages in Mexico and India.

_____ 2. *Irrigation* refers to
- a. varieties of crop yields.
- c. fertilizer used to increase crop yields.
- b. water used for crops.
- d. machinery used to harvest crops.

_____ 3. According to the passage, one problem with the green revolution is that
- a. few people have access to new techniques and machinery.
- b. it did not last long enough to make a difference in grain production.
- c. it led to widespread drought.
- d. it led to the overuse of fertilizers and pesticides.

Read the following question and write the answer in the space provided.

4. The verb *yield* means "to bear or bring forth as a natural product." Use this information to define *crop yield*.

_____

_____

_____

_____

5. How did Mexico benefit from the green revolution between 1950 and 1970? How did India benefit?

_____

_____

_____

_____

6. How was agriculture after the green revolution different from agriculture before the green revolution?

_____

_____

RECOGNIZING CAUSE AND EFFECT

Read each question and write the answer in the space provided.

7. What do new varieties of grain require to produce large yields?

_____

_____

_____

8. Why has grain production in the United States decreased since 1990?

_____

_____

_____

9. Why are yields from green revolution crops falling in many areas?

_____

_____

_____

10. What effect do the machinery, irrigation, and chemicals required by new crop varieties have on soil?

_____

_____

_____

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Environmental Science: Chapter 15 Food and Agriculture

15.2 Crops and Soil

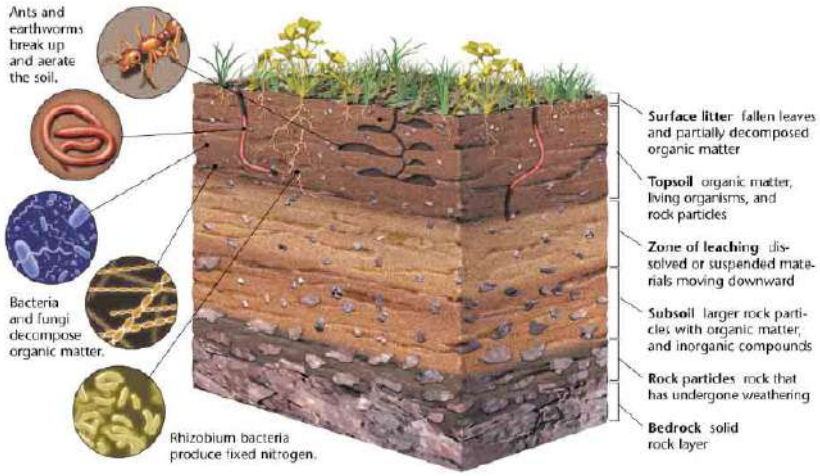
* _____ _____ is land that can be used to grow crops, and is only about _____ of Earth's surface.

A. Agriculture: Traditional and Modern

- Basic process of _____: plowing, fertilization, irrigation, and pest control.
- _____helps crops grow by mind soil nutrients, _____ particles and uprooting weeds
- _____ fertilizers (manure) are used to _____ the soil.
- _____ is done by water flowing through _____
- In _____ countries machinery powered by fossil fuels is used to _____ the soil and _____ crops.
- _____ _____fertilizers are now used instead of manure and plant wastes to _____ soil
- Synthetic chemicals are used to kill _____

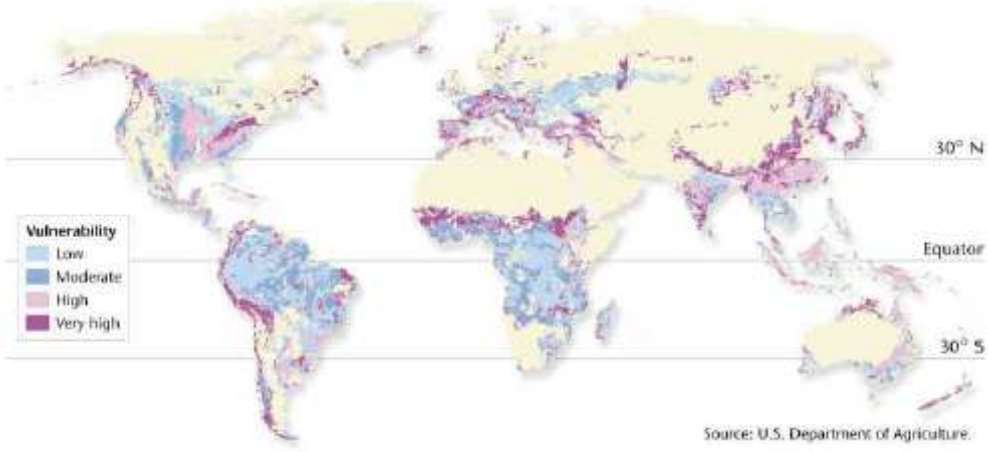
B. Fertile Soil: The Living Earth

- _____ _____is soil that can support the growth of healthy plants.
- Plant roots grow in _____(the surface layer of soil) which is usually richer in organic matter.
- Fertile topsoil is composed of living _____, rock particles, _____, air and organic _____.
- Most soil forms when rock is _____ down into smaller and smaller _____.
- _____ _____happens when the minerals in the rock react chemically with substances to form new _____
- Rock particles supply _____ _____to the soil
- Fungi and bacteria _____ dead plants and organic debris and add more _____ to the soil
- _____, _____, and small animals help plants grow by breaking up the soil and allowing _____ and _____ into it.



C. Soil Erosion: A Global Problem

- _____ is the movement of rock and soil by _____ and water.
- Eroded soil _____ into nearby rivers or is _____ away in clouds of dust.
- _____ of original topsoil in US has been lost to erosion
- Most farming methods _____ the rate of soil erosion



D. Land degradation

- _____ _____happens when human activity or natural processes damage the land so that it can no longer support the local ecosystem.
- _____ is the process by which land in arid or semiarid areas becomes more desert like.
- Desertification has happened in the Sahel region of northern Africa.
- The population in the region has grown and the land is being _____, grazed and deforested _____ than it can _____.
- Because of _____ the land has few plants to _____ the topsoil in place and large areas have become _____

E. Soil Conservation

- Soil usually erodes _____ and may soil conservation methods are designed to prevent downhill erosion.
- Example: building soil-retaining _____, or _____ plowing (plowing across the slope of a hill)
- Drip irrigation can _____ soil
- _____ farming a crop is harvested without turning over the soil. Seeds of next crop are planted among the remains of the _____ crop

F. Enriching the Soil

- Soil is enriched by adding _____ _____ (manure or leaves)
- As the organic matter _____ it adds nutrients to the soil
- _____ fertilizers can be used (they contain nitrogen, phosphorus, and potassium)
- _____ is partly decomposed organic material.
- Compost can be _____ to soil to enrich it.

G. Salinization

- _____ is the accumulation of salts in the soil
- Salinization is a problem in places with low _____l and naturally salty soil
- Eventually soil may become so _____ that plants _____ grow
- Salinization can be _____ if irrigation canals are lined or if soil is _____heavily

H. Pest control

- Insects eat about _____ of all crops in North America
- Worldwide _____ destroy _____ of world's potential food harvest
- A pest is any _____that occurs where it is not wanted and in large enough numbers to cause _____ damage.
- _____ plants have more protection from pests that crop plants

I. Pesticides

- _____ are chemicals used to kill _____, _____, or other crop pests.
- Pesticide were so _____ that farmer relied on them to _____t their crops form pests
- Pesticide can _____ beneficial pants, insects, wildlife, and people

1. Pesticide Resistance
   - Spraying crops with _____ _____of pesticides cause pest to evolve _____.
   - *Resistance* is the ability to survive _____ to a particular _____.
   - _____ insects have developed resistance to pesticide since 1940

2. Human Health Concerns
    - Pesticides are designed to_____ organisms and may be dangerous to humans
    - _____ rates among children in areas where large amounts of _____ are used are higher than the national average
    - People who apply pesticide need to follow _____ guidelines to protect their selves
3. Pollution and Persistence
    - _____ pesticides do not break down rapidly into harmless chemicals when they enter the _____
    - They can _____ in the soil and water
    - In US many have been _____, example _____

J. Biological Pest Control

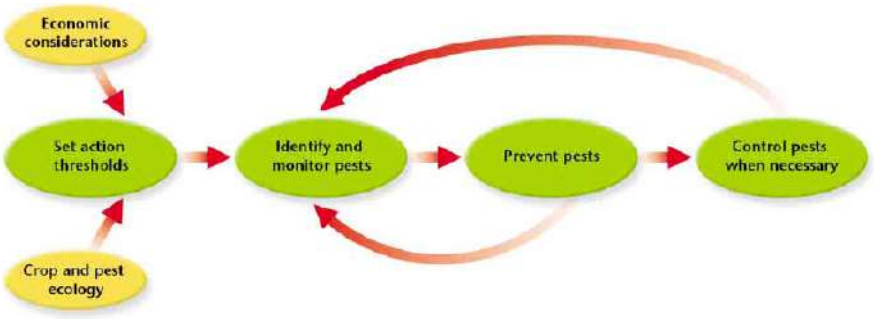
- _____ _____ _____is the use of living organisms to control pests.
- Every pest has natural _____ and these enemies can be used for pest control
- Example: using the American beetle to control _____ growth in India

1. Pathogens
    - _____ are organisms that cause disease and can be used to control pests.
    - *Bt (bacillus thuringienis)*is a bacterium used to kill the caterpillars of moths and butterflies
2. Plant Defenses
    - _____ have been bred to have _____ against pests.
    - Examples of plant defenses include _____ _____ that repel pests and tougher skin (a physical barrier)
3. Chemicals from Plants
    - The use of a plants' _____ chemicals as pest control
    - Example: chemicals found in chrysanthemum plants are sold as home _____
    - Are _____ and less harmful to humans and pets
4. Disrupting Insect Breeding
    - _____ _____ is a chemical that interferes with some stage of a pest's life cycle.
    - Flee pills use this to keep flea's eggs from _____ into adult fleas
    - _____ chemicals produced by one organism that affect the behavior of another organism.
    - Farmers can use pheromones to _____ with the mating of moths

K. Integrated Pest Management

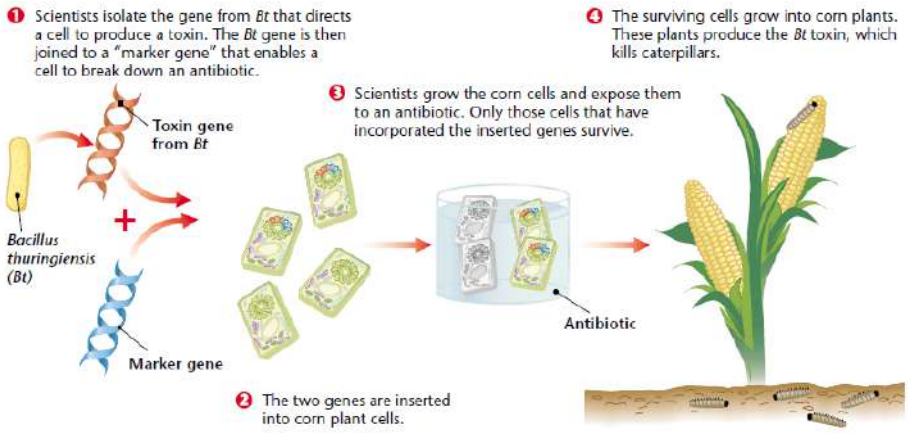
- _____ *pest management* is a modern method of _____pests on crops

- A different management program is developed for each _____
- When pest damage is _____ a program to control the pest is _____



L. Engineering a Better Crop

- Farmers select the _____ that have the _____produce and the least _____damage.
- These seeds are saved and used for _____ the next crops
- _____ _____ is where genetic material in living cells is modified for medical or industrial use.
- Scientists use genetic engineering to _____ desirable _____
- _____ _____plants are the plants that result from genetic engineering



1. Implications of Genetic Engineering
   - In US we eat and use genetically engineered agricultural products _____.
   - Many products have not been fully _____ for their environmental impacts

M. Sustainable agriculture

- _____ _____is farming that conserves natural resources and helps keep the land productive indefinitely.
- This minimized the use of _____, water, _____, and fertilizers.

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Section15.2: Crops and Soil **Active Reading**

Read the passage below and answer the questions that follow.

In North America, insects eat about 13 percent of all crops. Crops n tropical climates suffer even greater insect damage because the insects grow and reproduce faster in these climates. In Kenya, for example, insects destroy more than 25 percent of the nation's crops. Worldwide, pests destroy about 33 percent of the world's potential food harvest.

Insects are one of several types of organisms considered pests. A pest is any organism that exists where you do not want it or that exists in large enough numbers to cause economic damage. Humans try to control populations of many types of pests, including plants, fungi, and microorganisms.

Wild plants often have more protection from pests than do crop plants. Wild plants grow throughout a landscape, so pests have a harder time finding and feeding on a specific plant. Crop plants, however, are usually grown together in large fields, which provide pests with a one-stop source of food. Wild plants are also protected from pests by a variety of pest predators that live on or near the plants. Some wild plants have also evolved defenses to many pests, such as poisonous chemicals that repel pests.

IDENTIFYING MAIN IDEAS

One reading skill is the ability to identify the main idea of a passage. The main idea is the main focus or key idea. Frequently, a main idea is accompanied by supporting information that offers detailed facts about main ideas.

Read each question and write the answer in the space provided.

1. What is a *pest*?

_____

_____

_____

2. List three types of pest populations that humans try to control.

_____

_____

_____

Write the letter of the phrase in the space provided, that best answers the question.

_____ 3. How much of the potential food harvest do pests destroy worldwide?

a. 100 percent
b. 50 percent
c. 33 percent
d. 10 percent

RECOGNIZING SIMILARITIES AND DIFFERENCES

One reading skill is the ability to recognize similarities and differences between two phrases, ideas, or things. This is sometimes known as comparing and contrasting.

Read each question and write the answer in the space provided.

4. How does insect damage to crops in Kenya compare to insect damage to crops in North America?

_____

_____

_____

_____

5. Why do crop plants have less protection from pests than do wild plants?

_____

_____

_____

The following statements apply to either wild plants or to crop plants. In the space provided, write "WP" if the statement applies to wild plants or "CP" if the statement applies to crop plants.

_____ 6. grow throughout a landscape

_____ 7. provide pests with a one-stop source of food

_____ 8. have evolved defenses against many pests

_____ 9. are protected from pests by pest predators that live on or near the plants

_____10. grow together in large fields

RECOGNIZING CAUSE AND EFFECT

One reading skill is the ability to recognize cause and effect.

Read each question and write the answer in the space provided.

11. Why do crops in tropical climates suffer greater damage than crops in North America?

_____

_____

_____

12. Why do humans try to control pest populations?

_____

_____

_____

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Environmental Science: Chapter 15 Food and Agriculture

15.3 Animals and Agriculture

* Total energy needed to grow _____ for food is much less than the energy needed to raise _____ as food.
* Most _____ proteins contain more essential amino acids than proteins found in plants.
* _____means that animals are bred and managed for human use.
* Include _____, sheep cattle, _____, silk worms, _____and shellfish.

A. Food from Water

1. Overharvesting
   - _____ is catching or _____from a population more organisms than the population can _____
   - Many governments have created no-fishing zones so _____ populations can recover
2. Aquaculture
   - Fish and other aquatic _____ provide up to _____ of animal protein
   - _____ is the raising of aquatic organisms for human use or consumption
   - Most common method is known as _____ _____, fish grow to maturity in the ponds and then are harvested.
   - Another method is _____ where fish are raised until they reach a certain age.
   - _____ of seafood now comes from aquaculture
   - Can cause some problems because used of water depletes local _____supplies
   - And large amount of _____ can be a source of _____.

B. Livestock

- _____ are domesticated animals that are raised to be used on a farm or ranch or to be sold for a profit.
- Large livestock operations _____ most of the meat that is consumed in _____countries
- In _____countries live stock are used for _____, wool, eggs, _____ and used to pull cars and _____.

1. Ruminants
   - _____ are cud-chewing _____ that have three or four chambered stomachs (cattle, _____ and goats).
   - have _____ in their intestines to help _____ plant materials that humans cannot digest.
   - When humans _____ ruminants we are using them to convert _____ material (grass stems and shrubs) into food that we can _____.
2. Poultry

- Since 1961 the population of _____ worldwide has increased by _____
- *Poultry* are domesticated birds raised for _____ and _____.
- In _____ countries chickens and turkeys are usually raised in _____ farms.
- Ducks are important in _____ and produce ducks, silk, rice, and fish

SECTION15.3: ANIMALS AND AGRICULTURE ACTIVE READING

Read the passage below and answer the questions that follow.

There are a number of different methods of aquaculture. The most common method is known as a fish farm. Fish farms generally consist of many individual ponds that each contain fish at a specific stage of development. Clean water is circulated through the ponds and brings in oxygen while sweeping away carbon dioxide and fecal wastes. The fish grow to maturity in the ponds and are then harvested.

Another type of aquaculture operation is known as a ranch. In this method, fish such as salmon are raised until they reach a certain age and are then released. The salmon, for example, migrate downstream to the ocean, where they live until adulthood. When they are mature, the fish return to their birthplace to reproduce. When they return, they are captured and harvested.

IDENTIFYING MAIN IDEAS.

Write the letter of the term or phrase in the space provided, that best completes each statement or best answers each question.

_____ 1. What is the most common method of aquaculture?
a. fish farming
b. ranching
c. capturing
d. migrating

_____ 2. Each individual pond on a fish farm contains
a. several different types of fish.
b. one fish species and one of its predators.
c. fish at a specific stage of development.
d. mature fish that are ready to be harvested.

_____ 3. Where do salmon live until they reach a certain age, before adulthood?
a. on a fish farm
b. on a ranch
c. in a river
d. in the ocean

_____ 4. Where do salmon live after they leave their birthplace and until they reach adulthood?
a. in the ocean
b. in a pond
c. downstream
d. on a ranch

VOCABULARY DEVELOPMENT

5. The prefix *aqua-* refers to "water." The verb *culture* means "to foster the growth of living things." Use this information to define *aquaculture.*

_____

_____

In the space provided, write the letter of the definition that best matches the term.

_____ 6. migrate

_____ 7. circulate

_____ 8. harvest

_____ 9. mature

a. gather in
b. reach adulthood
c. flow without obstruction
d. move from one place to another

SEQUENCING INFORMATION

One reading skill is the ability to sequence information, or to logically place items or events in the order in which they occur.

Sequence the statements below to show the steps in the process of raising and harvesting salmon. Write "1" on the line in front of the first step, "2" on the line in front of the second step, and so on.

_____10. The salmon are released.

. _____11. The salmon return to their birthplace.

_____12. The salmon are raised on a ranch until they reach a certain age.

_____13. The salmon are captured and harvested.

_____14. The salmon migrate downstream to the ocean.

_____15. The salmon grow to adulthood.

RECOGNIZING CAUSE AND EFFECT

One reading skill is the ability to recognize cause and effect.

Read each question and write the answer in the space provided.

16. How does circulating clean water contribute to the operation of a fish farm?

_____

_____

_____

_____

17. Why do salmon return to their birthplace after they mature?

_____

_____

_____

_____

_____