**CHAPTER 12 Food, Soil, and Pest Management**

**Core Case Study: Golden Rice: Grain of Hope or an Illusion?**

1. Poor children that lack Vitamin \_\_\_\_\_ are likely to go blind and are susceptible to common infectious diseases.
2. In 1999, how did scientists, Potrykus and Beyer, help solve this problem?

**12-1: What is Food Security and Why Is It Difficult to Attain?**

Is there enough food in the world for everyone to have food security? \_\_\_\_\_\_\_

What is the root cause of food insecurity?

|  |  |  |
| --- | --- | --- |
| Macronutrient | Food Source | Function/Importance |
|  |  |  |
|  |  |  |
|  |  |  |

Micronutrients include \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ & \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Consequences of undernutrition include

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Complications from malnutrition

Iron: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Vitamin A: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Iodine: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Famine (crop failures) occur from



1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Consequences of Overnutrition

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_ billion people are sick because they do not eat enough,
\_\_\_\_\_ billion people are sick because they eat too much.

Annual Costs:

Money spent annually by Americans on weight loss: \_\_\_\_\_\_\_\_\_\_\_\_

Projected cost to eradicate world hunger: \_\_\_\_\_\_\_\_\_\_\_

**12-2: How Is Food Produced?**

Three systems produce most of our food

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ( %)

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ( %)

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ( %)

The three main grains worldwide are \_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_, & \_\_\_\_\_\_\_\_\_\_\_\_\_.

Types of Agriculture:

1. High Input (Industrialized) Agriculture

Uses \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Requires inputs of: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ & \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Main goal is to:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Forms of Industrialized Agriculture:

|  |  |
| --- | --- |
| Plantation Agriculture | Greenhouses |
|  |  |

1. Low Input (Traditional) Agriculture

|  |  |
| --- | --- |
| Subsistence Agriculture | Intensive Agriculture |
|  |  |

 Why is it a good idea for farmers to grow polycultures?

Slash and Burn agriculture involves \_\_\_\_\_\_\_\_\_\_\_ and clearing small plots of land, growing a \_\_\_\_\_\_\_\_\_\_\_\_\_ of crops for a few years until the soil is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and then shift to another plot.

The Green Revolution

Goal: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3 Requirements:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The Second Green Revolution

Grain production has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ due to the Green Revolution

Genetic Engineering:

Problems with traditional artificial selection

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Benefits of genetically engineered crops – They are resistant to:

1.

2.

3.

4.

5.

6.

7.

Meat Consumption:

Livestock is raised in \_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Meat production has increased \_\_\_\_\_\_\_\_\_\_\_ between 1961 and 2007.

Demand for meat will increase as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

This will require more \_\_\_\_\_\_\_\_\_\_\_\_ for feed.

Fish and Shellfish Production:

 Fishery-

 Aquaculture-

Why is this sometimes called the blue revolution?

 Uses \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ as feed.

This could be a problem because

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.



**Soil: Some of this can be found on pg 281 in Science Focus. The rest you will get in class.**

Topsoil provides:

 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Types of Weathering:

1. Chemical Weathering
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 3. Organic Weathering

 What determines soil type? Typical Soil Make-Up

 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_% Air

 2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_% Water

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_ % Mineral Matter

4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_ % Organic Matter

5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 a. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ What happens in the:

 b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ A layer?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 c. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ B layer?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 d. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Define: Sketch and label a soil profile:

 Soil Profile-

 Soil Horizons-

 O Horizon-

 A Horizon-

 B Horizon-

|  |  |  |  |
| --- | --- | --- | --- |
| Soil Type | Texture | Permeability | Porosity |
| Sand |  |  |  |
| Silt |  |  |  |
| Clay |  |  |  |

 C Horizon-

 Humus-

 Porosity-

 Permeability-

**12-3: What Environmental Problems Arise From Food Production?**

 Using Figure 21-9, describe 5 major harmful environmental effects of food production.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Biodiversity Loss | Soil | Water | Air Pollution | Human Health |
|  |  |  |  |  |

 What is soil erosion and what causes it?

 Two Major Harmful Effects of Soil Erosion:

 1.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 2.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 What is desertification?

 Problems with Irrigation:

|  |  |
| --- | --- |
| Salinization | Waterlogging |
|  |  |

 Industrialized food production requires about \_\_\_\_\_% of commercial energy in the US.

|  |  |  |
| --- | --- | --- |
| Advantages | Genetically EngineeredFoods | Disadvantages |
|  |  |

 How does growing corn in the Midwest for ethanol production decrease production of

 seafood in the Gulf of Mexico?

 Industrialized Meat Production:

|  |  |  |
| --- | --- | --- |
| Advantages | Animal Feedlots | Disadvantages |
|  |  |

 What is done with all of the livestock’s manure in the US?

 Producing more meat will increase pressure on the \_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ supply.

|  |  |  |
| --- | --- | --- |
| Advantages | Aquaculture | Disadvantages |
|  |  |

**12-4: How Can We Protect Crops from Pests More Sustainably?**

 What are pests?

 In what situations are pests actually a good thing?

 Pesticides:

|  |  |  |  |
| --- | --- | --- | --- |
| Insecticides | Herbicides | Fungicides | Rodenticides |
|  |  |  |  |

Where did humans get the idea to use chemicals as pesticides?

|  |  |
| --- | --- |
| First Generation Pesticides | Second Generation Pesticides |
|  |  |

|  |  |
| --- | --- |
| Broad Spectrum Agents | Narrow Spectrum Agents |
|  |  |

 Why is Rachel Carson an important figure in environmental history?

|  |  |  |
| --- | --- | --- |
| Advantages | Modern Synthetic Pesticides | Disadvantages |
|  |  |

 Who regulates the sale and use of pesticides under what Act?

 Is FIFRA working?

 Alternatives to using pesticides:

 1.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 2.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 3.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 4.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 5.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 6.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 7.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Describe the Integrated Pest Management (IPM) program.

**12-5: How Can We Improve Food Security?**

Governments use 3 main approaches to influence food production:

|  |  |  |
| --- | --- | --- |
| Control Prices | Provide Subsidies | Let marketplace decide |
|  |  |  |

List 2 of the 6 programs focused on saving children from poverty that you think are most important:

 1.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 2.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**12-6: How Can We Produce Food More Sustainably?**

Define: Soil Conservation-

 Methods farmers use to reduce soil erosion:

|  |  |  |  |
| --- | --- | --- | --- |
| Terracing | Contour and Strip Planting | Alley Cropping | Windbreaks |
|  |  |  |  |

 \_\_\_\_\_\_ of the US’s original topsoil is gone.

 What happened during The Dust Bowl?

 Define: Organic Fertilizers-

|  |  |  |
| --- | --- | --- |
| Animal Manure | Green Manure | Compost |
|  |  |  |

 Describe one way aquaculture can be practiced more sustainably.

 Why is polyaquaculture a good idea?

 Describe one way meat can be produced more efficiently and humanely.

 Define: Organic Agriculture-

 What must happen for crops to be certified as organic?

Even though organic farming produces 20% less product, how do organic farmers make up for this?

According to Figure 12-32, list 3 benefits to organic farming:

 1.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 2.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 3.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Why is buying locally grown food a good idea?