AP Environmental Systems Ch. 12

**Food Production and the Environment**

**Core Case Study: Growing Power – An Urban Food Oasis**

* Food \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Urban area where people have little or no easy access to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ food
* Growing Power, Inc. in Milwaukee, WI
  + Uses \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ power
  + Produces \_\_\_\_\_\_\_\_\_\_ varieties of vegetables
  + Runs education program

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

* Many people in less-developed countries have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ problems from not getting enough food, while many people in more-developed countries suffer health problems from eating \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_
  + The greatest obstacles to providing enough food for everyone are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_ weather, \_\_\_\_\_\_\_\_\_\_ change, and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ environmental effects of industrialized food production

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Is the Root Cause of Food Insecurity

* Food \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + All or most people in a country have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ access to enough \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ food to lead active and healthy lives
* Food \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ hunger and poor nutrition
  + Causes:
    - Political upheaval, war, corruption, and bad weather

Many People Suffer from Chronic Hunger and Malnutrition

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Carbohydrates
  + Proteins
  + Fats
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Vitamins
  + Minerals
* Chronic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Not enough food to meet basic energy needs
* Chronic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Not enough protein or other key nutrients
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Severe shortage of food
  + Result in mass \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, many \_\_\_\_\_\_\_\_\_\_, economic chaos, and social disruption

Many People Do Not Get Enough \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Most often vitamin and mineral deficiencies in people in less-developed countries
* \_\_\_\_\_\_\_\_\_\_
  + Anemia
* \_\_\_\_\_\_\_\_\_\_
  + Essential for thyroid function

Many People Have Health Problems from Eating Too Much

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Excess body fat from too \_\_\_\_\_\_\_\_\_\_ calories and not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ exercise
* Similar health problems to those who are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Lower \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Greater susceptibility to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Lower \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and life quality

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

* We have used high-input \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ agriculture and lower-input \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ agriculture to greatly increase food supplies

Food Production Has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Dramatically

* Three systems produce most of our food
  + Croplands – \_\_\_\_\_\_\_\_\_\_ on \_\_\_\_\_\_\_\_\_\_ world’s land area
  + Rangelands, pastures, and feedlots – \_\_\_\_\_\_\_\_\_\_ on \_\_\_\_\_\_\_\_\_\_ of world’s land area
  + Aquaculture – \_\_\_\_\_\_\_\_\_\_
* Three main grain crops – \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_
* Irrigation – supply of \_\_\_\_\_\_\_\_\_\_ to crops

Industrialized Crop Production Relies on High-Input \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Industrialized agriculture
  + Heavy \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Large amounts of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ capital, \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_, water, commercial fertilizers, and pesticides
  + \_\_\_\_\_\_\_\_\_\_ crop
* Goal is to steadily increase crop \_\_\_\_\_\_\_\_\_\_
  + Plantation agriculture – \_\_\_\_\_\_\_\_\_\_ crops
    - Primarily in \_\_\_\_\_\_\_\_\_\_-developed countries
  + Increased use of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to raise crops

Traditional Agriculture Often Relies on Low-Input \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Traditional \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ agriculture
  + Human labor and draft animals for family food
* Traditional \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ agriculture
  + Higher yields through use of manure and water
* Polyculture
  + Crop \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ over monoculture
* Slash-and-burn agriculture
  + Subsistence agriculture in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forests
  + Clear and burn a small plot
  + Grow many crops that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at different times
  + Reduced soil \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Less \_\_\_\_\_\_\_\_\_\_ for fertilizer and water

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Agriculture Is on the Rise

* Crops grown with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sound and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ methods
* No \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pesticides or fertilizers
* Has a number of environmental \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Usually produces \_\_\_\_\_\_\_\_\_\_ than conventional agriculture

A Closer Look at Industrialized Crop Production

* \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – increase crop yields
  + Monocultures of \_\_\_\_\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_ key crops
    - Rice, wheat, and corn
  + Large amounts of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_
  + Multiple cropping
* Second Green Revolution
  + Fast growing \_\_\_\_\_\_\_\_\_\_ varieties
* World grain has \_\_\_\_\_\_\_\_\_\_ in production

**Case Study: Industrialized Food Production in the United States**

* Agribusiness
  + Average farmer feeds \_\_\_\_\_\_\_\_\_\_ people
  + Annual sales greater than \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ combined
* Food production – very \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Americans spend \_\_\_\_\_\_\_\_\_\_ of income on food
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ of subsidies and costs of pollution and environmental degradation

Crossbreeding/Genetic Engineering Produce \_\_\_\_\_\_\_\_\_\_ Varieties of Crops/Livestock

* First \_\_\_\_\_\_\_\_\_\_ revolution
  + Cross-breeding through \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ selection
    - \_\_\_\_\_\_\_\_\_\_ process
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ results
* Genetic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – second gene revolution
  + Alter organism’s \_\_\_\_\_\_\_\_\_\_
  + Genetic modified organisms (\_\_\_\_\_\_\_\_\_\_) – transgenic organisms

Meat Production Has Grown \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Animals for meat raised in:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Meat production increased more than \_\_\_\_\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_ between \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_
  + Increased \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for grain
  + Demand is expected to go \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Production Have Increased Dramatically

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Concentration of a particular species suitable for commercial harvesting
  + \_\_\_\_\_\_\_\_\_\_ are overfished
  + \_\_\_\_\_\_\_\_\_\_ harvested at full capacity
* Aquaculture, \_\_\_\_\_\_\_\_\_\_ revolution
  + World’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ type of food production
  + Dominated by operations that raise \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ species

Industrialized Food Production Requires Huge Inputs of \_\_\_\_\_\_\_\_\_\_

* Mostly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy – oil and natural gas
* Agriculture uses \_\_\_\_\_\_\_\_\_\_ of all energy use in the U.S.
* Amount of energy per calorie used in the U.S. has declined \_\_\_\_\_\_\_\_\_\_ since the \_\_\_\_\_\_\_\_\_\_

**12-3 What Environmental Problems Arise from Food Production?**

* Future food production may be limited by \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ water shortages, air and water pollution, climate change, and loss of biodiversity

Producing Food Has Major Environmental Impacts

* Agriculture has harmful effects on:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_

Topsoil Erosion Is a Serious Problem in Parts of the World

* Soil erosion
  + Movement of soil by \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ causes
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ causes
* Two major harmful effects of soil erosion
  + Loss of soil \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Drought and Human Activities Are Degrading \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Productive potential of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ falls by \_\_\_\_\_\_\_\_\_\_ or more
  + Prolonged \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, human activities
* Human agriculture \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ desertification
* \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_
  + Severe wind erosion of topsoil

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Irrigation Has Serious Consequences

* Soil \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Gradual accumulation of \_\_\_\_\_\_\_\_\_\_ in the soil from irrigation water
  + Lowers crop \_\_\_\_\_\_\_\_\_\_ and can even \_\_\_\_\_\_\_\_\_\_ plants
  + Affects \_\_\_\_\_\_\_\_\_\_ of world croplands
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Irrigation water gradually raises \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_
  + Can prevent roots from getting \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Affects \_\_\_\_\_\_\_\_\_\_ of world croplands

Agriculture Contributes to \_\_\_\_\_\_\_\_\_\_ Pollution and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Clearing and burning of forests for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_ of all human-generated greenhouse gases
* Livestock contributes \_\_\_\_\_\_\_\_\_\_ of gases
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in cow belches

Food and Biofuel Production Systems Have Caused Major Losses of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Biodiversity threatened when:
  + Forest and grasslands are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with croplands – tropical forests
* Agrobiodiversity threatened when
  + Genetic diversity used on farms to produce food
* What is the importance of seed banks?

There Is Controversy over Genetically Engineered Foods

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to solve world food problems
* So far genetically modified crops have failed to provide extensive \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Potential environmental effects of genetically modified populations in the wild
  + Creating \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with natural organisms

There Are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the Expansion of the Green Revolutions

* Usually require large inputs of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_
  + Often \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for many farmers
* How can we expand the green revolution?

Industrialized Meat Production Has Harmful Environmental Consequences

* Pros:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ meat supply
  + Reduced \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Kept food prices \_\_\_\_\_\_\_\_\_\_
* Cons:
  + Uses large amounts of \_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ environmental costs

Aquaculture Can Harm Aquatic Ecosystems

* Several environmental problems
  + \_\_\_\_\_\_\_\_\_\_ are caught to feed to other \_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ process
    - Environmental \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Spread \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ plant species
  + Fish farms produce \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

* We can sharply cut pesticide use without decreasing crop yields by using a \_\_\_\_\_\_\_\_\_\_ of:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ techniques
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pest controls
  + Small amounts of selected \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pesticides as a last resort (integrated pest management)

Nature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the Populations of Most Pests

* \_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with human welfare
* Natural \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ control pests
  + Predators, parasites, disease organisms
  + In natural \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + In many polyculture \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* What will happen if we kill the pests?

We Use Pesticides to Help Control Pest Populations

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Chemicals used to kill or control populations of pests
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Produced by plants to ward off insects and herbivores
* \_\_\_\_\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pesticides
  + Borrowed from plants
* \_\_\_\_\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pesticides
  + Lab produced
    - \_\_\_\_\_\_\_\_\_\_ and others
* \_\_\_\_\_\_\_\_\_\_-spectrum and \_\_\_\_\_\_\_\_\_\_-spectrum agents
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ varies

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pesticides Have Several Advantages

* \_\_\_\_\_\_\_\_\_\_ human lives
* Increases food \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for farmers
* Work \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* For many, health risks are very \_\_\_\_\_\_\_\_\_\_ relative to benefits
* New pest control methods: \_\_\_\_\_\_\_\_\_\_ and more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Synthetic Pesticides Have Several \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Accelerate rate of genetic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in pests
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for farmers
* Some insecticides \_\_\_\_\_\_\_\_\_\_ natural predators/ parasites that help control \_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the environment
* Some harm \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Some are human health \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Case Study: Ecological Surprises: The Law of Unintended Consequences**

* \_\_\_\_\_\_\_\_\_\_ used to kill malaria-carrying mosquitoes
  + Have also killed other animals
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Pesticide Use Has \_\_\_\_\_\_\_\_\_\_ Reduced U.S. Crop Losses to Pests

* \_\_\_\_\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_ – crop losses from insects increased from \_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_, even with \_\_\_\_\_\_\_\_\_\_ increase in pesticide use
  + High environmental, health, and social \_\_\_\_\_\_\_\_\_\_ with use
  + Use \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pest management practices
* Pesticide industry \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ these findings

\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Can Help to Protect Us from the Harmful Effects of Pesticides

* \_\_\_\_\_\_\_\_\_\_ federal agencies and laws
  + \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_
  + Fungicide and Rodenticide Act, \_\_\_\_\_\_\_\_\_\_
  + Food Quality Protection Act, \_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of active and inactive pesticide ingredients are poorly documented
  + U.S. exports many \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pesticides
  + Poisons can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the atmosphere

There Are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to Synthetic Pesticides

* \_\_\_\_\_\_\_\_\_\_ the pest
  + Crop rotation; changing planting times
* Provide homes for pest \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Use polyculture
* Implant genetic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – genetic engineering
* Bring in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ enemies
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Use insect perfumes
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Bring in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Interfere with pest \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_
* Alternative methods of \_\_\_\_\_\_\_\_\_\_ control
  + Crop rotation, cover crops, and mulches

\_\_\_\_\_\_\_\_\_\_ Is a Component of More Sustainable Agriculture

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pest management (IPM)
  + Coordinate – cultivation, biological controls, and chemical tools to reduce crop damage to an economically tolerable level
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ pollution and pesticide \_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Requires \_\_\_\_\_\_\_\_\_\_ knowledge
  + High \_\_\_\_\_\_\_\_\_\_ costs
  + Government \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

* We can improve food security by reducing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and chronic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, relying more on locally grown food, and cutting food \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Use Government Policies to Improve Food Production and Security

* Control \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to make food \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Provide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to farmers
* Let the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ decide
  + Working in New Zealand and Brazil

Other Government/Private Programs Are Increasing Food Security

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ children against childhood diseases
* Prevent \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in infants and children
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ diverse gene pool

We Can Grow and Buy More Food Locally and Cut Food Waste

* Community-supported agriculture
  + Buy shares of a \_\_\_\_\_\_\_\_\_\_ farmers crops
* Reduce fossil fuel energy \_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ farms
  + Potential for the future

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

* We can produce food more sustainably by:
  + Using resources more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Sharply decreasing the harmful environmental effects of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ food production
  + Eliminating government \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that promote such harmful impacts

Many Farmers Are Reducing Soil Erosion

* Soil conservation
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ planting
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cropping with cover crop
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cropping, agroforestry
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or shelterbelts
  + Conservation-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ farming
* Identify \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ hotspots

We Can Restore Soil Fertility

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fertilizer
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ manure
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ manure
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Manufactured \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fertilizer
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Crop \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

We Can Reduce Soil Salinization and Desertification

* Soil salinization
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ solutions
* Desertification
  + Decrease:
    - Population \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ forms of planting, irrigation, and mining

Some Producers Practice More Sustainable Aquaculture

* \_\_\_\_\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ aquaculture
  + Choose \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fish
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ aquaculture
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

We Can Produce \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ Products More Efficiently

* Shift to more \_\_\_\_\_\_\_\_\_\_-efficient forms of protein
* Beef from rangelands and pastures, not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Develop \_\_\_\_\_\_\_\_\_\_ substitutes
* Eat \_\_\_\_\_\_\_\_\_\_ meat

We Can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to More Sustainable Food Production

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ agriculture
  + Uses fewer inputs
  + Creates less pollution
  + Contributes less to global warming
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ farming
  + Has many benefits
  + Requires more labor
* Strategies for more sustainable agriculture
  + Research on organic agriculture with \_\_\_\_\_\_\_\_\_\_ nutrition in mind
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of how organic agricultural systems work
  + Subsidies and foreign aid
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ programs; college curricula
  + Increased use of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Greater use of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy

Three Big Ideas

* About 1 billion people have health problems because they do not get enough to eat and 1.6 billion people face health problems from eating too much
* Modern industrialized agriculture has a greater harmful impact on the environment than any other human activity
* We should switch to more sustainable forms of food production
  + Greatly reduce harmful environmental impacts of industrialized food production systems
  + Will likely increase food security

Tying It All Together: Growing Power and Sustainability

* Urban farm – providing food to people in a food desert
* Rely more on solar energy
* Topsoil conservation
* Organic pest control