

# The Next Green Revolution

**Science prevented the last food crisis. Can it save us again?**



# The Green Revolution

- Dramatically increased per-acre yields
- Spread to the developing world in the 1940s with wheat, rice, corn
- Depended on large amounts of
  - Synthetic fertilizers
  - Chemical pesticides
  - Irrigation
  - Heavy equipment



Copyright © 2008 Pearson Education, Inc., publishing as Pearson Benjamin Cummings

# Norman Borlaug



# Benefits of the Green Revolution

- From 1900 to 2000, cultivated area increased 33%, while energy inputs increased 80 times!
- Positive effects on natural resources
  - Prevented some deforestation
  - Preserved biodiversity

# Harm From the Green Revolution

- Negative effects on natural resources
  - Pollution
  - Erosion
  - Salinization
  - Desertification

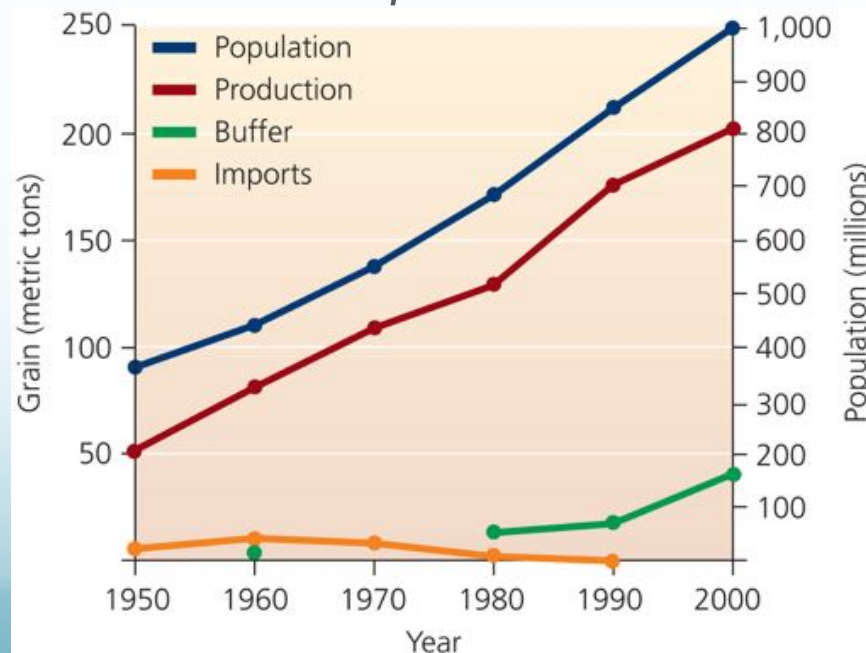


# The Green Revolution in India

- Between 1961 and 2003
  - Population increased 100%
  - Food production increased 150%

*As a result of the green revolution, India became a grain exporter*

Buffer=grain reserve in the event of food shortages



# Weighing The Issue:

## Turn & Talk

- Given that the green revolution has increased crop yields, but only by using increased fertilizers, pesticides, irrigation, and hybrid seed, do you consider it a success?
  - A. Yes, because more people were fed, regardless of the price
  - B. Yes, because industrialized countries can help through education and technology
  - C. No, we will have to eventually pay the environmental costs of producing food in this way
  - D. It does not matter, I can buy food whenever I want

# Monocultures Increase Output, But At A Cost

- **Monoculture:** A large expanse of a single crop
  - More efficient, increases output
  - Devastates biodiversity
  - Susceptible to disease and pests
- Narrows human diet: 90% of our food comes from 15 crop species and 8 livestock species

*Armyworms  
easily defoliate  
monocultures*







©MARLIN E. RICE

# Check In Question #1: **Turn & Talk**

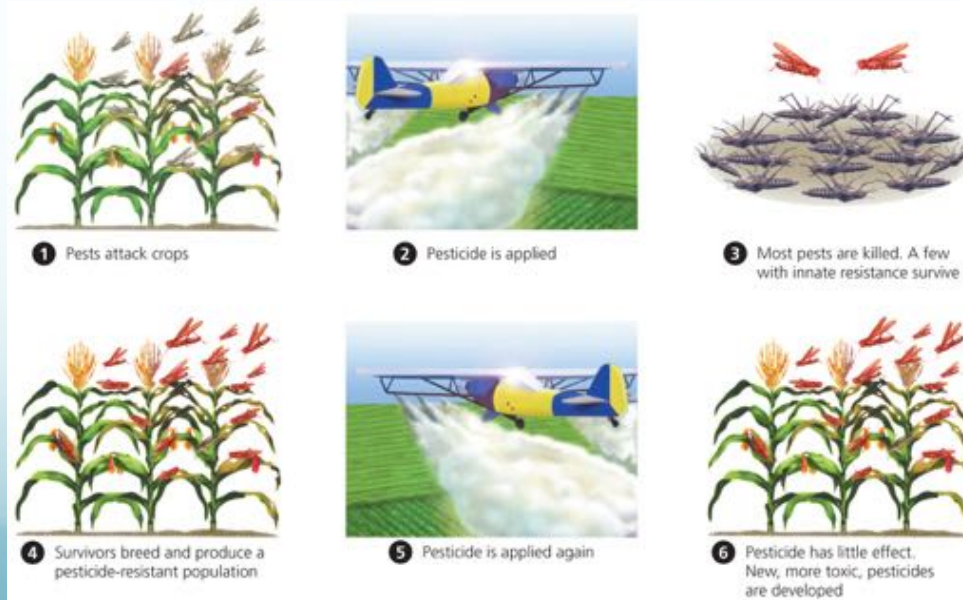
- Which of the following is NOT correct about monocultures?
  - A. They are an efficient way to produce food
  - B. They increase biodiversity
  - C. They make crops more susceptible to disease
  - D. They narrow human diets

# Pests and Pollinators

- **Pest:** Any organism that damages valuable crops
- **Weed:** Any plant that competes with crops
- **Pesticides:** Poisons that target pest organisms
  - **Insecticides:** Target insects
  - **Herbicides:** Target plants
  - **Fungicides:** Target fungi
- 400 million kg (900 million lbs.) of pesticides are applied in the U.S. each year
  - 75% of this is applied to agricultural land
  - Usage is increasing in developing countries

# Resistance to Pesticides

- Some individuals are genetically immune to a pesticide
  - They survive and pass these genes to their offspring
- Pesticides stop being effective
  - **Evolutionary arms race:** chemists increase chemical toxicity to compete with resistant pests









# Essay Question: **Turn & Talk**

- What kinds of techniques have people employed to increase agricultural food production?
- How did agricultural scientist Norman Borlaug help inaugurate the green revolution?

# Essay Question: **Turn & Talk**

- Explain how pesticide resistance occurs.