

**Please sit in the middle  
section and in the first 5  
rows only!**

**SIGN IN WILL GO ONCE WE  
START!**

- Look for your **name**, it is in **ABC order** by **last name**. IF for **ANY** reason, your name is **NOT** on the list, please **add it** to the last page with blank lines.
- Perfect attendance = prizes, do **NOT** forget to sign in at **EACH** class! 😊 You also get prizes for coming to 7 or 6 of the 8 sessions!

# Agriculture

*Origins, Innovations, and Diffusion*

**UCR AP Readiness**

**January 25, 2020**



*Miss Cisneros -or- Miss C*



Email: **CisnAL@fUSD.net**

Remind (app or text #81010):  
**@UCRAPHUG**

# Things to Note!

- **Eating in Class:** Please clean up after yourself!
- **Restrooms:** Located in the back of this classroom/lecture hall.
- **Expectations of Behavior:** Be an excellent reflection of your high school. 😊 Be on time, respectful, stay off your electronics.
- **UCR AP Readiness Breaks:** Keep aware of time, stick to areas near your classes. 😊



# UCR AP Readiness: What is it?!

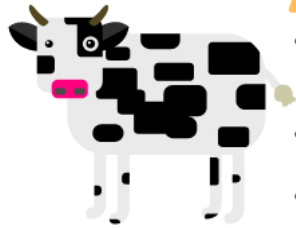


# Things to Know!



## UNIT 5

### AGRICULTURE & RURAL LAND USE



#### INTRODUCTION TO AGRICULTURE

- Agricultural practices are influenced by the physical environment and climatic conditions, such as the Mediterranean and tropical climates
- Intensive farming practices include market gardening, plantation agriculture, and mixed crop/livestock systems
- Extensive farming practices include shifting cultivation, nomadic herding, and ranching

#### SETTLEMENT PATTERNS

- Specific agricultural practices shape rural land use patterns
- Rural settlement patterns are classified as clustered, dispersed, or linear
- Rural survey methods include metes and bounds, township and range, and long lot



#### ORIGINS & REVOLUTIONS

- Early hearths of domestication of plants and animals arose in the Fertile Crescent, Indus River Valley, Southeast Asia and Central America and diffused with the Columbian Exchange
- New technology and increased food production in the 2nd agricultural revolution led to better diets longer life expectancies, and more people to work in factories
- The Green Revolution was characterized by the use of high-yield seeds, increased use of chemicals, and mechanized farming - impacting human populations & the environment



#### ORGANIZATION OF AGRICULTURE

- Production regions are defined by the extent to which they reflect subsistence or commercial practices (monocropping or monoculture)
- Large scale commercial agricultural operations are replacing small family farms
- Complex commodity chains link production and consumption
- Technology has increased economies of scale and the carrying capacity of the land

#### VON THUNEN MODEL

- Von Thunen's model helps to explain rural land use by emphasizing the importance of transportation costs associated with distance from the market; however, regions of specialty farming do not always conform to von Thunen's concentric rings
- Intensive and extensive farming practices are determined in part by land costs (bid-rent theory)



#### GLOBAL SYSTEM OF AGRICULTURE

- Agricultural products are part of a global supply chain
- Some countries have become highly dependent on one or more export commodities
- The main elements of global food distribution networks are affected by political relationships, infrastructure, and patterns of world trade

#### CONSEQUENCES & CHALLENGES

- Environmental effects include pollution, land cover change, desertification, soil salinization, and conservation efforts
- Slash & burn, terraces, irrigation, deforestation, draining wetlands, shifting cultivation, and pastoral nomadism alter the landscape
- Societal effects include changing diets, role of women in production, and economic purpose
- Innovations like biotechnology, GMOs, and aquaculture have been accompanied by debates over sustainability, soil & water usage, reductions in biodiversity, and extensive fertilizer/pesticide use
- Creation of new movements like urban farming, community supported agriculture, organic farming, value added specialty crops, fair trade, local food movements, and dietary shifts
- Challenges include food insecurity, food deserts, distribution systems, adverse weather, and loss of land due to suburbanization





# **Agriculture Trivia!**

**What percentage of the  
world works in  
agriculture related jobs?**

**40%**

# **Agriculture Trivia!**

**In 1960, the average U.S. farmer could produce food for 25.8 people. How many can a farmer feed today?**

**155**



# **Agriculture Trivia!**

**What percentage of the  
U.S. population is  
comprised of farm and  
ranch families?**

**2%**

# **Agriculture Trivia!**

**What is the number 1 fruit crop in the world (and 4<sup>th</sup> overall crop)?**

**Banana**



# **MOST IMPORTANT QUESTION**



# **Agriculture Trivia!**

**Where was the potato  
“invented”  
(domesticated)?**

**Peru**



# **Agriculture Trivia!**

**How many different  
varieties of potatoes are  
there?**

**Over 4,000!**

**Food...is life.**





# Agriculture

## There are 3 Agricultural Revolutions

- **First Agricultural Revolution**: (aka Neolithic Revolution) 10,000 – 2,500 B.C. [Fertile Crescent, Indus River Valley, Southeast Asia, Central America]
  - Moving from hunting and gathering to sedentary plant and animal domestication
- **Second Agricultural Revolution**: 1700s – 1900s [Western Europe]
  - New farming and storage abilities increased food supplies to meet a growing and urbanizing population.
- **Third Agricultural Revolution**: 1950s – now [North America]
  - Distributed mechanized farming technology and agricultural chemicals on a global level.



# Agriculture



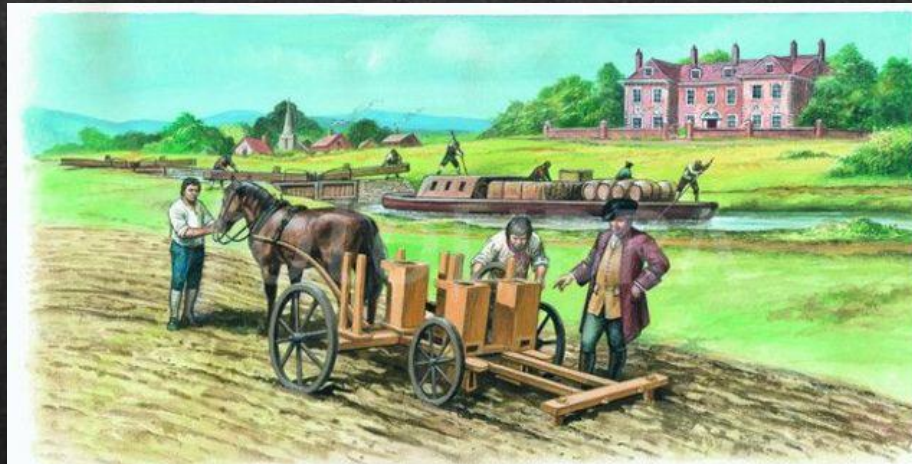
**First Agricultural  
Revolution**  
*Neolithic*



**Third Agricultural  
Revolution**  
*Green + Gene*

## AGRICULTURE REVOLUTIONS

**Second Agricultural  
Revolution**

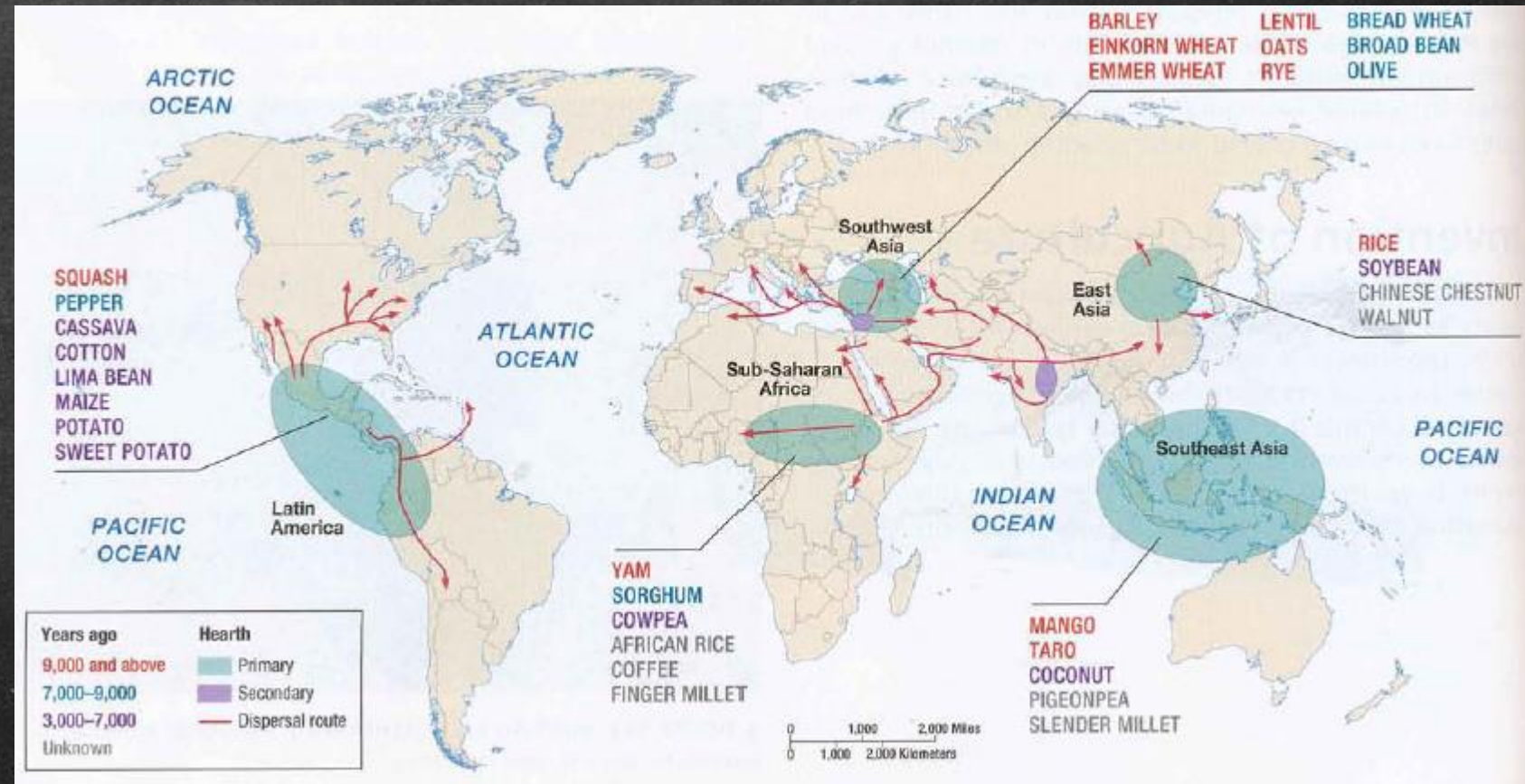




# Agriculture

## First Agricultural Revolution

- The First Agricultural Revolution developed through **independent invention**. This means it began in multiple different places at once.





# Agriculture

## First Agricultural Revolution

- People settle in one area permanently (**sedentary**).
- **Subsistence farming**: producing food for personal/family/community use.
- Used **human** and some **animal** power to grow crops.
- **Stage 2** of DTM: High birth rates, children needed to work on farms (free labor!)





# Agriculture

## Agricultural Hearths

TIME PERIOD	LOCATION	CROPS		EARLY DIFFUSION PATTERN
10,000 to 12,000 years ago	Southwest Asia (Fertile Crescent)	-Barley -Lentils -Oats	-Wheat -Olives -Rye	▪ North Africa ▪ Southern Europe ▪ Central Asia
10,000 years ago	Southeast Asia	-Mango -Taro	-Coconut	▪ Southeastern Asia
9,500 years ago	East Asia	-Rice -Walnut	-Soybean	▪ North Central Asia ▪ Korean Peninsula
7,000 years ago	Sub-Saharan Africa	-Yams -Cowpeas -African rice	-Sorghum -Coffee	▪ Western African ▪ North Africa
5,000 years ago	Mesoamerica	-Squash -Maize (corn) -Sweet potato	-Peppers -Potato <3 -Cassava	▪ North America ▪ South America

# Agriculture

## The good and the bad...

- **PROS**

- Faster food production.
- Cities developed.
- Population grew.
- Allowed for specialization of crops and jobs.

- **CONS**

- Caste/social system developed.
- Fatal diseases became more frequent (contagious among sedentary groups)
- Human lifespan decreased.





# Agriculture

## Columbian Exchange

- Domesticated world crops moved from the **New World** (South and Central America) to the **Old World** (Europe, Asia, Africa) through **relocation** diffusion
- Happened with the **conquest** of the Americas in the 1500s
  - Came after the voyage of Christopher **Columbus**





# Agriculture

## Second Agricultural Revolution

- Occurred in the developed world, mainly in Europe and the United States
- Increased productivity through new and better agricultural technology and techniques
- Brought better cultivation (growth), production (creation), and storage methods for crops
- Mechanization (use of machines) was first introduced to agriculture





# Agriculture

## Second Agricultural Revolution

- Development of commercial agriculture
  - agriculture that generates products for sale off the farm
    - Machines or farming technology power used to grow crops
- Closely related to the Industrial Revolution (happens at the same time)
- Stage 2 & 3 of DTM
  - High birth rates because of children needed for help on farm
  - As people move to city, low birth rate because of less need for children





# Agriculture

## Inventions and Innovations

- While there were MANY inventions and innovations, here are a few big ones:
  - Crop rotation: Planting of different crops in the same field year to year to replenish the nutrients in the soil, maintains the fertility of fields
  - Cotton gin: Eli Whitney, 1793, cleaned cotton of seed faster
  - Seed drill: created small holes and placed seeds directly into them
  - Animal husbandry: Animals purposely inbred and hybridized (combined with a different species of same animal); better output of meat, wool, milk, etc.



# Agriculture

## Crop Rotation



WEED OUTCOME

YEAR 1

YEAR 2

YEAR 3

YEAR 4

Poor



CORN



CORN



CORN



CORN

Fair



CORN



SOYBEAN



CORN



SOYBEAN

Better



CORN



WHEAT



SOYBEAN



CORN



WHEAT



SOYBEAN

Best



CORN



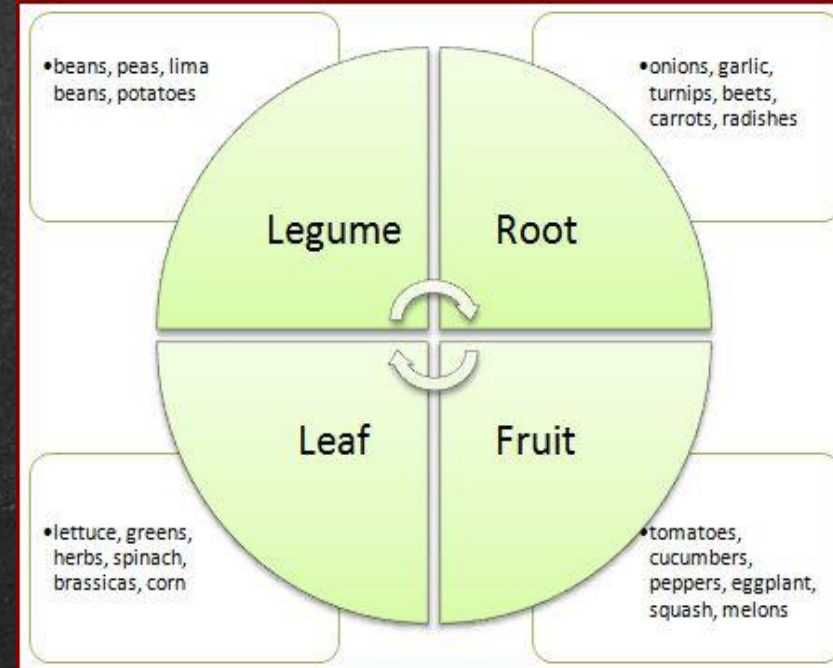
WHEAT



SOYBEAN



ALFALFA







# Agriculture

## Third Agricultural Revolution

- During this time there was a rapid diffusion of new agricultural technology and genetic engineering.
- increased food availability to rapid growing populations in Africa, Asia, and Latin America
- Invention and quick diffusion of agricultural techniques:
  - Genetic Engineering/biotechnology
  - Feedlots/Factory farms
  - Irrigation pumps
  - Irrigation dependent plants such as corn, rice, and wheat
  - Pesticides and chemical-based fertilizers
  - Tractors





# Agriculture

## *Green Revolution 1965-1985*

- First stage of the Third Agricultural Revolution
- Norman Borlaug started the Green Revolution (he was a microbiologist from Iowa who was successful at turning Mexico into a wheat exporting country)
- Goal of the Green Revolution: To end world hunger in LDCs (especially India)
- Positively affected Mexico, East Asia, Southeast Asia, India and Pakistan; did not affect Sub-Saharan Africa





# Agriculture

## The good and the bad...of the Green Rev.

### • PROS

- More food produced which helped alleviate world hunger in LDCs.
- Population doubled.
- Irrigated land doubled across the world.
- Lower death rates.
- Lower food prices.
- Many LDCs became self-sufficient in growing grains and rice.



### • CONS

- Farmers went into more debt.
- Weeds became more resistant to pesticides.
- Environmental damage caused by double cropping.
- Fertilizer use led to chemicals leaking into streams, rivers, and lakes which led to species extinction and health issues
- Use of machines run off petroleum led to air and water pollution



# Agriculture

## *Gene Revolution ~1970 – now...*

- Second stage of the Third Agricultural Revolution
- Was the transition from the Green Revolution to more genetic engineering and more company involvement in research and patenting
- Happened mostly in MDCs, especially in the US; most LDCs were unaffected





# Agriculture

## *Gene Revolution ~1970 – now...*

- Biotechnology (Biotech): improving livestock and crops through genetic engineering; example: genetically modified organisms (GMOs)
- Genetically Modified Organisms (GMOS): created by taking the genes from one organism and inserting them into another organism; use of engineering techniques to change the DNA of a seed or egg; very controversial; example: genetic code of rice can be changed to include a natural pesticide from a species of bacteria; most GMOs are corn, soybeans, and cotton in the US and they are disease-resistant and produce large yields
- Monsanto: Biotech company that creates GMOS; has caused controversy because they patent their GMO technology and control most GMOS on the market today
- Terminator Seeds: GMO seeds created by Monsanto that do not produce offspring; farmers are forced to purchase new seeds each year; recently banned

# Agriculture

## The good and the bad...of the Gene Rev.

### • PROS

- lower price of goods
- less need for chemical inputs (fertilizers)
- use of smaller pieces of land
- greater food security for growing populations

### • CONS

- unknown health effects
- effects on pollinating insect populations (ex. bees),
- puts small-scale farmers or farmers out of business







# Growing Concerns: GMO Crops Worldwide

BETWEEN 1996  
& 2011 THERE HAS BEEN A  
**9,000%**  
INCREASE IN ACRES  
OF GMO CROPS PLANTED  
WORLDWIDE

**93%**  
OF THE SOY GROWN IN  
THE UNITED STATES IS  
GENETICALLY  
MODIFIED

BY **2050** THE  
WORLD WILL HAVE TO PRODUCE  
**70% MORE FOOD,**  
INCLUDING AN ADDITIONAL  
**BILLION TONS**  
OF CEREALS, TO KEEP UP WITH  
POPULATION GROWTH

JUST **27%**  
OF EUROPEANS  
ARE IN FAVOR OF  
GMO FOOD

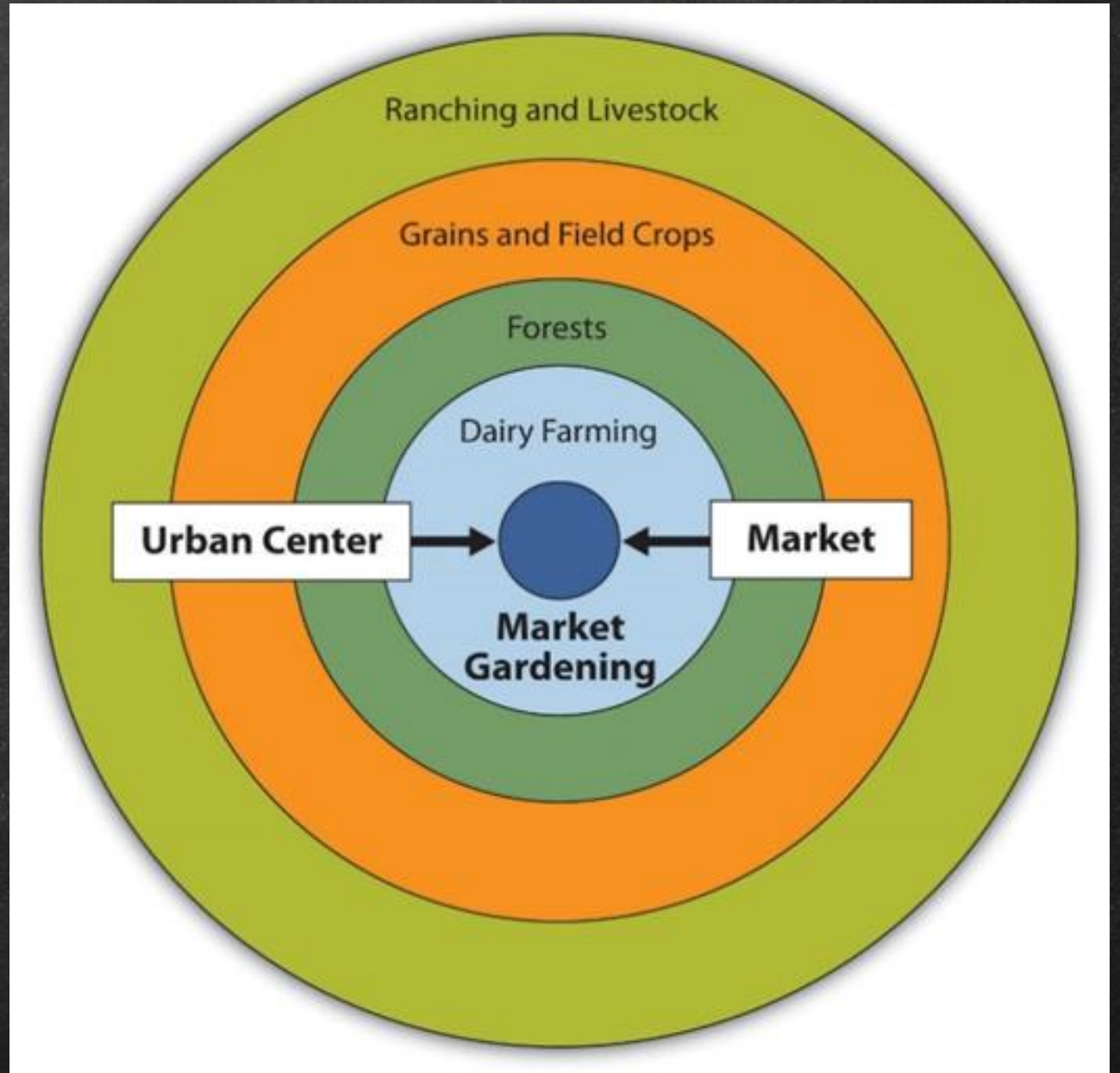
 COUNTRIES WITH COMMERCIALY  
CULTIVATED GM CROPS, 2011





## Von Thunen's Model

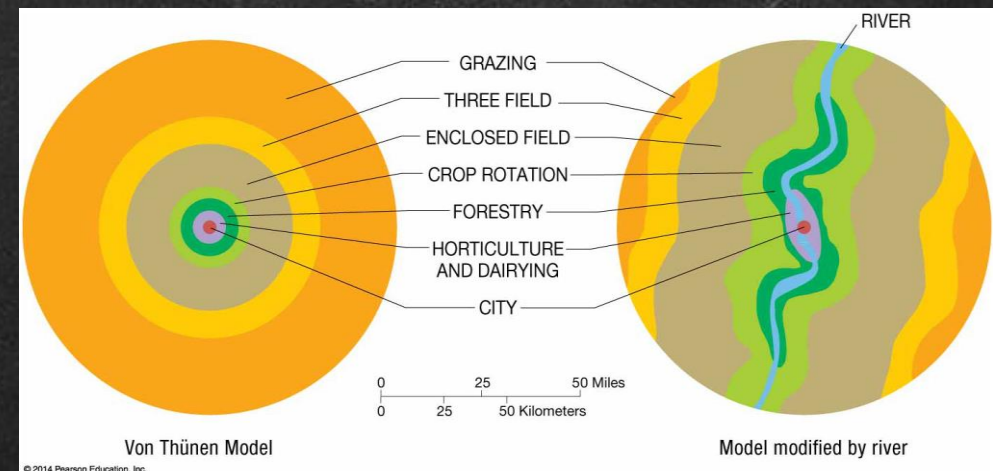
- helps to explain rural land use by emphasizing the importance of transportation costs associated with distance from the market



# Agriculture - Revolutions

## Von Thunen's Model

- Von Thünen
  - German farmer
  - Mapped out his rural (agricultural) land from his experience with farms in Germany and how close certain farming is to the central city or market
  - He claimed that farmers needed to decide what to produce based on their:
    - distance to the market
    - transportation costs
  - He assumed that agriculture was a business and farmers wanted to make a profit
- His model:
  - has four rings of land use (SEE NEXT SLIDE)
  - was based on the following assumptions:
    - the market is in the center of an isolated state
    - the land is flat
    - farmers transport their own goods to market by wagon

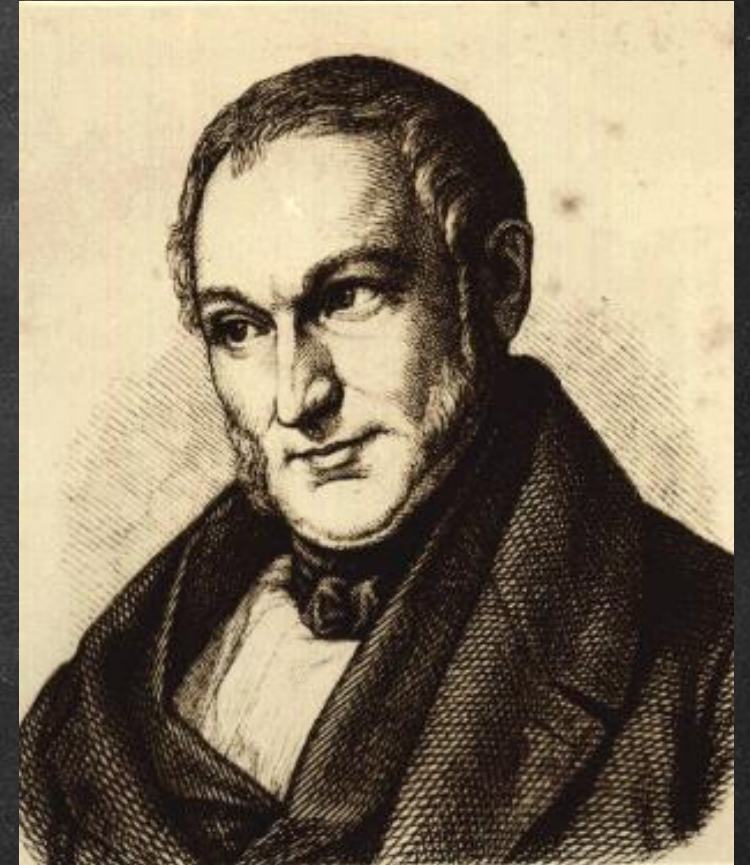




# Agriculture - Revolutions

## Von Thunen's Model

- includes intensive and extensive agriculture
  - Intensive agriculture:
    - Needs a high input of labor/capital/machines
    - Crops are closer together
    - More crops can be planted in less space
    - Example: fruits and vegetables
  - Extensive agriculture
    - Doesn't need as many inputs
    - Crops/livestock tend to be more spread out
    - Example: grains (corn, rice, wheat) and cattle
- explains location theory and how economic activity is related to land space where goods are produced
- was created before industrialization



# von Thünen's Model of Rural Land Use

- RING 1
  - What is cultivated/ raised?
  - **Horticulture** or market gardening/truck farming that produces **garden** vegetables and fruits\*
  - **Dairy** farming
- Intensive or extensive agriculture?  
intensive
- Why is it located the closest to the central city?
  - Farmers grow **garden** vegetables and raise dairy cows near city because they are **perishable** or generate perishable products
  - Not only do these products spoil but they are also **expensive** to deliver





# von Thünen's Model of Rural Land Use

- RING 2
  - What is cultivated/ raised?
    - Forest
  - Intensive or extensive agriculture? extensive
  - Why is it located close to the central city?
    - Trees are bulky and heavy to transport
    - When von Thünen was alive, towns were surrounded by forests
    - Forests are needed for fuel and construction of buildings and homes



# von Thünen's Model of Rural Land Use

- RING 3

- What is cultivated/ raised?

- Field crops

- Intensive or extensive agriculture?  
extensive

- Why is it located further away from the central city?

- Field crops, such as wheat, corn, and other grains, are less perishable

- These crops are rotated from one year to the next

- Used for feeding livestock in outer ring





# von Thünen's Model of Rural Land Use

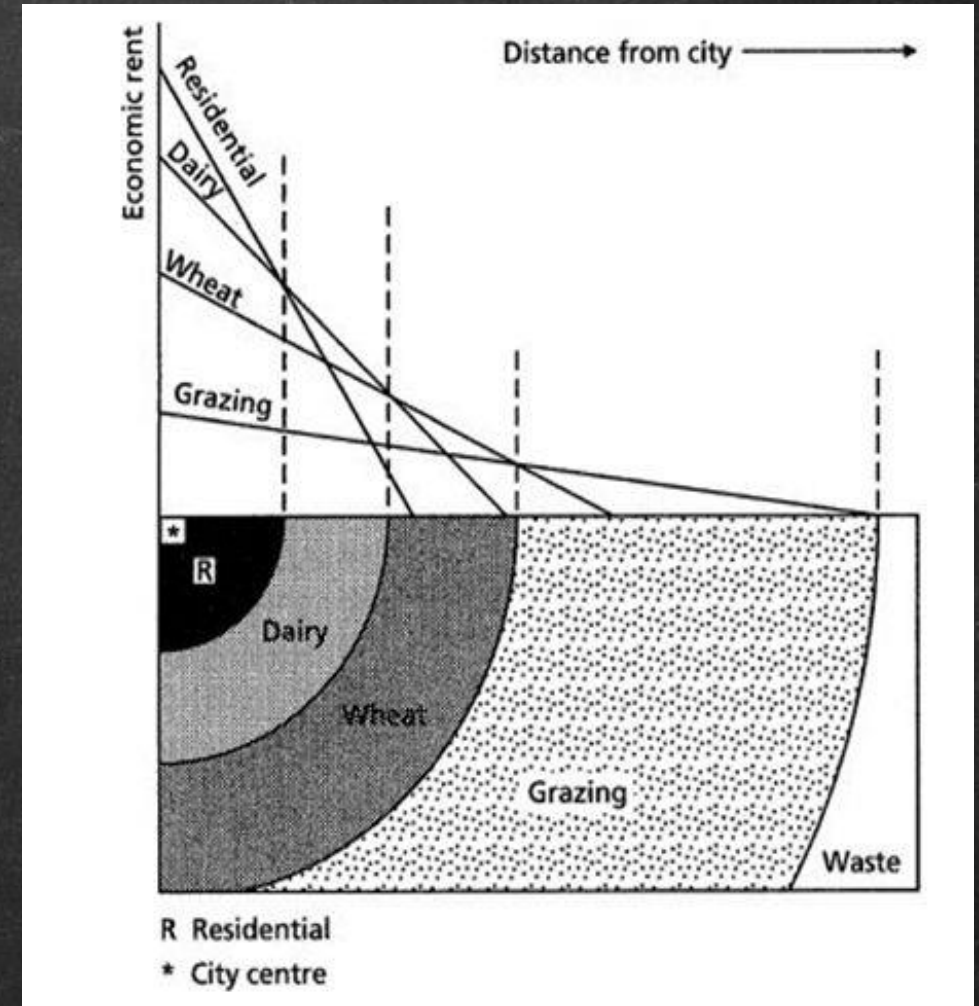
- RING 4
  - What is cultivated/ raised?
    - Livestock grazing
  - Intensive or extensive agriculture? extensive
  - Why is it located the furthest away from the central city?
    - Livestock grazing requires a lot of space
    - Beyond this ring, it is unprofitable to farm because transportation costs are too high
    - Cattle are walked to the market to be slaughtered and sold in the market



# Agriculture - Revolutions

## Bid-Rent Theory

- Used to indicate the **starting** position for each land use (based on where it is **located** in relation to the market)
- Shows where each **ring** in Von Thünen's Model begins and ends
- Also known as **bid** price curve
- Each line on the graph reflects the farmers' **willingness** to pay for land at various distances from the market
- A farmers is willing to pay **more** if they are **closer** to the market



- As distance from city center increases, cost of land goes down.



# Agriculture - Revolutions

## Food on a GLOBAL scale:

- Wealthy developed countries (MDCs) benefit from this global supply chain of food but developing countries (LDCs) do not:
  - Farmers in developing countries might not be able to afford to consume the products/crops they produce and extract from the ground or trees
  - Focusing on growing cash crops such as coffee, cotton, tobacco, and mustard in developing countries decreases the supply of needed foods which can cause famine and starvation
  - Farmers in developing countries choose farming techniques that are not sustainable such as shifting cultivation. These practices cause soil erosion, deforestation, and pollution



# GLOBALIZATION OF FOOD

IN THE  
USA

airfreight generates **50x** more  
CO<sub>2</sub> than sea shipping



**.16** metric tons of  
CO<sub>2</sub> from produce  
distribution annually

**30%** food wasted  
(\$48.3 billion)

**10-15%**  
food wasted in  
transportation,  
processing and  
storage

the top **4** food  
food retailers sell  
**36%** of  
America's food in  
2012

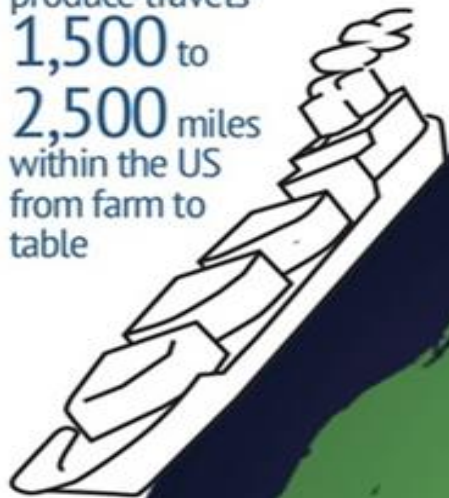
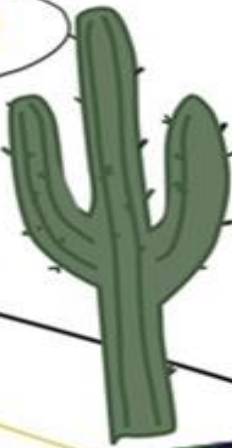


**23.5**  
million  
people live  
in a food  
desert  
**13.5**  
are low-  
income

Cities are up to  
**10X**  
hotter than  
their suburban  
and rural  
counterparts



produce travels  
**1,500** to  
**2,500** miles  
within the US  
from farm to  
table





# Student Evaluation

<http://bit.ly/UCR0125>

Last name: Cisneros

**\*\*Please do the survey and suggest topics! We want to help you as much as we can. Doing 1 survey after each class helps all of us!\*\***