Agricultural ecology

- Cultural adaptation

- How weather and climate probably exert the greatest influence on different forms of agriculture
  - Cultivation of frost-sensitive crops is very expensive outside tropical areas
  - Plantation agriculture thrives because it produces cash crops wanted by people in the middle latitudes where the crops cannot grow
  - Market gardening in the southern and southwestern United States provides citrus fruits, winter vegetables, and other crops to the urban markets of the Northeast
Agricultural ecology

- Cultural adaptation
- Need for abundant irrigation water confines paddy rice farming to its present limits in Asia
- Soils also play an important role in agricultural decisions
  - Shifting cultivation reflects an adaptation to poor tropical soils
  - The practice of peasant grain, root, and livestock agriculture is often successful because of the long lasting fertility of local volcanic soils
- Terrain influences agriculture because farmers tend to crop farm in level areas
Agricultural ecology

- The subtle influence of farming in marginal areas
  - Paddy rice farmers developed complex strategies to avert periodic famine because of unreliable rainfall, which included many varieties of rice
  - Farmers in Thailand rejected the Green Revolution because its methods were not appropriate for their marginal lands
  - Example of West Africa
    - Many crops are grown in the more humid lands near the coast
    - Moving inland, only a few drought-resistant basic crops are grown
Agricultural ecology

Many geographers believe we must cease imposing Western innovations on farmers in the less-developed countries.

- Traditional agriculture and resource management merit serious consideration.
- We should stop assuming our innovations are superior to the old ways.
- We have caused irretrievable loss of traditional farming knowledge.
Agricultural ecology

- Agriculturists as modifiers of the environment
  - Started after the domestication of plants and animals
  - Natural vegetation has been altered in a major way
    - To the hunter and gatherer, the forest harbored valuable wild plants and animals
    - To the agriculturist, woodlands had to be cleared to make fields
    - As populations grew, farmers expanded small patches of cleared land until these areas merged with other clearings
Agricultural ecology

- Agriculturists as modifiers of the environment
  - In parts of China, India, and the Mediterranean region, forests vanished
    - Forests were greatly reduced in trans-Alpine Europe, and the United States
    - A thousand-year clearing of forests in central Europe
  - Shifting cultivators in Africa’s rain forests produce acid rain levels comparable to those of industrial areas through their slash and burn practices
Humans as modifiers
Agricultural ecology

- Desertification
- Grassland modifications
  - Prairies gave way to plow
  - Overgrazing caused severe damage
- First studied a half-century ago by Rhoads Murphey
  - Assembled evidence farmers caused part of North Africa to be added to margins of Sahara Desert
Agricultural ecology

- Desertification
- Rhodes noted catastrophic decline of countries such as Libya and Tunisia
  - During Roman times served as “granary of the Empire”
  - Yielded huge wheat harvests
  - Many districts had substantially larger populations
  - Steady decline in agricultural production
  - Recent research centers on the Sahel region—just south of Sahara Desert
Agricultural ecology

- Desertification
- Destruction of land could pass a critical threshold
  - Plant life could not regenerate
  - Rainfall could be reduced
  - Temperatures could increase
- Region could become permanently joined to the adjacent Sahara
- Asia, Australia, the Americas, and Europe may also have endangered districts
Agricultural ecology

- Some scholars challenge the world’s deserts are on the march
  - Satellite imagery suggests since 1960 the Sahara/Sahel boundary has fluctuated as it always had
  - Boundary responds to wetter and drier years
  - Natural fluctuations need to be distinguished from actual soil degradation
Solutions proposed by those who accept notions concerning desertification

- The Poppers proposed huge areas of the Great Plains be withdrawn from farming and ranching
- Poppers want to create a “buffalo commons”—an expanse of restored natural grassland grazed by native animals
Agricultural ecology

- Desertification and irrigation
  - Benefits of ditch and canal irrigation often cause unintentional environmental destruction
    - Can cause water table to rise, waterlogging the soil, and salinizing the ground
    - In Pakistan, the water table rose 10 to 30 feet adding 800 to 2000 pounds of salt per acre
Agricultural ecology

- Well and pump irrigation has caused a lower water table in Texas
  - Ancient springs have gone dry
  - An early end to promising intensive agriculture is foreseen
  - Other parts of the American Great Plains are also suffer from a lower water table caused by well and pump irrigation
Agricultural ecology

- Irrigation caused desertification of the Aral Sea
  - Caused by diversion of water from inflowing rivers
  - Large areas of dry lake bed are now exposed
  - Local fishing industry is destroyed
  - Health problems have been caused by dust storms from the dry lake bed blowing chemical-laden dust onto nearby settlements
Agricultural ecology

- Increasing contamination of the land by fertilizers and pesticides
  - Used mainly by commercial farmers in Western cultures
  - Chemical fertilizers first used in Germany in the middle 1800s
  - Central Europeans still remain very dependent on chemicals today
  - Chemicals diffused widely with the Green Revolution and neo-plantations
  - Along with the use of large machines, chemicals allow drastic reductions in labor
  - In some areas, serious contamination problems have appeared
Use of Artificial Fertilizers in Agriculture shown in kg per hectare of arable land
(1 kg = 2.2 lbs) (1 hectare = 2 1/2 acres)

- Extreme dependence *above 150 kg per hectare*
- Heavy users *75–150 kg per hectare*
- Dependent *10–75 kg per hectare*
- Low users *below 10 kg per hectare*
- Data not available or largely nonagricultural
Agricultural ecology

- Chemical dependency may be no more sustainable in agriculture than in the human body

- **Sustainability**—*the* survival of a land-use system for centuries or millennia without destruction of the environmental base
Agricultural ecology

- Environmental perception by agriculturists
  - People perceive the physical environment through their culture
- Example of perception using the American Great Plains
  - Farmers from the humid eastern United States underestimated problems of drought when they first moved to the plains
  - In the 1960s older experienced farmers had the most accurate perception of drought, but still underestimated its frequency
  - German immigrants from the steppes of Russia and Ukraine accurately perceived the new land and experienced fewer problems
- A sudden rash of unusual weather can cause a change in environmental perception
Cultural integration in agriculture

Introduction

- A system of crop and livestock raising can become so firmly enmeshed in culture that society and religion are influenced.
- Agricultural borders often parallel other cultural boundaries.
- Many elements of agriculture roughly follow linguistic rather than a political boundary.
Cultural integration in agriculture

Intensity of land use
- Great variation exists in the *intensity* of rural land use
- Intensive agriculture—large amount of human labor, capital, or both, is put into each acre of land to obtain the greatest output possible
- In much of the world, high labor input creates the high intensity agricultural output
Cultural integration in agriculture

- In Western societies, high intensity is achieved by a high capital investment in machines, fertilizers, and pesticides, resulting in the highest agricultural output found anywhere.
- Increased land-use theories using the social-scientific method:
  - Population growth forces the need for additional food and reduces amount of land each farmer can have
    - Population increase is accommodated
    - Resulting farming system offers fewer options and has greater potential for environmental modification
  - Population increases following innovations of greater land-use intensity
The Von Thünen Model

- Profile: Johann Heinrich von Thünen
- Economic determinists, look to market forces and transportation costs using von Thünen’s model
  - Proposed an “isolated state”
  - Had no trade connections to outside word and possessed only one centrally located market in the state
  - Assumed all farmers living same distance from the market had equal access to it
  - Model created to study influence of distance from market and transport cost influence on type and intensity of agriculture
The Von Thünen Model

- Next slide presents a modified version of von Thünen’s model
- Improvements in transportation render some conclusions obsolete
  - Intensity of cultivation declines with increasing distance from market
  - Land values decrease farther from market
- Perishable products need to be produced near market
The Von Thünen Model

Central city (the market for agricultural produce)

1 - Zone of market gardens and feedlots
2 - Zone of dairying
   - A - Fluid milk
   - B - Extensive, mainly pasturage
3 - Zone of livestock fattening
   - A - Intensive, cultivation of feed crops
   - B - Extensive, mainly pasturage
4 - Zone of commercial grain farming
5 - Zone of livestock ranching
6 - Nonagricultural
Models are not meant to depict reality

- On a world scale, we see intensive commercial types of agriculture tend to occur commonly near huge urban markets
- Even close match occurs in smaller areas —Uruguay, SA
- The value of von Thünen’s model can be seen in less-developed countries
  - Region centering on Ethiopia’s capital city of Addis Ababa
  - Similarities can be found in the farming patterns of colonial Mexico during the period of Spanish rule
Cultural integration in agriculture

- Can the world be fed?
- Today we face a paradox
  - Some 850 million people are malnourished
  - Famines usually occur in one African Country or another each year
  - Food production has grown more rapidly than population over the past 30 or 40 years
  - Per capita basis food is more available than in 1950 when the population was about half of today’s.
Cultural integration in agriculture

- Poverty not food shortage causes hunger
  - Developing nations:
    - Do not grow enough food for their people
    - Do not have the money to buy enough imported food
Cultural integration in agriculture

- Lack of an infrastructure in developing countries
  - Poor transportation prevents food given by wealthy countries to be distributed
  - Political instability can disrupt food shipments
  - Donated food often falls into hands of corrupt local officials

- Famine is mainly a cultural phenomenon
  - Immediate causes could be environmental
  - Failure to relieve hunger has a cultural explanation
Agricultural landscape

- Survey, cadastral, and field patterns
  - *Cadastral* pattern—one describing property-ownership lines
  - *Field* pattern—reflects the way a farmer subdivides land for agricultural use
  - *Survey* patterns—lines laid out by surveyors prior to the settlement of an area
- Regional contrasts exist in all three patterns
  - Unit-block versus fragmented landholding
  - Regular, geometric survey versus irregular or unsurveyed property lines
Agricultural landscape

- In the Eastern Hemisphere fragmented farms are the rule
  - Farmers live in farm villages or hamlets
  - Fields are situated at varying distances and directions from the settlement
  - One farm can consist of one hundred or more separate parcels of land
  - In Asia and southern Europe individual plots may be roughly rectangular
  - Narrow strips are most common in Western and central Europe
Buildings of the village
Holdings of one farmer
Garden, vineyards, and orchards
Agricultural landscape

- Fragmented farm systems go back to an early period of peasant communalism
- Unit-block farms—all the farmer’s property is contained in a single contiguous piece of land
  - Occur mainly in the Americas, Australia, New Zealand, and South Africa
  - In the United States, the checkerboard pattern of farms and fields is a good example of the cadastral pattern
Original Survey Lines

Property Lines, About 1955
(Those that follow original survey lines are shown by thicker lines)

Field and Woodlot Borders, About 1955

U.S. RECTANGULAR SURVEY, HANCOCK AND HARDIN COUNTIES, OHIO

METES AND BOUNDS SURVEY, UNION AND MADISON COUNTIES, OHIO
Agricultural landscape

- The American rectangular survey system appeared after the Revolutionary War
  - Imposed a rigid, square pattern on much of the American countryside
  - Section—a one square mile piece of land containing 640 acres
  - Township—a six square mile parcel of land
    - Serve as political administrative subdistrict within counties
    - Roads follow section and township lines
- Canada adopted a similar rectangular survey system, which is very evident in the Prairie Provinces
Agricultural landscape

- Long-lot farms
  - A landholding consisting of a long, narrow unit-block stretching back from a road, river, or canal
  - Lie grouped in rows, allowing the cadastral-survey pattern to dominate entire districts
Long lot farms

- Occur in the hills and marshes of central and Western Europe, parts of Brazil, Argentina, along rivers of French-settled Quebec, southern Louisiana, and parts of Texas and northern New Mexico.
- Used to provide farmers access to transportation facilities.
  - In French America, water transport provided movement during colonial times.
  - In hill lands of central Europe, roads along valley floor provided transportation.
Agricultural landscape

- Metes and bounds surveying
  - Makes use of natural features such as trees, boulders, and streams
  - Farms are more irregular in outline
  - It is very visible where the two survey systems meet
U.S. RECTANGULAR SURVEY, HANCOCK AND HARDIN COUNTIES, OHIO

METES AND BOUNDS SURVEY, UNION AND MADISON COUNTIES, OHIO
Agricultural landscape

In Eurasia, changes made in cadastral and field patterns during the last several centuries have consolidated holdings into less fragmented farms.
Agricultural landscape

- What humanistic geographers might “read” from survey and cadastral patterns
  - Example of Canada prairie province road building practices
    - Roads along section lines do not go around sloughs—low wet places often filled with water—they will go right through them
    - May indicate a disregard for the natural habitat
    - North American culture seeks, through technology, to conquer and overwhelm nature rather than live in harmony with it
  - Agricultural landscape Cultural determinist might ask different questions
Fencing and hedging
Different cultures have their own methods and ways of enclosing land
Fences across the world consist of diverse substances
- New England, western Ireland, and the Yucatan use mile after mile of stone fencing that typify the landscape
- Barbed wire swept across the American countryside a century ago
- In Appalachia, traditional split-rail zigzag fence of pioneer times survives here and there
- Fence types can serve as indicators of cultural diffusion
Agricultural landscape

- Hedges are living fences
  - Mazelike hedgerow country can be found in Brittany, Normandy in France, and large areas of Great Britain and Ireland
  - In hedgerow country one experiences a unique feeling of confinement
Conclusions

- Forms of agricultural vary from place to place
  - Patterns expressed as agricultural regions
  - Range from traditional to highly mechanized
- All diverse systems rooted in ancient innovations of plant and animal domestication
  - Diffused from multiple points of origin
  - New innovations arose and diffused by expansion and relocation
Conclusions

- Cultural ecology is implicit in the tilling of soil and grazing natural vegetation
  - Humans must develop an adaptive strategy modifying the physical environment
  - Agriculture and grazing can result in environmental degradation
  - Climate plays a large role
- Cultural integration teaches us to look for cause-and-effect connections between agriculture and other cultural features
- The agricultural landscape is rich in spatial variations