The background of the slide is a dense, repeating pattern of yellow wheat grains, likely Triticum aestivum, shown from a top-down perspective. The grains are uniform in color and shape, creating a textured, organic background.

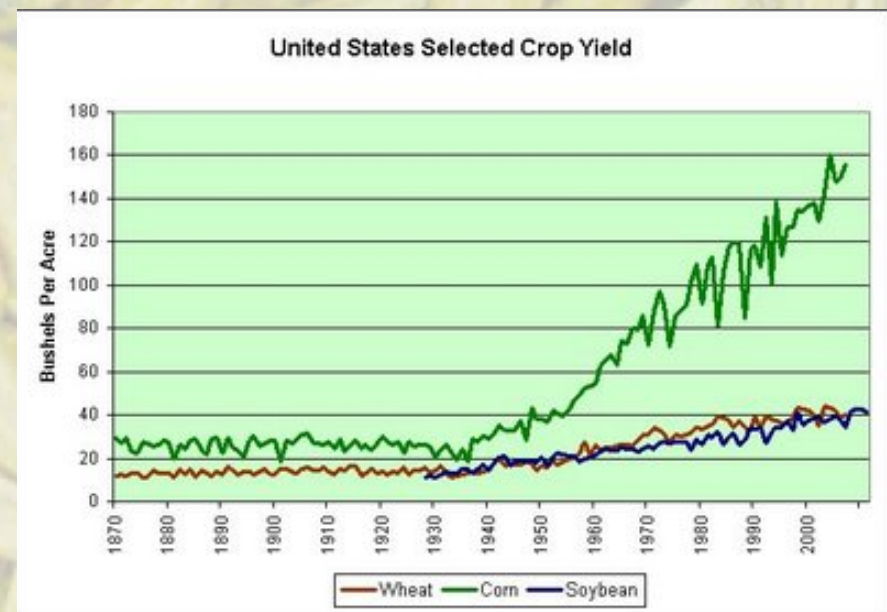
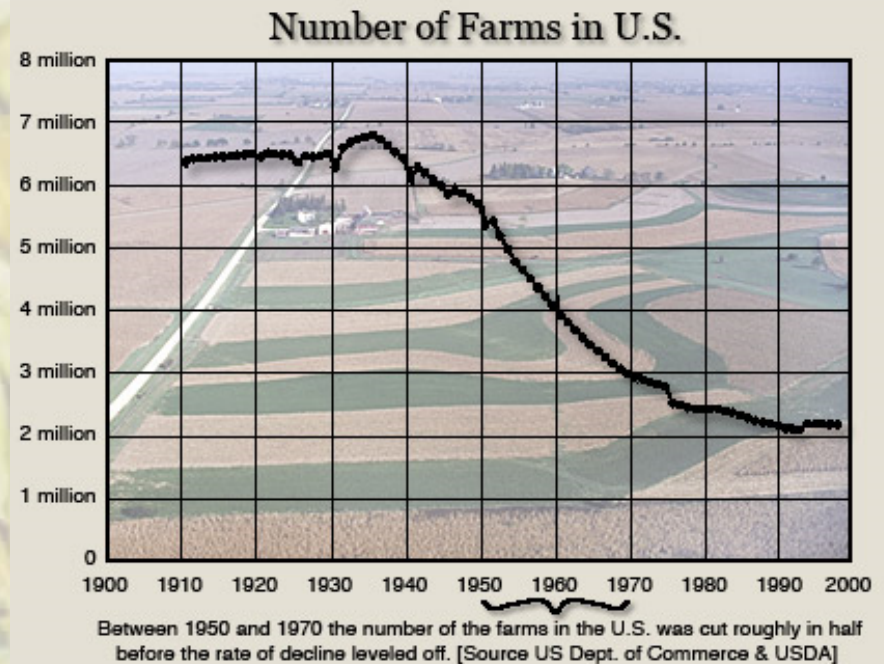
Agronomy

Chapter 2 Continued

Agronomy in the U.S.

- Total U.S. land area: 2,264 million acres
- Major land uses:
 1. Cropland – 20% or 1/5 – 467 mil A or 189 mil ha
 2. Grassland – 598 m A
 3. Forested – 718 m A
 4. Other – 297 m A
 5. Recreation and Wildlife – 87 m A
 6. Public installations and facilities – 35 m A
 7. Urban – 35 m A
 8. Transportation – 27 m A

- 40% of land is owned by Fed., state, or other public owners (some is agriculture land not in farm-grazing land, grassland, or forest)
- 45% of the land is in cropland and grassland
- The land in farms and the number of farmers has declined since 1965
- Crop production per acre has risen 60% since 1965



Tennessee Crops

Crops	Acres	Value	Yield	Value	Acres
Soybeans					
2003	1,120,000	332,920,000	41	1	2
2008	1,440,000	434,350,000	34		
Tobacco					
2003	31,140	138,290,000	2108	5	7
2008	21,800	110,448,000	2403		
Wheat					
2003	270,000	42,795,000	50	6	5
2008	340,000	198,198,000	63		
Corn					
2003	680,000	193,946,000	131	4	3
2008	690,000	334,530,000	118		

Tennessee Crops

Crops	Acres	Value	Yield	Value	Acres
Cotton					
2003	530,000	293,760,000	806	2	4
2008	285,000	154,850,000			
Sorghum					
2003	36,000	7,806,000	82	7	6
2008	-	-	18		
Hay					
2003	2,030,000	262,260,000	-	3	1
2008	1,870,000	405,705,000	2.11 tons/A		

Source: Tennessee Department of Agriculture

Crop Plants in Relation to the Environment

- Factors in Crop Distribution
 1. Climate – Rainfall (distribution most imp.) & temperature
 - Latitude - Distance from large bodies of H₂O
 - Altitude - Ocean currents
 - Direction and intensity of wind
 2. Topography
 3. Soil
 4. Insects
 5. Disease
 6. Economic Conditions
 7. Tradition



Classification Base on Climatic Factors

- Cool-season crops
 - Make best growth under relatively cool conditions, but are damaged by hot weather
 - Wheat, oats, barley, rye, potatoes, flax, sugarbeets, red clover, white clover, alfalfa, fescue, orchardgrass, KY bluegrass, ryegrass, timothy
- Warm-season crops
 - Killed by temperatures below freezing
 - Corn, cotton, sorghum, sugarcane, peanuts, soybeans, bermudagrass, dallisgrass, lespedezas

Classification Base on Climatic Factors

- Day length – Photoperiodism
 1. Long Day/Short Night
 - require relatively long days for the formation of inflorescence
 - Increase of vegetative growth when days are short
 - Flower matures in spring
 - Wheat, barley, oats, rye, red clover, fescue, orchardgrass, alfalfa, potatoes, sugarbeets, flax



Classification Base on Climatic Factors



1. Short Day/Long Night

- Produce flowers when days are short
- Increase in vegetative growth when days are long
- Matures in fall
- Corn, millet, soybeans, cotton, milo
- If darkness is interrupted with light, the soybean will remain vegetative and not flower

2. Examples

- Greenhouse experiment
- Fields with light

Precipitation

- In U.S.
 - Low – Death Valley receives less than 2”
 - High – More than 100” in areas of Washington and Oregon
- In the World
 - Low – Less than 0.05” in Chile
 - High – More than 450” in parts of India and Hawaii

Precipitation

- Crop regions may be classified on the basis of average rainfall
 1. Arid region: Avg. annual rainfall is 10" or less
 2. Semiarid region: Rainfall varies from 10"-20"
 3. Subhumid region: 20"-40" – 20% of land area
 4. Humid region: More than 40"
 - 11% (40"-60")
 - 14 (60" or more)
 - Middle TN receives 45"-50"
- Arid and subarid regions make up 55% of the world land area
- Water is the most critical and most often limiting factor in crop production

Precipitation

- Effectiveness of Rainfall
 1. Depends upon the time of year it falls
 2. Rapidity and intensity of individual rains
 3. Seasonal evaporation
- April 1 – Sept. 30 for summer row crops
 - Corn – 10 days after silking (July – most critical)
 - Soybeans – after blooming – pod filling
 - More sensitive to dry Aug. than corn

Weather Modification

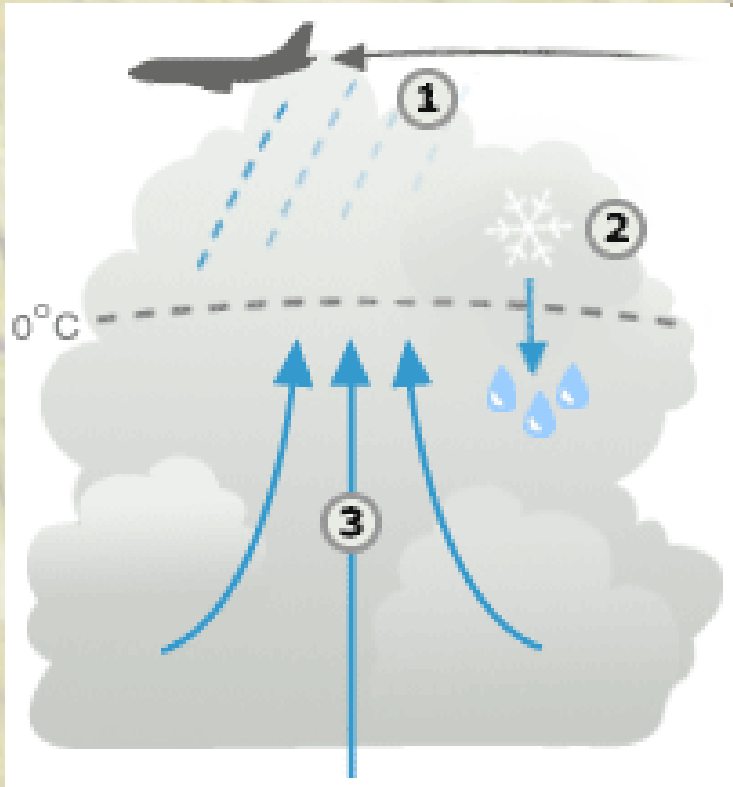
- Changing weather to suit human needs
- Rain dancing is an age-old attempt
- Krick Co.
 - Operated in the Southeast
 - Large acreage contract
 - Slight fee
 - Attempted to increase rainfall during critical needs



Weather Modification

- Cloud Seeding
 - May increase the chance of rain or snow by 5-30%
 - At times may decrease precipitation and other times has no effect at all
- Uses AgI (silver iodide) released at high altitude in supercool clouds. Also used to prevent hail damage and disperse fog
- Biodegradable compounds are being investigated because AgI may be harmful
- It is hard to measure effectiveness because it is hard to predict rainfall amounts

- Seeding seems to:
 1. Increase size & rain production of convective clouds
 2. Promote cloud merger
 3. Used to seed tropical storms
 4. Does seem to change rainfall patterns



- Legal Aspects
 - Who does the water in the atmosphere belong to?
 - Who is responsible for flood damage

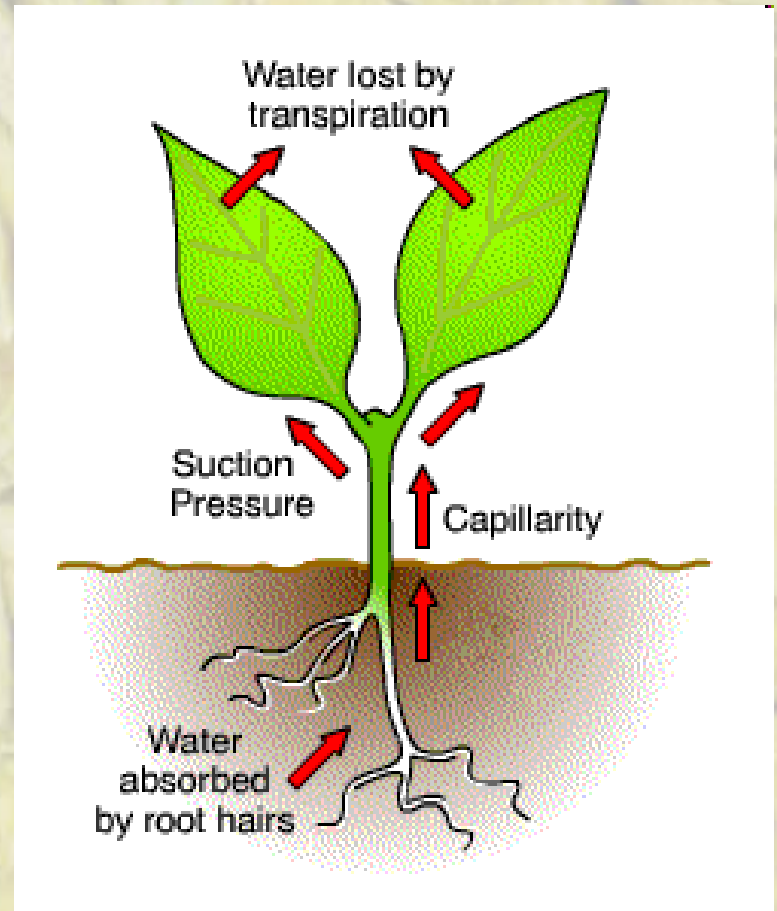
Heat Unit System

Growing Degree Days

- Degree days are a method for measuring how fast a crop is advancing towards maturity
- They are measured by counting the number of degrees Fahrenheit above an established minimum growing temperature
- Minimum growing temp for corn: 50 degrees F
- Minimum temp for peas: 40 degrees F
- Mean temp= $\frac{\text{High} + \text{Low}}{2}$
- It may take 3,000 heat units to mature a crop

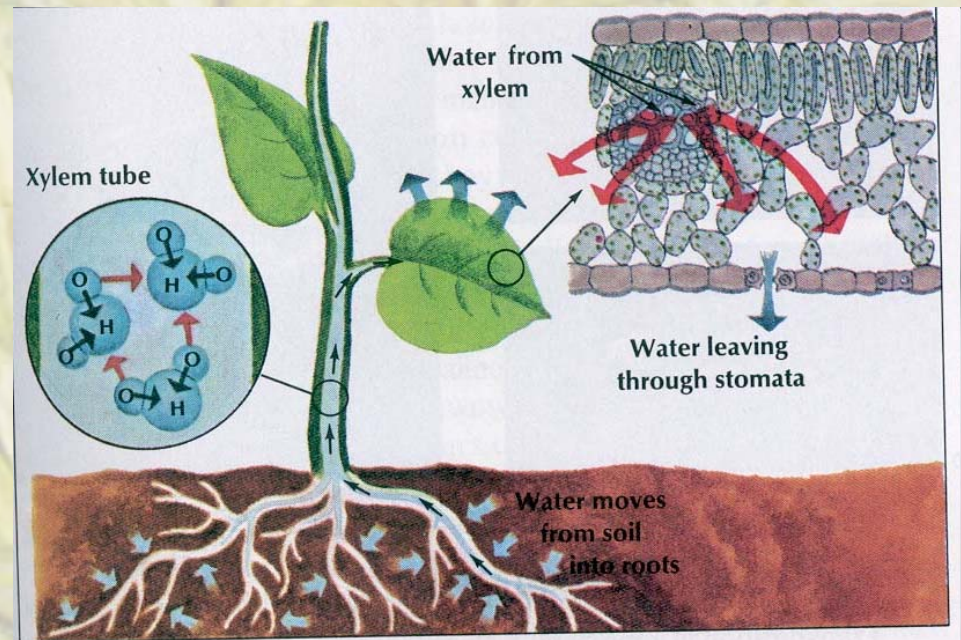
Water Use

- Water use in a plant
 - Transpiration 99%
 - Turgor 0.9%
 - Chemical Reaction 0.1%
- Transpiration – Loss of water in vapor form from a living plant usually through the stomata
- Crop plants transpire 200-1,000 pounds of water for every pound of dry matter produced



Transpiration Ratio

- Also known as – Water-use efficiency
- Amount of water transpired ÷ Lbs. of dry matter produced
- Corn – 300-400
- Oats – 450-600
- Wheat – 450-600
- Soybeans – 700
- Milo – 250-300
- Alfalfa - 850



- Corn – 100 bu/A – 5600 # of corn
- $5600 \times 5 = 28,000$ # of corn plant material
 - (Multiplied by 5 because 20% of plant in grain)
- $28,000 \times 350 = 9,800,000$ # of water
- 98,000 # of water to produce 1 bu of corn
- 12,250 gal. of water to produce 1 bu of corn



Morphological Plant Characteristics

- Reduce transpiration and lower water requirements
 1. Pubescent or hairy leaves
 2. Rolling of the leaves
 3. Bloom on leaf and stem (white powder)
 4. No. and size of stomata
 5. Cutinized epidermal cells
 6. Sunken stomata
 7. Smaller leaf area
 8. Edge presentation of leaves to sun

- Purposes of transpiration
 1. Cooler leaves
 2. Rapid conduction of solutes (soil)
 3. More rapid use of CO₂ in photosynthesis
- Chemical control
- Close stomata to reduce transpiration
- Yields are usually reduced when transpiration is reduced
- Anything which allows the crop to grow faster will result in better water use

- To increase water supply to crop:
 1. Irrigation
 2. Provide mulch
 3. Incorporate O.M.
 4. Chisel plow – better infiltration
 5. Break plow or natural pans – stubble or surface

