

A close-up photograph of a wheat field. The wheat stalks are golden-brown and appear to be in the late stages of ripening. The background is a bright, overcast sky, and the overall scene is a typical agricultural landscape.

Agronomy

Chapter 2

Agronomy

- The science of crop production
- Agros = field; nomos = to manage
- A branch of agriculture concerned with principles and practices of crop production and field management.
- 95% of the world's tilled land is devoted to agronomic crops

Agronomy

- A branch of botany – application of botany to crop production
- Deals directly with man's relationship and dependence on plants – culture, harvest, and improvement of field crops

Subdisciplines of Agronomy

- Plant breeding
- Plant nutrition
- Weed science
- Plant protection (pest control – weeds, insects, diseases)
- Crop ecology
- Crop physiology
- Crop pathology
- Crop entomology
- Forages
- Grain crops

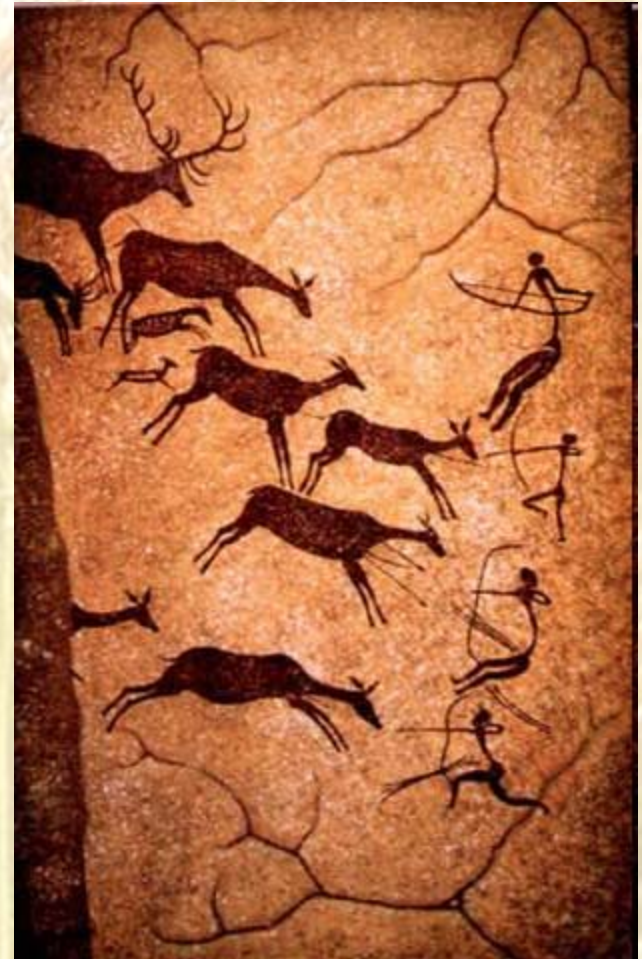


Agronomy

- Soil – Conservation, fertility, chemistry, classification, microbiology, physics, mineralogy
- Monoculture – One species grows over an area
- Mixtures – Pastures and hay crops

Agricultural Beginnings

- Agriculture developed 8,000-10,000 years ago
- Nomads led a hunting and food-gathering existence
 - Local plant communities governed their movements
 - Learned particular location and time of fruiting
 - Later moved with animals
- Early humans settled down in one area
 - Planned food supply; gathered seed of wild grasses
 - Planted the land they controlled and gathered food
 - Homesteading occurred in some areas



Centers of Crop Origin

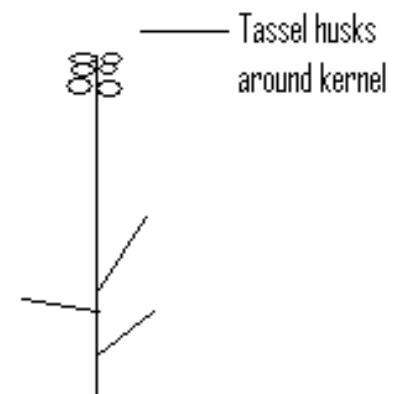


- Domestication – Wild species to cultivated species
- Vavilov – Russian geneticist
 - 1920-1930 – Travelled widely to determine center of origin
- Center of origin – Region where the greatest diversity of types occurred in a particular crop
- Largest number of ecotypes (plant type which is adapted to a particular area)
- As one goes out from the center of origin, fewer and fewer types of a particular species are found

Centers of Crop Origin

- Today
 - Wild counterparts serve as a gene pool to obtain germ plasma for improvement of crops (disease, adaption, insects)
- Cultivated plants now look much different than the wild types from which they were derived. Primitive humans made selections which were more satisfactory to their needs.
- Crops that originated in what is now the U.S. – Sunflower, pecans, strawberries, and cranberries

Early corn - Southern Mexico
(Tripsacum)

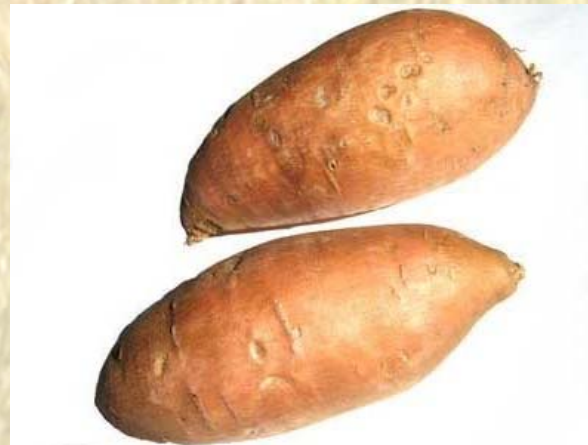


Major Crop Centers of Origin

- China (central and western) – 136 species – soybeans, barley, millets, sugarcane, buckwheat, naked oats
- India – 117 species – Rice, cotton, cowpeas
- Central Asia – 42 species – Common wheat, peas, cotton, hemp, lentils
- Near East (Including Asia minor and Iran) – 83 species – Alfalfa, some wheats, barley (2 rows), vetch, rye
- Mediterranean area – 84 species – Durum, emmer, wheats, some oats and barley, hops, and flax

Major Crop Centers of Origin

- Ethiopia – 38 species – 6-row barley, durum, wheat, milo, millet, castorbeans, chickpeas, lentils, coffee
- Southern Mexico and Central America – 49 species – Corn, upland cotton, red beans, sweet potatoes
- South America, especially Peru, Bolivia, and parts of Ecuador – 45 species – W. potato, tobacco, peanuts, tomato, some cotton, lupine



Beginning of Food Production

- 3 Periods in human existence
 - 1. 3 million years of dead-level savagery
 - 2. 10,000 years of hard-labor cultivation – no significant change in the relationship of humans and the environment
 - 3. 150 years of scientific progress
- 99% of human existence on earth was as hunter-gatherers

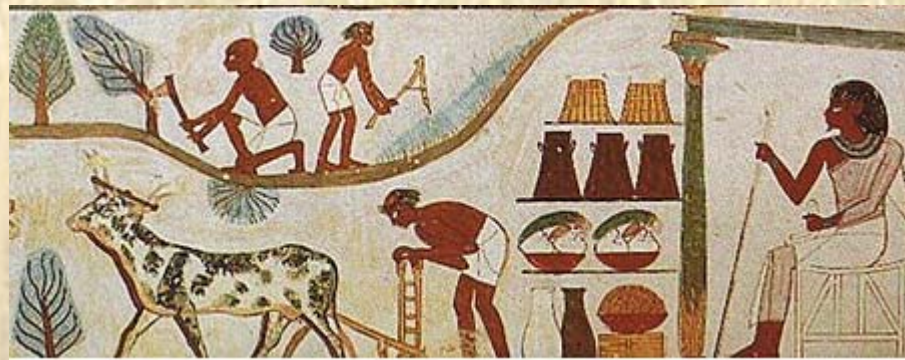
Beginning of Food Production

- Last 10,000 years
 - Plants and animals were domesticated
 - Gradually humans became less dependent on wild food sources
 - More than 90% of humans have lived as hunter-gatherers; only 6% have lived as agriculturally dependent



Beginning of Food Production

- Thailand– Remnants of soybeans and rice found from 10,000 years ago
- Iraq – Seeds of wheat and barley found dating to 1750 B.C.
- Egyptians – Well-advanced agriculture for at least 6,000 years
- South Central Mexico – Corn, squash, chili peppers, avocado, and amaranth – 5,000 years ago
- Peru – Cotton, squash, gourds, lima beans, and chili peppers – 3,000 years ago



Crops in Worship



- Food crops, especially the cereals, were associated with religion and worship because human existence depended on a successful harvest
- Ceres – Roman goddess of agriculture – first temple dedicated in 496 B.C.
- Christian world prayer – “Give us this day our daily bread”
- Biblical times – Hunger and starvation were common concerns
- Christian families still give thanks for food, even though they have not ever struggled for food
- Thanksgiving was meaningful to the Pilgrims

The Food Problem

- Throughout history it has been a race between supply of food and number of mouths to feed
- Early Egypt (2,000 B.C.) – Stored grain in years of plenty for the prospect of lean years to come (Genesis 21:46-57)
- No year in recorded history has been free of famine
 - 879 – Year of universal suffering from lack of food
 - 1125 – German population reduced by half
 - 1877 - 9.5 million Chinese perished
 - 1891 – 27 million Russians went hungry with many deaths

The Food Problem

- A standard of living depends directly on the efficiency of food production
- Low standard of living – when $\frac{1}{2}$ of the population must devote itself to the production of food
- Today it is estimated that about 1 billion people are malnourished

Agriculture in the United States

- American Indians made a great contribution to agriculture
- English settlers were not assured of adequate food supplies until they learned to adopt the Indians' plants, along with their methods of cultivation, harvesting, processing, and food preparation
- Squanto (Indian) – Taught the Pilgrims how to grow corn. The English grain crop failed, but 20 acres of corn succeeded when they used a fish in each hill for fertilization.
- The Indians were the first to practice row cropping. They planted in hills so the space could be tilled.



Agriculture in the United States

- Before the discovery of America, most crops in Europe were broadcast
- The farming methods of the American Indians and those of Europe produced the beginning of American agriculture and provided the basis for its development
- American Indians domesticated and produced 150 plant species – more than 50% of America's farm production today consists of plants used by the Indians before Columbus discovered the New World.

Agriculture in the United States

- Crops used – corn, cotton, peanuts, pumpkins, squash, beans, potatoes, sweet potatoes, tobacco, and tomatoes
- Corn – the most important – yields 20-50 bu/A but with occasional yield of 100 bu/A
- Indians did not use draft animals or plowing machinery; all work was done by hand
- The white man introduced the ox and horse, and ultimately field machinery

Rise of Scientific Research (An Art to a Science)

- Romans (234-149 B.C.) – Use of alfalfa in rotation
- Tull – (1701) – An Englishman and Oxford Univ. graduate who invented the grain drill and worked with advanced row-crop cultivation
- Hooke – (1590) Invented the microscope
- Mendel – (1860) Austrian monk that experimented with genetic inheritance in peas



Rise of Scientific Research (An Art to a Science)

- Carl Von Linne (Linnaeus) – (1760s) Swedish scientist; developed the classification system
- Priestley – (late 1700s) Discovered that oxygen was produced by plants
- Lawes and Gilbert – (1840s) Founded the Rothamsted Experimental Station, one of the oldest agricultural research stations in England
- Pasteur – (1870s) Worked with microorganisms and diseases



The original Rothamsted
Experimental Station building

Rise of Scientific Research (An Art to a Science)

- Liebig – (Mid 1800s) German scientist who worked with soil minerals removed by crops and production limits
- Late 1800s – A wooden plow with steel points was used
- 1830s – John Lane and John Deere began commercially manufacturing steel plows
- Eli Whitney – (1793) Invented the cotton gin
- Cyrus McCormick – (1831) Invented the McCormick mechanical reaper

