

Friday, February 8

FOOD ISSUES AND GENETIC RESOURCES

Agricultural Period

- 10,000 years
- thousands of species have been used for food
- about 200 domesticated

Top 15 Global Foods

- From first to last: sugar cane, maize, rice/paddy, wheat, whole fresh cow milk, potatoes, fresh vegetables, cassava, sugar beet, tomatoes, barley, indigenous pig meat, sweet potatoes, bananas

Evolution of Agriculture and Agricultural Plants

- Crop plants evolved in several centers of origin, including Africa, the Middle East, Asia, and South/Central America

Native Crops of the U.S.

- sunflower
- wild rice
- blueberries
- cranberries
- strawberries, too!

Domestication as Gene Change

- Patterns of plant change:
 - 1. size of fruit or other exploited organ
 - 2. greater allocation to fruit/seed
 - 3. ease of collection - barley, wheat - shattering vs. non-shattering
 - 4. uniform maturation, especially for grains
 - 5. reduction in germination inhibitors
 - 6. chemical changes - decrease in toxins or development of cooking methods
 - 7. modern crops - more vulnerable to environmental stresses such as drought, low nutrients, pests

Agricultural Systems are Dynamic Evolution and Change

- natural vs. artificial selection

- example of tomatoes that are genetically modified/injected that become huge, whereas normal tomatoes are much smaller
- natural selection is the natural continuation of plant species
- artificial selection is when humans come in and make them bigger and tailored to our needs
- modern selection is using crops for multiple reasons
 - for example, there used to be just green peppers, then red peppers when they were left long enough on the vine
 - now, we have orange, yellow, purple, etc. peppers

Genetic Variation

- modern cultivators
- landraces
 - crop selections suited to local conditions
 - types desired by local farmers
 - different variations of corn have been discovered, including one that is extremely long
 - they also differ in color, size, tolerance vs. drought

Green Revolution

- began in 1940s, when the Rockefeller Foundation began funding the development of crops
- brought people in from around the world to develop new ones
- hybrid crops - bringing in two different species to make new ones with very high return rates
- new kinds of wheat, for example
- then, these crops were spread around the world
- this has allowed us to support the population around the world today
- in one sense, has worked out well

Criticisms of the Green Revolution

- 1. intensive system - fertilizers and irrigation
- 2. mechanized, used more energy
- 3. the wealthy benefited and the poor were hurt
- 4. loss of traditional varieties
 - Indonesia - estimated 1500 varieties of rice
 - India - 75% of production comes from 10 varieties instead of the 30,000 formerly grown

Why Do We Care About the Loss of Genetic Variation in the Crops that We Grow? The Importance of Genetic Resources

- growth characteristics
 - tomato, for example
 - single gene for improving soluble solids worth millions to tomato growers/processors
- disease resistance
 - peanuts, for example
 - fungal disease-resistant gene
 - wild species in Amazon
 - reduces fungicide use by 75%

Crop Germplasm Centers in U.S.

- USDA and other organizations comprise the National Plant Germplasm System
- maintain hundreds or thousands of accessions representing genetic variation of crops and their wild relatives from around the world
- seeds are kept in long or short term storage

National Cotton Germplasm Collection, Texas

- 9,300 varieties
- colored cottons are used to make dye-free clothing
- native to Central and South America
- red-colored cotton boll deters insect feeding
- sharply dissected leaves aerate the cotton canopy and suppress mold in humid climates

Newest Long-Term Storage: Doomsday Vault

- world's most important assets remain safe from climate change and nuclear world
- kept at the top of the planet in the northernmost town in the world where there are lots of polar bears and especially lots of reindeer
- It was built to hopefully last forever.
- The vault is refrigerated to preserve the seeds in even colder temperatures than outside.
- It's a giant vault built in the Arctic to safe hold samples of all the world's crops.
- If an asteroid strikes the earth, or anything bad happens, this is the backup.
- But really, today lots are our variations are going extinct.
- Every day, one crop strain disappears.
- Seeds used to be passed down through families, but today farmers are mass producing crops, which wipes out variations of seeds.
- In the U.S., there are over 50,000 samples of wheat in one building.
- Today, scientists prevent famines by going through all the different genes and species to see which ones will remain and which ones will fight disease.