SYNOPSIS:

Agricultural science is in the middle of a technological revolution. It is a science that will demand extensive growth as the global population increases. Farmers rely on techniques using crop rotation, cover crops, soil enrichment, and pest management to enhance their yields. Genetic engineering has provided us with crops that can endure more adversity. Some are engineered to endure stress from harsh environments such as arid lands, cold temperatures, and low nutrient levels. Some products are altered to contain more vitamins and nutrients. Using geospatial technology, farmers are taking advantage of global positioning systems and related software to navigate field equipment and make herbicide application, fertilizer, and irrigation more efficient and accurate.

CURRICULUM UNITS:

Agriculture
Biology
Biotechnology
Ecology
Environmental Science

CAREER OPPORTUNITIES:

Biologist
Environmentalist
Engineer
Farmer
Geneticist
Plant Pathologist
Soil Scientist

PROGRAM OVERVIEW:

Agricultural science is important to our everyday lives. Agricultural resources exist in all of our lives in some way – From the clothes we wear to the food you eat. It is a market that demands extensive growth as the world population is increasing rapidly. We must find ways to produce food to sustain healthy lives without degrading the life support system of our local ecosystems. Agriculture has seen something of a revolution with geospatial technology. Farmers are finding good use for global positioning systems, or GPS devices. They are able to map their fields with precision and detail, track harvest records, and direct field equipment easier. With the ability to guide application vehicles, GPS devices working closely with agricultural software applications reduce overlap and improve accuracy of herbicide application, fertilizer, and irrigation.

ISSUES & CRITICAL THINKING:

1) While scientists tackle many variables involved in productive, sustainable farming, one natural resource has driven successful farming for centuries - water. Create a timeline detailing the quest for water to help make things grow. What technologies have been invented over time to solve the need for water to make things grow?

2) Geospatial technology has changed the industry of agriculture. How might scientists use geospatial technologies to search for viable farming land?

3) Scientists looking for ways to solve our energy needs are charged with a most important task. Scientists dedicated to agricultural sustainability are decidedly essential to our existence. How do the tasks of these two scientists compare? How are their research efforts unique?

4) Prioritize a list of the most important factors in agricultural sustainability. How do these priorities vary from country to country, and from region to region?

5) Research the science of hybrid agriculture, and genetically engineered plant products. What advantages and disadvantages exist in relation to altering “mother nature?”

GLOSSARY:

Biomass- Plant material, vegetation, or agricultural waste used as a fuel or energy source.

Compost- A variety of decaying organic substances, as dead leaves or manure, used for fertilizing soil.

Cover Crops- A crop, usually a legume, planted to keep nutrients from leaching, soil from eroding, and land from weeding over, as during particular seasons.

Crop Rotation- The system of alternating crops in a definite order on the same ground – to avoid depleting the soil and to control weeds, diseases, and pests.

Gene silencing- Interruption of the expression of a gene at transcriptional or translational levels.

Gene Splicing- A technique separating and recombining segments of DNA or genes, often employing a restriction enzyme to cut a gene from a donor organism and inserting it into a plasmid or viral DNA for transplantation into a host, where the gene causes the production of a desired substance for harvesting.

Geospatial Technology- Systems used for visualization, measurement, and analysis of specific features that occur on the earth.

Global Positioning Systems- A system of navigational satellites that provide precise positional and velocity data and global time synchronization for air, sea, and land travel.

Hybrids- The offspring of two plants of different breeds, species, or genera - as produced through human manipulation for specific genetic characteristics.

Integrated Pest Management- An ecological approach that combines understanding the causes of pest outbreaks, manipulating the ecosystem for pest control, and monitoring pests and their cycles to determine if the use of pesticides is required.

Leguminous- Any of a large number of eudicot plants belonging to the family Leguminosae with the characteristic fruit of a seed pod.

Nanotechnology- The branch of technology devoted to producing devices on an atomic scale.

Recombinant DNA- DNA in which one or more segments or genes have been inserted, either naturally or by laboratory manipulation, from a different molecule or from another part of the same molecule, resulting in a new genetic combination.

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