Agriculture

Content Area: **Science**
Course(s): **CP Environmental Science**
Time Period: **Marking Period 3**
Length: **3-4 weeks**
Status: **Published**

Course Pacing Guide

Course Pacing Guide

Units	Quarter	# Weeks
Biodiversity	1	4
Natural Resources	1	5
Ecology	2	6
Pollution	2	4
Energy	3	6
Agriculture	3	5
Human Health and the Environment	4	4
Climate Change	4	5

Unit Overview

Food Production systems link most of the main environmental themes - pollution, energy, biodiversity and human health. Over human history food production systems have changed dramatically. From hunter gathering to local subsistence farming to the Green and Gene Revolution. There are significant environmental impacts of our current food production systems. Water use, pest management, fertilzer use, energy needs and land use represent the main themes of environmental impact. In the past few decades gene technologies have beend eveloped to change the course and outcome of agricultural systems. During the same time period there has been a growing interest in how food is produced and an increased sustainability of our food systems. Organic farming, Integrated pest management, community supported agriculture, foodsheds and urban farming have all developed to address the environmental and human health concerns of industrial food production.

Enduring Understandings

Producing food requires a significant input of natural resources.

Only a few crops are used to supply a large % of the world's calorie needs.

The Green revolution, post WWII, has led to food production methods that have seriously imapcted the earth's environment and threatened human health.

Gene technolgies have answered the concerns about a ceiling of productivity and environmental limitations for agriculture, but there are serious questions about the sustainability such measures.

Sustainable Agriculture can be achieved through a combination of practices; organic production, urban farms, community supported agriculture, foodsheds, IPM

Essential Questions

What have been the trends associated with Food production over human history?

What brought on the Green Revolution post WWII?

What are the trends associated with the Green Revolution?

How have these trends imapcted the environment and human health?

Has the gene revolution been a beneficial practice for agriculture and human health? What are the concerns?

What are the key strategies for a more sustainable approach to food production?

What Ecological services and what biodiversity is required to sustain our food production systems?

New Jersey Student Learning Standards (No CCS)

9-12.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
9-12.HS-ESS3-1.6	Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific knowledge, principles, and theories.
9-12.HS-ESS3-1.6.1	Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.
9-12.HS-ESS2-2.ESS2.D.1	The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.
9-12.HS-ESS2-7.ESS2.E.1	The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it.
9-12.HS-ESS3-1.ESS3.A	Natural Resources
9-12.HS-ESS3-3.ESS3.C.1	The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources.
9-12.HS-LS1-5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
9-12.HS-LS1-5.2.1	Use a model based on evidence to illustrate the relationships between systems or between components of a system.
9-12.HS-LS2-3.5.1	Energy drives the cycling of matter within and between systems.
9-12.HS-LS1-5.5.1	Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.
9-12.HS-LS1-6.5.1	Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.
9-12.HS-LS1-5.LS1.C	Organization for Matter and Energy Flow in Organisms
9-12.HS-LS2-2.LS2.A.1	Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.
9-12.HS-LS2-4.LS2.B	Cycles of Matter and Energy Transfer in Ecosystems

9-12.HS-LS2-4.LS2.B.1	Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved.
9-12.HS-LS2-2.LS2.C.1	A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.
9-12.HS-LS2-7.LS2.C.1	Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species.
9-12.HS-LS2-6.LS2.C.1	A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability.
9-12.HS-LS2-7.LS4.D.1	Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction).
9-12.HS-LS2-7.LS4.D.2	Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.

Amistad Integration

LA.RI.11-12.10b	By the end of grade 12, read and comprehend literary nonfiction at grade level text-complexity or above.
SEL.PK-12.1.2	Recognize the impact of one's feelings and thoughts on one's own behavior

Holocaust/Genocide Education

Interdisciplinary Connections

List at least one specific standard

No general statements

PFL.9.1.12.A.8	Analyze different forms of currency and how currency is used to exchange goods and services.
SOC.9-12.1.1.1	Compare present and past events to evaluate the consequences of past decisions and to apply lessons learned.
SOC.9-12.1.1.2	Analyze how change occurs through time due to shifting values and beliefs as well as technological advancements and changes in the political and economic landscape.
SOC.9-12.1.2.1	Construct various forms of geographic representations to show the spatial patterns of physical and human phenomena.
SOC.9-12.1.2.2	Relate current events to the physical and human characteristics of places and regions.
SOC.9-12.1.3.1	Distinguish valid arguments from false arguments when interpreting current and historical events.
SOC.9-12.1.3.2	Evaluate sources for validity and credibility and to detect propaganda, censorship, and bias.
SOC.9-12.1.3.3	Gather relevant information from multiple sources representing a wide range of views (including historians and experts) while using the date, context, and corroborative value of the sources to guide the selection.
SOC.9-12.1.4.1	Take a position on a current public policy issue and support it with historical evidence, reasoning, and constitutional analysis in a written and/or oral format.

Technology Standards

List specific standards that are relevant
No general statements

TECH.8.1.12.A.4	Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
TECH.8.1.12.A.5	Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.
TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B.2	Apply previous content knowledge by creating and piloting a digital learning game or tutorial.
TECH.8.1.12.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.1.12.B.CS2	Create original works as a means of personal or group expression.
TECH.8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
TECH.8.1.12.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.12.E.2	Research and evaluate the impact on society of the unethical use of digital tools and present your research to peers.
TECH.8.1.12.E.CS1	Plan strategies to guide inquiry.

TECH.8.1.12.E.CS4	Process data and report results.

21st Century Themes/Careers

List specific standards that are relevant
No general statements

HPE.2.2.8.A.2	Demonstrate the use of refusal, negotiation, and assertiveness skills when responding to peer pressure, disagreements, or conflicts.
CAEP.9.2.12.C.1	Review career goals and determine steps necessary for attainment.
CAEP.9.2.12.C.2	Modify Personalized Student Learning Plans to support declared career goals.
CAEP.9.2.12.C.3	Identify transferable career skills and design alternate career plans.

Financial Literacy Integration

Instructional Strategies & Learning Activities

Lab Reports

Review and discussion of case studies

Experimentation - controlled studies and field investigations

Visit to farm

Grocery market inventory and food production/ price comparison

Drawing foodshed maps

growing your own food

Differentiated Instruction

Examples may include:

- Curriculum Map
- Inquiry/Problem-Based Learning
- Learning preferences integration (visual, auditory, kinesthetic)
- Relationship-Building & Team-Building
- Self-Directed Learning
- Student Data Inventories

- Mastery Learning (feedback toward goal)
- Goal-Setting & Learning Contracts
- Grouping
- Socratic Seminar
- Rubrics
- Learning Through Workstations
- Concept Attainment
- Mentoring
- Assessment Design & Backwards Planning
- Student Interest & Inventory Data

Formative Assessments

Quiz - Environmental Impacts of Green Revolution

Developing a menu for a Foodshed

Grocery store comparisons - organic vs. standard foods - availability and cost

creating a foodshed map

Summative Assessment

Exam - Agriculture and Food Production

Ecological Footprint - Report on food choices and carbon footprint

Lab Report - Comapring organic and inorganic fertilzers in seed germiomation and seedling growth

Benchmark Assessments

reference above

Alternate Assessments

reference above

Resources & Technology

Miller and Spoolman text - Environmental Science - sustaining your world

Local Food Pricing lists

Greenhouse/ grow lamp setting

USDA website

EPA IPM website

BOE Approved Texts

Miller and Spoolman - Environmental Science - Sustaining your World

Closure

- Gallery Walk - On chart paper, small groups of students write and draw what they learned. After the completed works are attached to the classroom walls, others students affix post-its to the posters to extend on the ideas, add questions.
- Sequence It - create timelines of major events discussed
- Low-Stakes Quizzes - Give a short quiz using technologies like Kahoot or a Google form.
- Have students write down three quiz questions (to ask at the beginning of the next class).
- Ask a question. Give students ten seconds to confer with peers before you call on a random student to answer. Repeat.
- Direct kids to raise their hands if they can answer your questions. Classmates agree (thumbs up) or disagree (thumbs down) with the response.
- Have kids create a cheat sheet of information that would be useful for a quiz on the day's topic.
- Kids write notes to peers describing what they learned from them during class discussions.
- Have students complete the following sentence: "The [concept, skill, word] is like _____ because _____."
- Ask students to write what they learned, and any lingering questions on an "exit ticket". Before they leave class, have them put their exit tickets in a folder or bin labeled either "Got It," "More Practice, Please," or "I Need Some Help!"

- After writing down the learning outcome, ask students to take a card, circle one of the following options, and return the card to you before they leave: "Stop (I'm totally confused. Go (I'm ready to move on.)" or "Proceed with caution (I could use some clarification on . . .)"

ELL

Such as:

- Alternate Responses
- Advance Notes
- Extended Time
- Teacher Modeling
- Simplified Written and Verbal Instructions
- Frequent Breaks
- E-Dictionaires
- Google Translate

Special Education

List is not inclusive but may include examples such as:

- Shorten assignments to focus on mastery of key concepts.
- Shorten spelling tests to focus on mastering the most functional words.
- Substitute alternatives for written assignments (clay models, posters, panoramas, collections, etc.)
- Specify and list exactly what the student will need to learn to pass.
- Evaluate the classroom structure against the student's needs (flexible structure, firm limits, etc.).
- Keep workspaces clear of unrelated materials.
- Keep the classroom quiet during intense learning times.
- Reduce visual distractions in the classroom (mobiles, etc.).
- Provide a computer for written work.
- Seat the student close to the teacher or a positive role model.
- Use a study carrel. (Provide extras so that the student is not singled out.)
- Provide an unobstructed view of the chalkboard, teacher, movie screen, etc.
- Keep extra supplies of classroom materials (pencils, books) on hand.
- Maintain adequate space between desks.
- Give directions in small steps and in as few words as possible.
- Number and sequence the steps in a task.
- Have student repeat the directions for a task.
- Provide visual aids.
- Go over directions orally.

- Provide a vocabulary list with definitions.
- Permit as much time as needed to finish tests.
- Allow tests to be taken in a room with few distractions (e.g., the library).
- Have test materials read to the student, and allow oral responses.
- Divide tests into small sections of similar questions or problems.
- Allow the student to complete an independent project as an alternative test.
- Give progress reports instead of grades.
- Grade spelling separately from content.
- Allow take-home or open-book tests.
- Show a model of the end product of directions (e.g., a completed math problem or finished quiz).
- Stand near the student when giving directions or presenting a lesson.
- Mark the correct answers rather than the incorrect ones.
- Permit a student to rework missed problems for a better grade.
- Average grades out when assignments are reworked, or grade on corrected work.
- Use a pass-fail or an alternative grading system when the student is assessed on his or her own growth.

504

Examples of accommodations in 504 plans include but are not limited to:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

At Risk

Examples may include:

- Use of mnemonics
- Have student restate information
- Provision of notes or outlines
- Concrete examples

- Use of a study carrel
- Assistance in maintaining uncluttered space
- Weekly home-school communication tools (notebook, daily log, phone calls or email messages)
- Peer or scribe note-taking
- Lab and math sheets with highlighted instructions
- Graph paper to assist in organizing or lining up math problems
- Use of manipulatives
- No penalty for spelling errors or sloppy handwriting
- Follow a routine/schedule
- Teach time management skills
- Verbal and visual cues regarding directions and staying on task
- Adjusted assignment timelines
- Visual daily schedule
- Immediate feedback
- Work-in-progress check
- Pace long-term projects
- Preview test procedures
- Film or video supplements in place of reading text
- Pass/no pass option
- Cue/model expected behavior
- Use de-escalating strategies
- Use peer supports and mentoring
- Have parent sign homework/behavior chart
- Chart progress and maintain data

Gifted and Talented

Focus on effort and practice

Offer the Most Difficult First

Offer choice

Speak to Student Interests

Allow G/T students to work together

Encourage risk taking