



# Project-Based Learning Activities: Agriculture

*Flint Hills Learning Center*

*A project of the Flint Hills Discovery Center,  
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## Introduction

The **Flint Hills Learning Center** is a grass-roots, teacher-led program with the mission to deepen students' knowledge, pride, and commitment to their special place in the world – the Flint Hills of Kansas and Osage Hills of Oklahoma.

These **Project-Based Learning Activities** are designed as starting points for educators. Students will use inquiry to explore a topic related to the Flint Hills eco-region. These activities can be adapted to various grade levels and can serve as single lessons or developed into larger projects. Educators are permitted to copy, distribute, modify, and use these activities for non-commercial purposes only.

## Project-Based Learning Activities

### 1. Range Management

Students will define and explore concepts in range management.

**Critical Questions to Explore:** What is rangeland? What is a “range site”? How important are soil types? Can you see a copy of your county’s Soil Survey book? How do horses, goats, and cattle graze differently? What is a “stocking rate”? Why can’t managers simply say 4 acres per steer? Will a large steer, cow, or horse eat more than a small steer? Why do range managers use animal units? What is an “animal unit”? What is "carrying capacity"? What are the different recommended grazing systems in your area? Interview a rancher regarding his/her opinion on the advantages and disadvantages of different grazing systems.

**Student Activity:** Students will examine Natural Resource Conservation District and Extension Service publications on grazing management systems. Students will calculate different stocking rates for various sizes of pasture and animal unit numbers.

**Subjects:** career, agriculture and technology, animal science, agronomy, science, botany, mathematics

**Links:** [Managing FH grasslands](#); [Stocking Rate & Grazing Mgmt](#); [Stocking Range is the Key](#); [Summer Grazing Strategies in FH](#); [Grazing Distribution](#); [Forage Facts](#)

**Standards:** KSDE CTE Competencies: 18081-01. 2. Define rangeland. 08. 1. Recognize the importance of stocking rates. 2. Analyze stocking rate studies and develop his/her own stocking rate theory. 3. Compare the effects of heavy stocking to light-moderate stocking rate. 5. Recognize the influence of stocking rate on range livestock productivity. 10. Determine adjustments to be made on recommended stocking rates concerning distances from water, slope, and forage demand. 10. 3. Classify kinds of

livestock based on their vegetative preferences. 9. 1. Define deferred, rest, and rotation grazing. 18001-28. 8. List the four components of soil. 9. Identify the different soil classes.

## 2. Design of a Small Portable Livestock Shed

Students will examine possibilities for design of a small portable livestock shed for cattle, horses, sheep, or goats.

**Student Activity:** Students will research space, feeding, shelter, and other needs for the livestock they choose. Students will examine an actual local building site for initial placement including level ground, drainage issues, wind, etc. Students will create a design for (and if possible build) an appropriate portable livestock shed.

**Subjects:** career, agriculture and technology, animal science; construction, CAD, welding; mathematics

**Standards:** KSDE CTE Competencies: 18101-AS.07.01. 1. Identify facilities needed to house and produce each animal species safely and efficiently. 2. Identify equipment and handling facilities used in modern animal production. AS.07.02. 1. List the general standards (e.g., environmental, zoning, construction) that must be met in facilities for animal production.

## 3. Design a Set of Livestock Loading Pens

Students will design a set of livestock loading pens. Students will evaluate a local ranch site and owner needs for a set of pens.

**Critical Questions to Explore:** Where should the pens be located? Is there room for a semi-trailer truck to back in and turn around and get out? How big is the pasture(s) being served? How many cattle will need to be held? What various sorting pens and lanes are needed? Where should the loading ramp and chute be located? Where should livestock gates be located, what size, and which way should they open? Will you need some smaller human gates for convenience and safety - where, what size, and opening which way? Will you build any solid shields along the loading lanes to calm animals and facilitate loading? How can the pens be designed to cause as little stress as possible to the cattle?

**Student Activity:** Students will use CAD to design an optimal set of loading pens for the site and needs of the rancher. Students will price materials and labor and create a bid for such a project.

**Subjects:** career, agriculture and technology, animal science; construction, CAD, welding; mathematics

**Links:** [Grandin Website – example cattle corral designs](#)

**Standards:** KSDE CTE Competencies: 18101-AS.06.01. 1. Discuss the dangers involved in working with animals. 2. Explain the implications of animal welfare and animal rights for animal agriculture. AS.07.01. 2. Identify equipment and handling facilities used in modern animal production.

## 4. Using GPS to Map Infestations of the Noxious Weed *Serecia Lespedeza*

Students will explore the use of global positioning systems (GPS) to map infestations of the noxious weed *Serecia Lespedeza*.

**Critical Questions to Explore:** How could use of a GPS device aid land managers in surveying areas of invasion, determining an appropriate control plan, applying and returning in subsequent years for monitoring? Students will learn the basic principle and operation of a hand-held GPS device. Students will acquire a map of the area to be surveyed for recording of locations. What type map would be best? Aerial photo, orthophoto, or topographic?

**Student Activity:** Students will review the appearance and characteristics of the invasive plant *Serecia Lespedeza*. Students will survey the pasture on foot to locate *Serecia Lespedeza* plants, recording the locations on their maps through the GPS system.

**Subjects:** career, agriculture and technology; social studies, geography, agronomy; science, biology

**Links:** [Serecia Lespedeza](#)

**Standards:** KSDE CTE Competencies: 18058-09. A.1. Identify noxious weeds and their seeds. 18206-Technology in Agriculture. 1. Report on uses of global positioning systems (GPS) in agriculture. 2. Utilize a GPS receiver to find a location given coordinates.

## 5. Marketing & Distributing Produce from a Market Garden

Students will explore alternatives for marketing and distributing produce from a market garden.

**Critical Questions to Explore:** What is “Community-Supported Agriculture (CSA)”? What are “community gardens”? Private “market gardens”? What is a “subscription service” for vegetables/produce? What is involved in establishing a “vegetable/produce stand”? How do Farmers’ Markets work? Students can interview people involved in these enterprises. Market analysis: What demographic group likes to buy local food? Would any grocery stores or restaurants be interested? Can small, local growers compete with prices of large-scale commercial growers? What are costs of delivery? What community colleges in Kansas offer training in this area of sustainable farming?

**Student Activity:** Students will estimate a cost of goods sold for produce. Students will create two marketing-distribution plans and compare the profitability of each.

**Subjects:** career, agriculture and technology, horticulture, agriculture economics, food science; business, entrepreneurship, accounting; mathematics

**Links:** [Kansas Garden Guide](#); [Kansas Rural Center](#); [High Tunnels](#); [Horticulture Business Publications](#)

**Standards:** KSDE CTE Competencies: 18201-ABS.03.02-1. Monitor inventory to maintain optimal levels and calculate costs of carrying input and output inventory; ABS.06.05-1. Identify, explain and organize components of the sales process; ABS.07.02-2. Identify common resources need to operate a production facility.

## 6. Bison Livestock Industry

Students will explore the bison livestock industry today.

**Student Activity:** Students will interview a bison grower. Students will create a business plan for a bison ranch.

**Subjects:** career, agriculture and technology, animal science; business, entrepreneurship

**Links:** [Kansas Buffalo Association](#)

**Standards:** KSDE CTE Competencies: 18103-AS.01.01-1. Evaluate and describe characteristics of animals that developed in response to the animals' environment and led to their domestication; 18001-026. 11. Describe trends in the animal science industry (such as the increase in poultry production).

## 7. Raising & Marketing of Grassfed Beef

Students will explore the raising and marketing of grassfed beef.

**Critical Questions to Explore:** How is this beef product different from that of cattle fed grain in feedlots? Why is this beef much lower in fat? What are the flavor claims of grassfed beef producers about their products? What are the health claims of grassfed beef producers, and how does grassfed beef challenge the quality grading system of the USDA which gives a higher grade to more fattening beef products? What is the history of grassfed beef in the Flint Hills? During what period was grass-finishing the original, dominant production model for Flint Hills beef? When did grain-feeding become the popular production method and why? What is a "niche" product? How might raising grassfed beef again be an opportunity for smaller beef producers? Can consumers buy local grassfed beef direct from ranchers in the Flint

Hills? What retail establishments offer grassfed beef? What are the challenges of distributing a perishable food product? What cooking methods are most successful with very lean beef products?

**Student Activity:** Students will write a brochure advertising the nutritional advantages of grassfed beef.

**Subjects:** career, agriculture and technology, animal science, food science, agronomy; business, entrepreneurship, family and consumer science, food science, culinary arts; language arts, writing

**Links:** [American Grassfed Beef Association](#)

**Standards:** KSDE CTE Competencies: 18201-ABS.06.03-1. Identify and use strategies frequently employed in marketing programs, including those used in niche markets; ABS.06.03-1. Identify, explain and organize components of the sales process. 2. Develop strategies to gain new customers; ABS.07.02-2. Identify common resources needed to operate a production facility; 18101-AS.08.01-1. Evaluate the effects of animal agriculture on the environment; AS.06.02-1. Identify animal production practices that could pose health risks or are considered to pose risks by some.

## 8. Purchasing Beef Products

Students will investigate issues for the consumer purchasing beef products.

**Critical Questions to Explore:** What are the special nutrients found in beef? Students will evaluate the nutritional profiles of various cuts of beef. Which cuts are lower in fat? Which are more economical? How is beef graded, and what are the various grades of beef? What is the best way to cook lean beef? Is any beef processed in your area? Do you know a butcher? What is grassfed beef and what are its special health benefits? Do you know where the beef in your local supermarket comes from? Do any local ranchers sell beef directly in bulk to customers? How many square feet of freezer space would be required to buy a half or quarter of a beef direct? How much money would you save in buying direct over retail?

**Student Activity:** Students will prepare a summary of the nutritional benefits of beef. Students will compare the costs of buying beef retail vs. buying in bulk.

**Subjects:** family and consumer science, consumer finance, food science, culinary arts; math; health; career, agriculture and technology, animal science

**Links:** [Kansas Beef Council](#)

**Standards:** Kansas FCS: CAI 8.4.4 Utilize a variety of cooking methods to prepare beef; CAI 8.5.2 Identify how food cost is determined. CE 8.5.2 Select the heat transfer method of conduction, conduction, and/or radiation to be used during food production. CE 8.5.3 Identify the foods bestsuited for dry heat, moist heat and combination cooking methods. NW 14.1.3 Examine the effects of global and local events

and conditions on food choices and practices. National FCS: FPS 8.4.7 Apply principles of Measurement, Portion Control, Conversions, Food Cost Analysis and Control, and Menu Pricing. FPS 8.5.2 Demonstrate professional skill for a variety of cooking methods including roasting, broiling, smoking, grilling, pan frying, deep frying, braising, and stewing. FPS 8.5.14 Demonstrate cooking methods that increase nutritional value, lower calorie and fat content and utilize herbs and spices to enhance flavor. NW 14.3.1 Apply various dietary guidelines in planning to meet nutrition and wellness needs. NW 14.3.3 Demonstrate ability to select, store, prepare, and serve nutritious and aesthetically pleasing food.

## 9. Science, Culture, & Economics of the Horse

Students will explore the science, culture, and economics of the horse.

**Critical Questions to Explore:** What are the physical parts of a horse? What are common diseases of horses? How did horses come to North America? How did Native Americans use horses? What tack, breeds, and riding methods did they use? What are the different horse breeds that are commonly found in the Flint Hills? How many horses are in your county? What percentage are used for work and for pleasure? What local events feature horses? What does it cost to buy and care for a horse? What local tourism activities involve horses? What efforts are being made to create riding trails in the Flint Hills? How could horses be utilized in a business venture?

**Student Activity:** Students will write a history of horses in North America. Students will create a budget for owning a horse. Students will create a business plan for a horse “dude ranch.”

**Subjects:** career, agriculture and technology, animal science; science, zoology; business, entrepreneurship; social studies, history; language arts, writing

**Links:** [KSU Equine](#); [Horses & Flint Hills Cowboys](#); [Mustang Poem](#)

**Standards:** KSDE CTE Competencies: 18104-B-2. Determine the classification of equine. 3. Process of domestication of equine. 5. Uses of equine. C-5. Determine a least cost ration based on local prices. F-1. Identify major breeds of horses. G-1. Determine labor requirements of equine facility. 3. Understanding pasture/stable management.

## 10. Science & Culture of Cattle

Students will explore the science and culture of cattle in the Flint Hills.

**Critical Questions to Explore:** What are the physical parts of a cow? Explain the unique digestive system of a cow. What are common diseases of cattle? How did cattle come to North America? What are the different cattle breeds commonly found in the Flint Hills? What local cattle breeders are in your area

who sell purebred seedstock? What are the advantages they claim for their particular breed? What local events in your area feature cattle?

**Student Activity:** Students will create an illustrated diagram of the physiology of cattle. Students will write a history of cattle in North America and the Flint Hills.

**Subjects:** career, agriculture and technology, animal science; science, zoology; social studies, history; language arts, writing

**Links:** [Beef Production in FH](#); [Cattle in FH & Texas](#); [Cattle in FH](#); [Graze Like a Cow Lesson](#)

**Standards:** KSDE CTE Competencies: 18101-AS.01.01-2. Define major components of the animal industry. AS.07.01-2. Identify equipment and handling facilities used in modern animal production. AS.08.02-1. Identify optimal environmental conditions for animals. AS.06.01-2. Explain the implications of animal welfare and animal rights for animal agriculture.

## 11. Burning a Pasture

Students will examine the process of burning a pasture.

**Critical Questions to Explore:** How is this done? What tools and equipment are used? How many people are needed? How is the wind a critical factor? What techniques of back-fire and head-fire are utilized? How are patch burns conducted? What governmental agencies must be notified before burning a pasture? Discuss the dangers of burning (wildfire, personal injury, traffic accidents)? How can these be prevented?

**Student Activity:** Students will write a process paper describing the steps in burning a pasture.

**Subjects:** career, agriculture and technology, agronomy; science, biology, writing

**Links:** [Planning and Conducting a Burn](#)

**Standards:** KSDE CTE Competencies: 18504-NRS.04.01-1. Describe techniques used to suppress wildfires and manage prescribed fires. 18081- Range Ecology-5. Discuss the impact of fire on rangeland vegetation. 9. Associate effects of fire with plant succession.

## 12. Creating a Value-Added Agricultural Product

Students will define and explore the concept of “value-added agricultural products.”

**Critical Questions to Explore:** What does “value-added” mean - what are ways you can add value? What are some examples of value-added products produced in your state or area? What are some products in

your area that could be physically changed or processed in a way that farmers, ranchers, or local people could gain more income? What local products might be specially-raised or identified in a way that some people would pay more for them (i.e. locally-grown, grassfed, organic, free range, etc.)? What lessons can you learn from other producers who have created value-added products (case studies)? What facilities would be necessary to process foods? What is a “certified kitchen”? Is there a demand or market for your value-added product? How would you market it? Are there any marketing associations that would help? How would you label your product? Would you need a business plan?

**Student Activity:** Students will choose one local product and imagine two ways value could be added to it to increase the income to growers. Students will name their product and design a label. They will then research and write a summary of one aspect of product development such as: production methods, production costs, marketing, etc.

**Subjects:** N/A

**Links:** [Kansas Value Added Foods Lab](#); [Food Labeling for Kansas Food Products](#); [Business Plan for Value Added Food Products](#)

**Standards:** N/A