









CATTLE RANCH RIDDLE

Student Guide

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Challenge Rationale

There are multiple factors at play and many cattle ranchers must consider many things when running their operation. Today's beef is produced using fewer resources than ever before, but there is still more to be done. Through this challenge, students will become more aware of the intricacies of beef production. After thoughtful research to evaluate how these challenges exist globally, nationally, and locally, students will design, test, and demonstrate a solution that optimizes production as well as economic, environmental, and social needs.

Establishing The Challenge

The Challenge

According to the United Nations, it's estimated there will be nearly 10 billion people on Earth by 2050.¹ That's three billion more mouths to feed than exists today, which means more food will need to be raised and grown to meet the food demands of a growing population. People around the world consume beef, particularly in the United States, because it has 10 essential nutrients, such as protein and iron, that are important requirements in our diets.² Cattle ranching families have to balance maintaining a profitable business that complies with current regulations with producing a safe and affordable product for a growing population, while at the same time, caring for the land and environment.

¹ United Nations, Department of Economic and Social Affairs. (2017, June 21). World population projected to reach 9.8 billion in 2050, and 11.2 billion in 2100. Retrieved from <https://www.un.org/development/desa/en/news/population/world-population-prospects-2017.html>

² Cattlemen's Beef Board and National Cattlemen's Beef Association. (2018). The nutrients you need with a taste you love. Retrieved from <https://www.beefitswhatsfordinner.com/nutrition/beef-nutrients>

Establishing The Challenge

Challenge Question

How can we, as cattle ranchers, raise beef cows in a way that balances production as well as economic, environmental, and societal needs?

THIS SOLUTION MUST ADDRESS THE FOLLOWING NEEDS:

- Production as well as economic, environmental and societal needs

SUCCESS WILL BE DETERMINED BY:

- Construction of a model of a cattle ranch (either cow-calf or stocker/backgrounder) that addresses best practices in the following areas:
 - a. Beef cattle health/welfare
 - b. Land management
 - c. Beef cattle nutrition
 - d. Costs of production
 - e. Grazing plan
- Producing and sharing a presentation that communicates knowledge gained

STEP ONE

1 | IDENTIFY



Purpose of Step

Define the need and how it affects life globally, nationally, and locally. Research and consider how others have approached solving the need including how people have addressed this need historically. Describe why this challenge needs a solution and determine constraints (e.g., time, space, resources, etc.).

Student Prompts and Guiding Questions:

- Why is ranching an important occupation?
- What would happen if we ran out of food?
- Why is it important for food sources to be sustainable?
- What are the benefits of eating meat, and in particular, beef?
- How do we balance having affordable beef and having responsibly run cattle ranches?
- What are cattle ranching families already doing to balance the production as well as economic, environmental, and societal needs?

Signs of Step Completion

Students will present a description of the challenge to the facilitator. The description should include how this challenge affects communities globally, nationally, and locally. The description should also include ways in which others have addressed finding a solution and constraints to be considered (e.g., time, space, resources, etc.).



Important discoveries during this step:

- Define the problem as it relates to you locally
- Plans for the next step
(e.g., knowledge to gain, questions to answer, preparations to make, etc.)

STEP ONE: REFLECTION

1 | IDENTIFY



Important Discoveries During this Step:

Define the Problem as it Relates to You locally:

Plans for the Next Step (E.G. Knowledge to Gain, Questions to Answer, Preparations to Make, Etc.):

STEP TWO

2 | IMAGINE



Purpose of Step

Brainstorm solutions to the challenge. List all of your ideas – don't hold back!
Discuss and select the best possible solutions.

Student Prompts and Guiding Questions:

- How much room do cattle need?
- Where do cattle sleep?
- What do cows eat?
- How much water is needed on a ranch?
- Can well-managed pasture systems improve soil quality?
- How can cattle ranchers prevent soil erosion?
- How can wildlife and cattle coexist on a farm?
- What can cattle ranchers do to maintain a profitable business?
- How can cattle ranchers take care of their sick animals and what can they do to prevent diseases?
- What are ways to manage herd health?
- How much does it cost to operate a cattle ranching business?
- How can we provide for beef cattle welfare?

Signs of Step Completion

Present a list of possible solutions to the identified challenge to the facilitator.

STEP TWO: REFLECTION

2 | IMAGINE



Important Discoveries During this Step:

List Your Possible Solutions:

Identify the Solution that You Think will be Achievable:

Plans for the Next Step (E.G. Knowledge to Gain, Questions to Answer, Preparations to Make, Etc.):

STEP THREE

3 | DESIGN



Purpose of Step

Develop a possible solution and identify the materials needed to provide evidence for why the solution is creative, unique, and sustainable. Write out the steps to take and describe the expected outcomes.

Student Prompts and Guiding Questions:

- Where is the cattle ranch located and how many acres or hectares is it?
- Where and what will the cows eat?
- How will all of the cow's nutrition requirements be met?
- Where can the cattle access water?
- If the water source for the cows is a stream or pond, how can that water resource be protected?
- Do the cows have a place to get out of the elements?
- Where will the fencing be and what will it be made of?
- Who will help you run your cattle ranch?
- How often will your cows rotate through different fields?

Signs of Step Completion

Present a detailed description of the solution as well as a written plan of how it could be carried out. Include the following in the plan: a materials list with budget (if building a physical model or conducting lab research), detailed directions, and expected outcomes.

STEP THREE: REFLECTION

3 | DESIGN



Important Discoveries During this Step:

Justify Your Model Design and the Materials You will Need:

Plans for the Next Step (E.G. Knowledge to Gain, Questions to Answer, Preparations to Make, Etc.):

STEP FOUR

4 | CREATE



Purpose of Step

Follow the design plan and construct the solution.

Student Prompts and Guiding Questions:

- Use all research, knowledge gained, and the design plan to create the solution.
- Repeat any of the previous steps should issues arise during the building process.
- Consider the parameters of the challenge and what needs to be accomplished for a successful challenge.

Signs of Step Completion

You will construct the solution and share with the facilitator.

STEP FOUR: REFLECTION

4 | CREATE



Important Discoveries During this Step:

Describe any Barriers You Overcame in Creating Your Model:

Plans for the Next Step (E.G. Knowledge to Gain, Questions to Answer, Preparations to Make, Etc.):

STEP FIVE

5 | TEST & IMPROVE



Purpose of Step

Test the design and collect qualitative and quantitative data. Discuss results and compare with the expected outcome. Seek areas of improvement and make changes where needed.

Student Prompts and Guiding Questions:

- How successful was your cattle ranch model in addressing the Cattle Ranch Riddle requirements?
- Were there any missing project components from your model?
- Was the ranch budget calculated accurately?
- Based on their plan, would you feel comfortable buying beef from this ranch?
- What suggestions do you have for improvements to the model/plan?
- What changes will you make to your design based on feedback from your peer reviewers?

Signs of Step Completion

The students will keep records of all test trials and share data with the facilitator. Entries should include both qualitative and quantitative data. The students will also share recordings of any improvements made to the solution and the effect they had on the outcome.

STEP FIVE: REFLECTION

5 | TEST & IMPROVE



Important Discoveries During this Step:

Impacts to the Global, National, and Local Community:

Plans for the Next Step (E.G. Knowledge to Gain, Questions to Answer, Preparations to Make, Etc.):

STEP SIX

6 | SHARE



Purpose of Step

Communicate what was learned throughout the challenge. Share the design process, data, and conclusions on how the solution answers the challenge question.

Student Prompts and Guiding Questions:

- Develop a presentation including knowledge gained, design plans, and materials used to develop a potential solution that is creative and sustainable.
- How is your solution an appropriate, innovative solution that realistically responds to the precise design competition problem?
- How does your solution address budgetary constraints, timeline issues, and other potential challenges?
- How successful was your solution in addressing the elements of the challenge?
- Describe and/or demonstrate what you learned from this challenge.

Signs of Step Completion

Present what was learned through the design process, including sharing how the solution addresses the problem, key aspects of design, data from test trials, and end results.

Additional Resources



The resources listed below are links to additional information to help you and your students complete the Cattle Ranch Riddle Challenge. In addition, be sure to check out the supplemental lessons on the Purple Plow website.

Curriculum

Ag in the Classroom – Beef Basics Curriculum

<https://agclassroom.org/matrix/lesson/284/>

Illinois Ag in the Classroom – Beef Lessons

<https://www.agintheclassroom.org/beef/>

Oklahoma Ag in the Classroom – Oklahoma Beef Cattle

<https://oklahoma.agclassroom.org/lessons/agricultural-topic/animal/beef/>

Grazing and Pasture Management

National Resources Conservation Service – Small Scale Solutions for your Farm:

Balancing Animals with Forage

<https://www.farmers.gov/sites/default/files/2022-09/farmersgov-small-scale-factsheet-balancing-animals-with-forage-10-2022.pdf>

Cattlemen's Beef Board and National Cattlemen's Beef Association – Raising Beef

<https://www.beefitswhatsfordinner.com/raising-beef>

The Pasture Project – Develop a Grazing Plan

<https://pastureproject.org/publications/rotational-grazing/>

The Pasture Project – Grazing Fundamentals

<https://pastureproject.org/resources/grazing-fundamentals/>

University of Wisconsin Extension Service – Pastures for Profit: A Guide to Rotational Grazing

<https://learningstore.extension.wisc.edu/products/pastures-for-profit-a-guide-to-rotational-grazing-p96>

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