

SUSTAINABLE BIOECONOMY

FOR ARID REGIONS

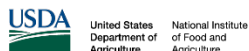


Guar as an Alternative Crop

OVERVIEW

This video lesson introduces students to guar (*Cyamopsis tetragonoloba*) with a seminar by Dr. Laura Rodriguez-Urbe. Guar is an alternative crop for arid regions. The lesson covers guar's agronomic and environmental importance, industrial uses, and biproducts. Students gain an understanding of how guar can be a useful to grow in arid lands.

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Guar as an Alternative Crop

STUDENT LEARNING OBJECTIVES:

After completing this video lesson, students will:

1. Understand the need for alternative crops in arid regions.
2. Understand how guar can enrich soil.
3. Identify industries where guar is useful.

TIME REQUIRED:

45 minutes

10 minutes teacher preparation

RESOURCES:

1. Guar as an Alternative Crop Lesson Plan
2. Guar as an Alternative Crop video by Dr. Laura Rodriguez-Uribe (available in Spanish, English and both languages): <https://www.youtube.com/watch?v=P2m30VPCpEc>

EQUIPMENT AND SUPPLIES NEEDED:

1. Device with access to YouTube videos (<https://www.youtube.com/watch?v=P2m30VPCpEc>)
2. Guar Quiz (page 5) for all students

THIS LESSON WOULD WORK WELL AS PART OF:

- Environmental Science curriculum
- Sustainability curriculum
- Agronomy curriculum
- Botany curriculum

THIS LESSON IS ALIGNED TO AFNR, FFA AND NGSS STANDARDS. Expanded standards listed on page 7.



LESSON PLAN:

1. Bell Ringer (5 minutes)

Have students work in pairs or small groups. Discuss the following questions:

- What is an alternative crop?** *A crop not usually grown in a geographic area but selected for use due to potential high sale value (products) or specialized benefit to the farming system.*
- Why do we need to learn about alternative crops?** *These crops help contribute to diversity in agricultural production, can address water challenges, can improve soil.*
- Why would the United State want to grow a crop that can be imported?** *Importing can be expensive and is often not environmentally sustainable, sometimes there are transportation challenges, sometimes the crop has other benefits that have not been considered.*

2. Guar as an Alternative Crop Video (10 to 15 minutes)

Students will watch the video “Guar as an Alternative Crop” presented by Dr. Laura Rodriquez-Uribe. The video is 9 minutes long but consider pausing the video to check for comprehension.

3. Guar Discussion (5 minutes):

Have students continue to work in pairs or small groups. Have students discuss and share responses to the following prompts:

- Discuss the ways growing guar helps soil.
- Discuss the many ways guar is used by industry.
- Discuss which research areas (video 8:03) you want to learn more about.

4. Guar Quiz (10 minutes):

Students complete the Guar Quiz (page 5). Have students correct their own quiz using the answer key on page 6. Check for comprehension using the video timestamps on the answer key.

5. Leveling Up (5 minutes):

Have each pair or group list 3 ways an alternative crop such as guar would address challenges facing agriculture in arid regions. Have students share responses.

6. Exit Ticket (5 minutes):

Have each pair or group Identify one concept presented in the video they would like to learn more about. Have students share responses.



DEFINITIONS:

Alternative crops: An agronomic crop not usually grown in a geographic region, selected for use due to potential high sale value or specialized benefit to the farming system.

Biproducts: An additional product that is manufactured in an industrial or biological process. This is in addition to the primary product.

Cover cropping: Cover crops can be broadly defined as any non-cash crop grown in addition to the primary cash crop. These crops have the potential to increase soil organic matter and fertility, reduce erosion, improve soil structure, promote water infiltration, and limit pest and disease outbreaks.

Cyamopsis tetragonoloba: The botanical name for guar.

Guar gum: Also called guaran, is a galactomannan polysaccharide extracted from guar beans that has thickening and stabilizing properties useful in food, feed, and industrial applications.

Legume: The fruit or seed of plants of the legume family (such as peas or beans) used for food.

Root Nodule: An area on the root of a leguminous plant that contains nitrogen fixing bacteria

Thickening agent: A substance which can increase the viscosity of a liquid without substantially changing its other properties.



Guar Quiz

Name: _____

Directions: Answer all questions

1. What year was guar introduced to the United States?
 - a. 1905
 - b. 1904
 - c. 1903
 - d. 1902

2. Guar nodules can help fix one of the following
 - a. Oxygen
 - b. Hydrogen
 - c. Nitrogen
 - d. Aluminum

3. Guar has _____ main biproducts
 - a. 3
 - b. 6
 - c. 12
 - d. 9

4. Which of the following is true about guar?
 - a. It requires a lot of moisture to grow.
 - b. Some parts are edible for human but not for ruminant animals.
 - c. It is a legume.
 - d. It can not be grown in the United States.

5. Guar is a drought tolerant annual crop?
 - a. TRUE
 - b. FALSE

6. Name 3 crops that can be rotated with guar:
1. _____ 2. _____ 3. _____

7. Name 3 industries where guar is being used:
1. _____ 2. _____ 3. _____



Answer Key for Guar Quiz

1. What year was guar introduced to the United States?
1903 (video: 01:15)
2. Guar nodules can help fix one of the following
Nitrogen (video: 01:59)
3. Guar has _____ main byproducts
3 (video: 03:44)
4. Which of the following is correct about guar?
It is a legume (video: 01:35)
5. Guar is a drought tolerant annual crop?
TRUE (video: 00:26)
6. Name 3 crops that guar would serve as a good crop to rotate in.
Cotton, Lentil, Soybean, Sorghum (video: 01:32)
7. Name 3 industries where guar is useful.
Cosmetic, Food, Medical, Pharmaceutical, Explosives, Mining (video: 05:47)



STANDARDS DETAIL:

AFNR

CRP.02: Apply appropriate academic and technical skills. Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive.

CRP.02.01. Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.

CRP.02.02. Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.

CRP.04: Communicate clearly, effectively, and with reason. Career-ready individuals communicate thoughts, ideas and action plans with clarity, whether using written, verbal and/or visual methods.

CRP.07: Employ valid and reliable research strategies. Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies.

CRP.08: Utilize critical thinking to make sense of problems and persevere in solving them.

CS.06. Analyze the interaction among AFNR systems in the production, S processing and management of food, fiber and fuel and the sustainable use of natural resources.

FFA Precept

FFA.PL-A. Action: Assume responsibility and take the necessary steps to achieve the desired results, no matter what the goal or task at hand.

FFA.PL-E. Awareness: Understand personal vision, mission and goals.

FFA.PL-F. Continuous Improvement: Accept responsibility for learning and personal growth.

FFA.PG-J. Mental Growth: Embrace cognitive and intellectual development relative to reasoning, thinking, and coping.

FFA.CS-M. Communication: Effectively interact with others in personal and professional settings.

FFA.CS-N. Decision Making: Analyze a situation and execute an appropriate course of action.

FFA.CS-O. Flexibility/Adaptability: Be flexible in various situations and adapt to change.

NGSS

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.

E S S2.D: Weather and Climate

E T S1.B: Developing Possible Solutions



AUTHOR BIOGRAPHY

Oluwatobi Omotayo was born and raised in Lagos Nigeria. He is a graduate student in Agricultural Economics & Agricultural Business department at New Mexico State University. His undergraduate degree is from the Federal University of Agriculture, Abeokuta, Nigeria where he studied Agricultural Economics. He now works with Dr. Frannie Miller and participates in the System Performance and Sustainability component and the Extension and Youth Development activities of the Sustainable Bioeconomy for Arid Regions (SBAR) project. Tobi's goal is to build competences with a synergy of agriculture, data analytics and public policy so that he will be able to advocate for policies that will foster development in Africa and other emerging economies.

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