

THE VALUE OF ECOTOURISM

Subject Area: Science, Social Science, Economics

Grades: 6th – 8th

Time: Two 45-minute sessions.

Essential Questions:

- How does ecotourism help ranchers make the most money from their land while helping wildlife?
- What trade-offs do ranchers need to make to engage in the ecotourism business compared with just selling their land?
- Why do ranchers see the need to manage wildlife and agriculture as part of their traditional culture?

Purpose and Overview:

In this lesson, students explore the trade-offs between ranchers farming keeping land for cattle/ and ecotourism versus selling land to a large agribusiness. They consider which economic choices help ranchers make the most money from their land in both the short and long term. Students role-play cattle ranchers and consider traditional culture and predicted economic outcomes to determine if they will sell or keep their land. They learn how raising cattle combined with ecotourism can be an alternative economic model to the boom and bust of selling land to the highest bidder.

Nature Works Everywhere Themes:



Nature provides grazing habitat that ranchers use to raise cattle that provide milk, meat and fertilizer. The grazing habit also supports wildlife that can serve as an additional source of meat.



Nature provides a grazing habitat that supports the survival of cattle and wildlife populations. Healthy cattle and wildlife populations enable the existence of the cattle ranching and ecotourism industries.

Introduction:

Kenya is a country rich in wildlife. Tourists pay thousands of dollars to see the wildlife. That income is vital to Kenya's economy. Most Kenyans earn less than \$10 a week, so income from tourism money means a lot to the Kenyan people. But there's a problem. Ranchers' needs often conflict with those of wildlife. Cattle and wildlife may compete for land and water, and wildlife may raid crops or kill cattle. In addition, because Kenyan ranchers measure wealth in terms of their cattle, they may see setting aside land for wildlife as reducing their wealth.



Many ranchers have wants and needs that exceed their available resources. Their land is limited in extent. Environmental and ecological factors limit the size of herds, which serve as their primary source of income. Furthermore, raising cattle is hard work and some land is not suitable for cattle. Thus, alternatives to the traditional pastoralist lifestyle can be appealing.

Kenya's climate is ideal for growing crops such as cotton and coffee. As a result, Kenya is currently undergoing a land "rush" where foreign businesses are moving in and buying up land to turn it to monoculture for agribusiness. Businesses can buy the land for low prices, but the money ranchers receive is a big short-term cash boost.

However, land used by agribusiness cannot be used by wildlife. Therefore, land managers and conservationists are working with ranchers to provide incentives to keep their land for ranching and ecotourism.

Ecotourism has the potential to benefit people and wildlife. It provides direct income for ranchers and it can indirectly benefit the community through tourism-related activities such as the sale of handicrafts. Ecotourism can involve significant initial investment, however, and an ecotourism business model must account for variability in tourist visits.

Objectives:

The student will...

Knowledge

- Describe economic features of an emerging country.
- Describe an example of a trade-off.
- Identify benefits of ecotourism.

Comprehension

- Illustrate the meaning of a trade-off in an economic context.
- Develop a process for decision-making.
- Explain the importance of comparing different scenarios in a decision-making process.

Application

- Compare the economic indicators of an emerging country with that of a more industrialized country.
- Role-play a decision-making scenario.

Analysis

- Analyze the meaning of key economic indicators.
- Compare the benefits of ecotourism with other options for generating income.

Synthesis

- Evaluate differences in key economic indicators between an emerging country and a more industrialized country.
- Model an economic scenario using simulated data.

Evaluation

- Interpret data related to economic activities.
- Debate the pros and cons of different economic decisions.

Standards:

Next Generation Science Standards

Disciplinary Core Ideas

- ESS3.C Human Impacts on Earth Systems
- ETS1.A: Defining and Delimiting Engineering Problems

Crosscutting Concepts

- Cause and Effect
- Stability and Change

Science and Engineering Practices

- Asking Questions and Defining Problems
- Constructing Explanations
- Engaging in an Argument from Evidence
- Obtaining, Evaluating, and Communicating Information

Performance Expectations Middle School

- MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

Common Core English and Language Arts Standards for Writing Grades 6-8

- CCSS.ELA-LITERACY.WHST.6-8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

- CCSS.ELA-LITERACY.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
- CCSS.ELA-LITERACY.WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

National Social Studies Standards

Culture – Learners will understand:

- How culture influences the ways in which human groups solve the problems of daily living;
- That culture may change in response to changing needs, concerns, social, political, and geographic conditions.

People, Places, and Environments – Learners will understand:

- The theme of people, places, and environments involves the study of relationships between human populations in different locations and geographic phenomena such as climate, vegetation, and natural resources.

Production, Distribution, and Consumption – Learners will understand:

- Individuals, government, and society experience scarcity because human wants and needs exceed what can be produced from available resources;
- How choices involve trading off the expected value of one opportunity gained against the expected value of the best alternative.

Global Connections – Learners will understand:

- Global factors such as cultural, economic and political connections are changing the places in which people live (e.g. through trade, migration, increased travel, and communication)

Vocabulary:

Ecotourism: Environmentally responsible travel to natural areas, in order to enjoy and appreciate nature (and accompanying cultural features, both past and present) that promotes conservation, has a low visitor impact, and provides for beneficially active socio-economic involvement of local peoples.

Emerging Country: A nation where the average income is much lower than in industrialized nations; where the economy relies primarily on agriculture, and where farming is conducted by non-mechanized methods. In many emerging nations, rapid population growth threatens the supply of food.

Pastoralism: A lifestyle based primarily on nomadic herding.

Trade-off: A choice that is made to gain one benefit while another is given up.

Materials:

Nature Works Everywhere videos that support this lesson plan:

- Introductory video *The Value of Grasslands*: <https://vimeo.com/77808155>
- Scientist interview questions:
 - *Ecotourism #1: Traditional* - “Why do ranchers see the need to manage wildlife and agriculture as part of traditional culture?” <https://vimeo.com/78371503>

- *Ecotourism #2: Incentives* - “What are the economic incentives of ecotourism for ranchers?” <https://vimeo.com/78371502>
- *Ecotourism #3: Decisions* - “How does a rancher decide to support ecotourism compared with just selling his/her land for the highest price?” <https://vimeo.com/78371504>
- *Ecotourism #4: Balance* - “How do ranchers balance cattle grazing and wildlife needs?” <https://vimeo.com/78371374>

For each group of/individual students:

- 1 cup
- Computer with Internet access
- Graph paper (optional)
- Notebook paper/journal
- Calculators (optional)

Other materials (all printouts located at the end of this lesson):

- Computer, Internet, projector for teacher
- Timer
- [Printouts of the scenario and 4 positions](#)
- [Printouts of Model 1 and Model 2 – either to project or use handouts](#)

Classroom Activities:

Part 1: Engage

1. Ask students, “If you were to get \$10 in allowance per week, what would you spend the money on?” Pose the question, “Of the things that were suggested, which are absolutely necessary to live?”
2. Ask students what they know about Kenya. Explain that Kenya is an emerging country. Ask students if they know what this means. An emerging country is a nation where the average income is much lower than in industrial nations, where the economy relies primarily on agriculture and where farming is conducted by primitive methods. In many developing nations population growth threatens to food supply.
3. Explain that the average Kenyan earns about \$450 per year, or less than \$10 per week. With that money, s/he has to pay for food, clothes, housing, healthcare, and transport. Most people in Kenya are very poor.
4. Explain that Kenya is on the equator, so its climate and natural resources, including wildlife, are different from the United States.
5. Explain that most rural Kenyans make their living as cattle ranchers and that these ranchers measure their wealth in cattle. As a result, anything that might limit the size of their herds is seen as potentially decreasing their already limited wealth.

6. Explain that foreign agriculture companies are currently trying to buy Kenyan land cheaply in order to grow cash crops, including coffee and sugar cane. Ask students:
 - Why might Kenyan ranchers choose to sell their land to these foreign businesses? (short-term cash gain)
 - Why might they choose not to sell? (preservation of culture, long-term financial security)

Answers will vary. Accept all answers.

7. Explain that ecotourism is another economic option available to Kenyan ranchers. Ask, “What is ecotourism?” Have students work in groups, for two minutes, to list their ideas about ecotourism. Show [The Value of Grasslands \(6:01\) video](#). Allow students to add ideas as the video plays. After the video, have groups use the teammates consult strategy (see below) to generate a definition for ecotourism (a couple of sentences). Randomly call on a couple of groups to share. Ask other groups (not randomly selected) if they have anything to add. Post and share The International Ecotourism Society’s definition of ecotourism.

Ecotourism is...“responsible travel to natural areas that conserves the environment and improves the well-being of local people”

8. Explain that wildlife is one of Kenya’s major assets and that tourism is important to the Kenyan economy.

Teammates consult- Place a cup in the middle of each table/group. Have each student put pencil in cup. Allow time for groups to discuss and agree upon a definition for ecotourism. Start a two-minute timer. Check on student progress after two minutes. If more time is needed restart the two-minute timer. Only when all group members agree can students remove their pencils from the cup to record their definition. Encourage students to justify their thinking to other group members when they are trying to reach a consensus.

9. Remind students that most rural Kenyans earn money by raising cattle. This lifestyle is referred to as pastoralism. Pastoralism is a lifestyle based primarily on nomadic herding.
10. Explain that tourism companies/land managers and conservationists are working with ranchers to provide incentives to keep their land for ranching and ecotourism as opposed to selling it for agricultural use. Ask students to briefly consider:
 - What are some advantages of keeping the land for ranching?
 - What are some advantages of using the land for ecotourism?
 - What kinds of incentives might convince ranchers not to sell their land to agribusinesses?
11. Explain to students that they will work to answer these questions during the lesson. Focus their attention on the guiding questions:
 - How does ecotourism help ranchers make the most money from their land while helping wildlife?

- What trade-offs does a rancher need to make to engage in ecotourism business compared with just selling their land?
- Why do ranchers see the need to manage wildlife and agriculture as part of their traditional culture?

Part 2: Explore

1. Explain to students that to help them understand the issues facing ranchers in Kenya they will learn more about Kenya as an *emerging country* and the ranchers' lifestyle/culture.
2. Have students create a T-chart with one column labeled Kenya and the other column labeled United States.
3. Have students explore the profiles of Kenya and the United States using the online tools [Gapminder](#) and the [CIA World Factbook](#). Focus their attention on the following areas:
 - Economy
 - Labor force – by occupation
 - Population below poverty line
 - Industries

Students should write down key facts about Kenya and the United States in the corresponding columns of their T-charts.

4. Ask students, “Based on what you’ve just learned, why might it be easier for individuals in the U.S. and other wealthy countries to forego immediate economic gain than it is for people in Kenya and other emerging societies to do so?”
5. Explain that in industrialized nations, many people earn a steady reliable income with little risk. Hence, people in these wealthier countries can more easily forego immediate economic gain than those in poorer countries.
6. Explain that due to their poverty, many Kenyan ranchers are easily tempted to sell their land to the highest bidder, especially in times of drought. The land is usually sold to big agricultural companies.
7. Ask, “If three quarters of the Kenyan population is engaged in cattle ranching, do you think Kenyans believe keeping land to raise cattle is important to their culture?” Explain that for many Kenyans, raising cattle heavily influences not just their way and quality of life but also their cultural identity. For example, the Kikuyu are primarily settled ranchers, whereas the Maasai are semi-nomadic pastoralists.
8. Help students understand that, in addition to not supporting cattle, the land dedicated to crops cannot support the wildlife that tourists want to see.
9. Show the scientist interview video [Ecotourism #1: Traditional](#) that answers the question: “Why do ranchers see the need to manage wildlife and agriculture as part of traditional culture?”

10. Summarizer: Pose the question, “What Roles Do Cattle and Wildlife Play in Kenya?” Draw a Venn diagram on the board with “cattle” in one circle and “wildlife” in the other circle. Use calling sticks to randomly select students to share and record their answers in the appropriate circles. Make sure to write answers that apply to both cattle and wildlife in the part of the Venn diagram that overlaps. The main ideas are that cattle play a central role in Kenya’s rural culture and wildlife attracts tourists to the country. They both can provide income for Kenyans.
11. Have students individually respond to the reflection questions below.
- Can the presence of wildlife help Kenyan ranchers maintain their traditional culture?
 - Land used for agricultural purposes such as growing cotton or coffee cannot support wildlife tourists want to see or cattle. Why would Kenyan ranchers be tempted to sell their land to an agricultural company?
 - Why in industrialized countries such as the United States might it be easier for citizens to more easily forgo immediate economic gain?

Day 2

12. Have each student take out paper, pencil and calculator. Assign students to work in small groups. Each group represents a group of Kenyan ranchers who own land. Have individual students record information, on a “keep” or “sell” T-chart, to help them decide if they will keep or sell the land.

Present students the following scenario (printout version at the end of this lesson):

“You are a cattle rancher in Kenya. You have been approached by a big business that is offering to buy your land for more than anyone else is willing to pay. They want to grow cotton.

Once the land is used for this purpose it will no longer be able to support cattle or wildlife. Wildlife is your country’s main source of income. Your main source of income is cattle. Lately, you have been considering making extra money through ecotourism. You need to consider the trade-offs. A trade-off is a choice that is made to gain one benefit while another is given up.

Think about your country’s economy, your long-term personal finances and how much you value your traditional culture when trying to decide if you will sell your land.”

13. Suggest to students: “You may be tempted to sell since you could get a cash windfall of about 10 times what you’d make in a single year of raising cattle. The question is - will you sell?”
14. Once groups finish brainstorming have a class discussion based on the talking points listed below.
- Emphasize to students that drought or disease could easily wipe out a herd and put the farmer out of business in the next few years, in which case he would have been better off with the cash. Therefore, a rancher might prefer to sell to avoid

the long-term risk. On the other hand, if the farming is good and he is lucky, he may make more in the 10 years than he would if he sold.

- Also suggest to students: “Your culture is based on the ownership of cattle and small-scale farming. You might not want to sell because that would mean the possible loss of cultural traditions. In many African cultures, the opinions of the ancestors are very important. How might the ancestors feel if you sold your land?”

15. Place the opinion of one of four stakeholders in each corner (printouts to use in the classroom are at the end of the lesson) and either have students rotate through the corners to read the perspectives OR elect four students to go to the corners and read or role-play their character’s opinion.

The perspectives:

Older Kenyan Cattle Rancher:

“Ranching is a tradition and an integral part of our culture. Our way of life has survived drought, disease, and predation. New efforts to provide options for us to insure our herds and host tourist visits will enable our culture to continue.”

Kenyan Government Representative:

“Ecotourism is our country’s main source of income. It is dependent upon maintaining a healthy wildlife population. Cattle ranchers can support Kenya’s economy by hosting tourist visits, on their land, to supplement their personal income.”

Kenyan Cattle Rancher’s Son:

“I have spent my whole life learning how to raise and tend to cattle. I know my father will get a lot of money if he sells our land. I do not know how I will earn a living.”

Nature Conservancy Scientist:

“Cattle are susceptible to drought and disease. Drought is the main threat to herds and can kill up to hundreds of thousands of animals a year. Cattle deaths negatively impact a rancher’s livelihood. Cattle ranchers that can live side by side with wildlife can potentially strengthen their communities and help the environment.

16. While students are hearing the perspectives of different stakeholders. Instruct them to record information offered by the stakeholders that might help them make their decision about whether or not to sell their land.
17. Have each group share its answer initial responses to the hypothetical question posed in Step 12. Explain that there is no right or wrong answer. This is why ranchers must use models to help them decide.
18. Explain to students that they will use a model with simulated data to illustrate how a rancher might choose between selling to big agribusiness or continuing to farm. Explain that once this model is analyzed they will study a second model to learn how cattle plus ecotourism is another option.

19. Share [Model 1](#) with students. A sheet is included at the end of this lesson for you to project or use as a worksheet for student calculations. Explain that models have limitations but are good tools to use to help make decisions. This model projects what might happen over the next ten years if you sell or keep your land. As a cattle rancher, you will analyze a couple of models to help you decide if you will sell. Keep in mind that factors such as drought, disease and higher than average profit are hard to predict.

Ask students “At a quick glance, will selling or farming make you more money?”

Model 1 Answer Key

Year	Yearly income	
	Selling Land	Cattle only
1	\$500	\$56
2	\$20	\$92
3	\$21	\$85
4	\$22	\$73
5	\$23	\$81
6	\$24	\$60
7	\$25	\$67
8	\$26	\$83
9	\$27	\$71
10	\$28	\$91
Total	\$716	\$759

20. Emphasize to students that these data are simulated (multiplying by a factor of 20 could be a ballpark for a more realistic scenario). The aim of the data is to show the principle of a *trade-off*. The trade-off in this case is that the rancher might decide selling provides an immediate benefit. This choice might be a better option than the long-term risk of raising cattle, even though ranching could provide more income in the long term.

21. Have students use calculators to determine totals. Based on the current data, have students predict if they think selling or keeping land/current lifestyle is a better option. Explain the numbers in the table. Selling gives a big immediate return, and some steady income due to jobs. Ranching provides a higher income than jobs but is more variable from year to year.

22. Show the scientist interview video [Ecotourism #2: Incentives](#) that answers the question: “What are the economic incentives of ecotourism for ranchers?” Remind students to record information on their T-charts.
23. Explain that ecotourism can be an attractive option for ranchers, because ecotourism offers additional revenue. This revenue can buffer them against variable income from cattle alone. Tell students that there are a variety of costs associated with starting an ecotourism business, but the income earned from hosting tourist visits should make-up these costs. Tell them that ranchers would have to forego some income and possibly some labor while starting an ecotourism business. Cite this as another example of a trade-off. The trade-off a rancher needs to make to engage in ecotourism is to forego short-term for long-term benefits.
24. Explain that, over time, the income from ecotourism will add to that of cattle ranching. The joint income of cattle and ecotourism has the potential to exceed income from cattle only or selling the land.
25. Show the scientist interview video [Ecotourism #3: Decisions](#) that answers the question: “How does a rancher decide to support ecotourism compared with just selling his/her land for the highest price?”
26. Direct students’ attention to [Model 2](#). A sheet for you to project or use as a worksheet is included at the end of this lesson plan. This model projects what might happen over the next ten years if you keep your land and add ecotourism to your workload. Say, “Now that you have an idea of how raising cattle and selling the land might impact your income, let’s explore what might happen if you decide to supplement your income with ecotourism.”

Model 2 Answer Key

Year	Yearly income			
	Cattle only	Ecotourism income	Cattle income with ecotourism*	Income from cattle and ecotourism
1	\$56	(\$50)	\$28	(\$22)
2	\$92	(\$25)	\$46	\$21
3	\$85	\$0	\$43	\$43
4	\$73	\$25	\$37	\$62
5	\$81	\$50	\$41	\$91
6	\$60	\$75	\$30	\$105
7	\$67	\$100	\$34	\$134
8	\$83	\$157	\$42	\$199
9	\$71	\$110	\$36	\$146
10	\$91	\$132	\$46	\$178
Total	\$759	\$574	\$380	\$954

*This model assumes that farming income is reduced by 50% due to ecotourism activities.

27. Have students calculate the totals and add advantages and disadvantages of keeping and selling the land to their T-charts while considering the idea of using ecotourism as a source of revenue.

28. Have students brainstorm how they/ranchers can make money from ecotourism. Ecotourism provides multiple avenues to earn money:

- Access permits for ecotourism companies
- Compensation for fallow land or set-asides
- Service jobs including hotel staff and tour guiding
- Cultural performances
- Sales of handicrafts

29. Explain how ecotourism helps wildlife:

Direct benefits

- Decrease local poaching and hunting of wildlife
- Increase land set aside for wildlife
- Reduce pressure to maximize cattle herds, which compete with wildlife for water and grazing

Indirect benefits

- Increase awareness of and appreciation for wildlife among locals as part of their culture
- Increase tourists' appreciation for wildlife and likelihood to support wildlife conservation
- Increase revenue to local and national governments, encouraging support for and enforcement of wildlife conservation laws

30. Show the scientist interview video [Ecotourism #4: Balance](#) that answers the question: "How do ranchers balance cattle grazing and wildlife needs?"
31. Mention to students that ecotourism is not a perfect solution. Some travel companies call their operations ecotourism, but they may not work with local people or contribute to wildlife conservation. Negative effects of ecotourism include:
- Accommodation, feeding and transport of tourists can damage habitats and cause pollution.
 - Tourists may change local culture by introducing cash-based incomes and by changing the basis for traditional cultural practices, such as trading cattle for goods.
 - Ecotourism may close off development opportunities for others in the community who want to engage in non-tourism activities.
32. Have students return to their small groups and use all of the information they have acquired to make a decision about whether to continue to raise cattle alone, sell their land, invest in ecotourism alone, or invest in both farming and ecotourism.
33. While they are thinking through all of the information they have compiled about selling or keeping their land, have them consider the following guiding questions:
- Would the initial loss due to investment of starting ecotourism be worth it?
 - Do you prefer to be able to maintain your traditional cattle ranching culture?
 - How will you make a living once you spend money you obtain from selling your land?
 - What is the best overall decision for you?
34. Invite student groups to share and explain their answers.

Part 3: Explain

1. Share the [original scenario](#) again.

“You are a cattle rancher in Kenya. You have been approached by a big business that is offering to buy your land for more than anyone else is willing to pay. They want to grow cotton.

Once the land is used for this purpose it will no longer be able to support cattle or wildlife. Wildlife is your country’s main source of income. Your main source of income is cattle. Lately, you have been considering making extra money through ecotourism. You need to consider the trade-offs. A trade-off is a choice that is made to gain one benefit while another is given up.

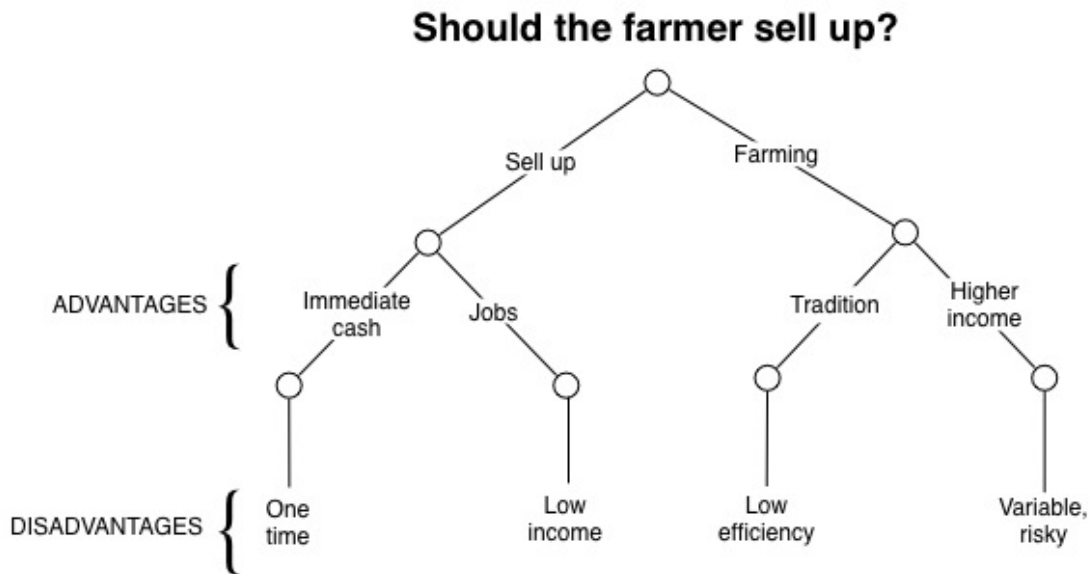
Think about your country’s economy, your long-term personal finances and how much you value your traditional culture when trying to decide if you will sell your land.”

2. Have students work in their small groups to create short skits that include roles for a group of ranchers faced with the opportunity to begin an ecotourism business or sell to a large agricultural business.
3. Ensure the skit includes a role for one student from each group to act as the group representative. The representative will ask the group for their decision on whether to sell their land to the big business, continue with their traditional farming or to develop a combined farming-ecotourism. They will provide rationale for their decision based on the data they have collected from models and discussion. In coming to a decision as a group use majority rule; individual students will have the opportunity to communicate different ideas in the next task.
4. The skit must explain whether or not you decided to sell your land, the consequences of selling or keeping the land, and what you will do after you keep/sell the land.
5. After skits are performed, have individual students write a paragraph about why they agree or disagree with their group’s decision to keep or sell the land.

Part 4: Extend

1. Have students use the graph paper to plot the data in the tables from the **Explore** section.
2. From the decision process, have students create a decision tree. The decision tree should clearly illustrate the advantages and disadvantages of each potential decision to help ranchers decide whether or not to sell their land.

For example:



3. Have students research ecotourism in Kenya using online resources (PDFs and websites). Have them create a list of issues related to ecotourism in Kenya. This exercise will put the farmers' situation into perspective. Issues should include:
 - Kenya's dependence on ecotourism
 - a. For jobs
 - b. Foreign income
 - Use of land for ecotourism
 - Feeding a growing population
 - Alternative income sources from the land (e.g., industry)
 - Impact of ecotourism
 - a. On natural habitats
 - b. On cultures
 - Foreign ownership of ecotourism businesses
4. Have small groups create a presentation from their list, titled "Cattle Ranching Versus Ecotourism in Kenya." Their presentation can be an overview or it could focus on one or two of the different issues.

Part 5: Evaluate

Have students self-evaluate for:

- Their understanding of the economic comparisons between the U.S. and Kenya
- How well their T-chart and skit covered the various aspects of rancher income
- The extent and quality of writing in their individual summaries

Specific questions:

1. Compare and contrast the line of the graph for “Income from ranching and ecotourism” with the line for “Income from selling.”
2. State three reasons why ranching income is variable. Describe how ecotourism can be a buffer against risk.
3. Explain how ranching and ecotourism can help Kenyans preserve traditional culture.

Scoring key for evaluation

1. In the graph, the line for selling shows the highest income in Year 1. After Year 1, income drops rapidly and increases only slightly for the next nine years. In the first year, income from ranching and ecotourism is much less than selling. The rancher makes a loss. However, income rises steadily so that by Year 5 ranching and ecotourism combined is providing more yearly income than any of the other options.
2. Three reasons farming income is variable:
 - a. Variable production – due to environmental factors, production of livestock or crops for sale may be more or less in some years than others.
 - b. Variable costs – due to various factors, the cost of production, such as fuel, fertilizer or feed may be higher or lower from year to year.
 - c. Variable market prices – due to economic factors, the price of livestock or produce may be higher or lower from year to year.

Ecotourism can be a buffer against risk because it provides an alternative source of income. Ecotourism costs and income are different from those of ranching, so a poor year of farming might be offset by a good year for ecotourism.

3. Ranching is part of many Kenyans’ traditional culture, so keeping land for ranching helps them maintain their lifestyles, connection to the land, and ways of measuring wealth. Ecotourism can create a market for traditional handicrafts as well as providing a venue for traditional music and dance performances.

Additional resources and further reading

- CIA World Factbook: Kenya
<https://www.cia.gov/library/publications/the-world-factbook/geos/ke.html>
- CIA World Factbook: United States
<https://www.cia.gov/library/publications/the-world-factbook/geos/us.html>
- International Monetary Fund: World Economic and Financial Surveys – World Economic Outlook Database
<https://www.imf.org/external/pubs/ft/weo/2015/01/weodata/index.aspx>
- USDA Economic Research Service: Farm Labor
<http://www.ers.usda.gov/topics/farm-economy/farm-labor.aspx>
- World Bank/IFC Doing Business Economy Profile: Kenya
<http://data.worldbank.org/country/kenya>
- What is Ecotourism?
<http://www.nature.org/greenliving/what-is-ecotourism.xml>
- What is grass banking? An article about how ranchers can stay in business while protecting land from development.
<http://science.howstuffworks.com/environmental/green-science/grassbanking.htm>
- Ecotourism: Green Problem or Green Solution?
<http://blog.nature.org/conservancy/2009/11/04/ecotourism-green-problem-green-solution-matt-miller-nature-conservancy/>
- Decision Trees: Choosing by Projecting “Expected Outcomes” – A Tool For Helping Choose Between Different Courses of Action
<http://www.mindtools.com/dectree.html>