

Agriculture and Water in the U.S. and Africa

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UNIT DESCRIPTION

This unit includes four lessons, each lasting two class periods focusing on agriculture and water. For background readings and resources on agriculture and water, go to the Geography: Teaching with the Stars web site at <http://geoteach.org> and click on the Teacher Resources page. This page also contains a profile of Nicole Vickerman.

The purpose of this unit is to compare agriculture and water use in the United States and Africa. It is part of a more general consideration of Africa in a ninth grade World Geography course. In the first lesson, students visit learning stations to explore maps, tables, and graphs related to agriculture and water. The second lesson has students read articles and share what they learned. They also put together climographs that show similarities in crop production between Africa and the U.S. In the third lesson, students choose a topic related to agriculture, research it, and then give presentations. In the final lessons, students consider “dead zones” in the U.S. and Africa.

INSTRUCTIONAL OBJECTIVES

After participating in these lessons, students will be able to:

- Interpret maps, tables, and graphs related to agriculture and water in Africa and the United States.
- Identify similarities and differences in agriculture and water use for the United States and Africa.
- Create presentations related to major agricultural issues.
- Describe the causes and locations of dead zones in the United States and Africa.

NATIONAL STANDARDS

Note: New Geography Standards will be available in December, 2011.

MATERIALS AND ADVANCE PREPARATION

All materials you need to conduct these four lessons are either provided in this guide or are available via links contained in the guide. The following is a list of the materials and links contained in the guide, along with some suggestions for preparing them for use.

Lesson One: By the Numbers

- **Compare and Contrast** transparency master (Page 6)
- A copy of the **Procedure for Interpreting Maps, Tables, and Graphs** handout for each student. (Page 7)
- Assessment transparency master (Page 8)

- Two or three copies of the following document for Learning Station #1
United States Department of Agriculture
Economic Research Service
The 20th Century Transformation of U.S. Agriculture and Farm Policy
<http://www.ers.usda.gov/Publications/EIB3/>
- Two or three copies of the cartograms like the following for Learning Station #2
Export of Primary Goods
Secondary Exports
Exports of Hi-Tech Goods
Human Development Index
Absolute Poverty
Highest Proportions of Child Laborers

Source: Worldmapper
<http://www.worldmapper.org/>
- Two or three copies of the maps like the following for Learning Station #3
Children Underweight Rate
Arable and Permanent Cropland
Obesity
Drinking Water Availability

Source: NationMaster
Agricultural Statistics by Country
<http://www.nationmaster.com/cat/agr-agriculture>
- Access to a computer to link to the following web site, where students can choose data to explore, for Learning Station #4.

Source: NationMaster
Agricultural Statistics by Country
<http://www.nationmaster.com/cat/agr-agriculture>

Lesson Two: Agriculture and Water

- a soft ball or globe for selecting which student will share
- A copy of **Agriculture and Water** for each student in Reading Round One. (Page 10)
- A copy of the **Climograph Puzzle** handout for each student. (Page 11)
- A copy of the **Climograph Matrix** for each student. (Page 12)
- Multiple copies of articles like the following, so that each student gets to read one article in Reading Round Two.
A Look at California Agriculture
<http://www.agclassroom.org/kids/stats/california.pdf>

Summary of Estimated Water Use in the US, 2005
<http://pubs.usgs.gov/fs/2009/3098/pdf/2009-3098.pdf>

Agricultural Water Use
<http://www.water.ca.gov/wateruseefficiency/agricultural/>

Irrigation Water Use

<http://ga.water.usgs.gov/edu/wuir.html>

- Multiple copies of articles like the following, so that each student gets to read one article in Reading Round Three.

Agriculture pillars critical to recovery (in Zimbabwe)

<http://www.thestandard.co.zw/business/29071-agriculture-pillars-critical-to-agric-recovery.html>

Untapped Crop Data from Africa Predicts Corn Peril if Temperatures Rise

<http://news.stanford.edu/news/2011/march/africa-corn-peril-030911.html>

Southern Africa: Taking the risk out of subsistence farming

<http://www.irinnews.org/report.aspx?ReportId=92136>

Kenya: International campaigners warn Europe over biofuels carbon disaster in Africa

<http://reliefweb.int/node/393042>

Advancing Food Security in a Changing Climate

<http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:22858132~pagePK:64257043~piPK:437376~theSitePK:4607,00.html>

Q and A Why food prices and fuel costs are going up.

<http://www.bbc.co.uk/news/business-11177214>

Lesson Three: The Geography of . . .

- A copy of the SHEEP handout for each student. (Page 14)
- You may want to have students choose from among a variety of short articles about agriculture to serve as a jumping off point from sources such as Geography in the News (<http://www.geographyinthenews.rgs.org/>) or you can have the students choose a topic and leave all of the research to them. Here are some possible article titles from Geography in the News, which is a subscription service.

Many Reasons for Africa's Hunger and Starvation

World Food Price Crisis

Global Land Grab

Dangers from Imported Food

Brazil's Soybean Boom

Black Pepper from Malabar

Loving Chocolate

World Food Price Crisis

Here are some other possibilities:

The New Geopolitics of Food

http://www.foreignpolicy.com/articles/2011/04/25/the_new_geopolitics_of_food

What is Fair Trade?

<http://www.fairtradefederation.org/>

Global Issues for Breakfast: The Banana Industry and Its problems

<http://www.scq.ubc.ca/global-issues-for-breakfast-the-banana-industry-and-its-problems-faq-cohen-mix/>

You may want to create a rubric based on your expectations for this lesson. This rubric could, for example, credit both the research and the product. Here is an example:

Presentation Rubric

<http://www.ncsu.edu/midlink/rub.pres.html>

- A computer with Internet access for each small group (2–3 students/group).

Lesson Four: Dead Zones

- Find the Dead Zone video on YouTube, located at <http://www.youtube.com/watch?v=3n7yyJinlNw>
- **Venn Diagram** transparency master (Page 17)
- Two or three copies of **Animal Noises** Chart (Page 18) to cut up and use as follows: Before class, staple a horse slip to a copy of each different article (see below for list of suggested articles). Do the same with the other animal slips, so that no particular animal slip (eg., cow, pig, dog, cat) appears on more than one copy of the same article. This will allow students to form groups containing members who have read a variety of articles.
- Using a variety of articles in this lesson will add to the richness of the discussion. You can determine how many articles to use. You should include articles about the U.S. dead zone and the African dead zone. Here are some possibilities:

U.S. Dead Zone

A ‘Dead Zone’ in the Gulf of Mexico, Washington Post, 07/31/08

<http://www.washingtonpost.com/wp-dyn/content/story/2008/07/31/ST2008073100349.html>

The Gulf of Mexico’s Dead Zone is among the world’s largest—and corn is one of the culprits.

<http://www.indyweek.com/indyweek/the-gulf-of-mexicos-dead-zone-is-among-the-worlds-largestandmdashand-corn-is-one-of-the-culprits/Content?oid=1520017>

Gulf of Mexico Dead Zone: Mitigating the Damage.

<http://www.environmentalleader.com/2010/11/30/gulf-of-mexico-dead-zone-mitigating-the-damage/>

More corn for meat and ethanol, less habitat for Gulf fish.

<http://www.grist.org/article/2010-08-02-more-corn-for-meat-and-ethanol-less-habitat-for-gulf-fish/>

Despite promises to fix it, the Gulf’s dead zone is growing. New Orleans Times-Picayune, 06/09/07

http://blog.nola.com/times-picayune/2007/06/despite_promises_to_fix_it_the.html

Dead zone as big as Massachusetts along the coast of Louisiana and Texas, scientists say. New Orleans Times-Picayune, 08/05/10

http://www.nola.com/news/gulf-oil-spill/index.ssf/2010/08/dead_zone_as_big_as_massachuse.html

African Dead Zone

Growing Atlantic dead zone shrinks habitat for billfish and tuna, may lead to over-harvest

http://news.mongabay.com/2010/1229-morgan_dead_zone.html

Climate change may be sparking new and bigger “dead zones”

<http://www.scientificamerican.com/article.cfm?id=climate-change-dead-zones>

Ocean’s dead zones expanding; billfish more exposed to capture

<http://thecostaricanews.com/ocean%E2%80%99s-dead-zones-expanding-billfish-more-exposed-to-capture/5024>

Lesson One:

By the Numbers

OPENING THE LESSON

1. Begin by dividing students into groups of two or three.
2. Indicate to students that in this lesson they will examine and analyze maps, tables, and graphs dealing with agriculture and development in the United States and Africa at four learning stations located around the classroom. They will then be asked to share what they learned with the class.

DEVELOPING THE LESSON

3. Project the **Compare and Contrast** transparency on the screen. Indicate to students that they should make a copy of the chart for themselves and use it to record important similarities and differences about agriculture in the United States and Africa as they move through the stations.
4. If your students need practice in interpreting maps, tables, and graphs, distribute a copy of the **Procedures for Interpreting Maps, Tables, and Graphs** handout to each student. Encourage students to use the procedure outlined in the handout to help them understand the graphics available at each station. (Note: You might want to have students practice the interpretation procedure as a class, on one of the maps or graphs, before they start their group work.)
5. Give the groups between 10 and 12 minutes to complete each station. Encourage the students in each group to share and discuss what they are learning about agriculture in Africa and the United States. You might want to circulate among the groups to monitor their progress and to ask and answer questions, as necessary.

CONCLUDING THE LESSON

6. When each group has completed its work at the learning stations, invite individual students to share a similarity or difference between agriculture in the United States and Africa, that they identified, by recording it on the **Compare and Contrast** transparency at the front to the class. You can ask presenters questions to clarify or extend what they have said.
7. Project the **Assessment** transparency on the screen. To conclude the lesson, have each student respond, in a paragraph, to the assignment described on the transparency. Review the assignment with the class before they start.

Compare and Contrast

	Africa	United States
Agriculture		
Development		
Similarities		

Procedure for Interpreting Maps, Tables, and Graphs

Use the following three-step procedure to analyze the information contained in each of the maps, tables, and graphs that appear in the *Background Brief*.

1. **What is it about?** This step involves previewing the item: inspecting the title, checking the notes and source, studying the key and symbols. It also involves identifying the form in which the information is presented: a map (what kind), a table, a bar graph, a line graph, a circle graph, a pictograph.

2. **What does it say?** This step involves discovering what the item tells you about the issue under consideration.

3. **What does it mean?** This step involves speculating about the factors that could have led to the patterns in this distribution and/or the possible implications of the patterns observed.

Assessment

Compare and contrast the impact of agriculture on development in the United States and Africa in at least five sentences. You may use specific countries in Africa or discuss the continent as a whole in your answer. Be sure to support your ideas with specific facts.

Lesson Two:

Agriculture and Water

OPENING THE LESSON

1. Indicate that in this lesson, students will read a series of articles about water and agriculture in the United States and Africa. The goal is to compare the use of water and agriculture in the two regions and to share what they learned.
2. Reading Round One: Distribute a copy of the first article, “Agriculture and Water” to each student.

DEVELOPING THE LESSON

3. Ask students to read the article. Remind them to look for what the article says about water and agriculture. Encourage students to underline important points made in the article and to write notes in the margins. This will make it easier to review the articles later.
4. When students have finished reading the article, ask them to share what they have learned. Encourage the other students to take notes on the information shared.
5. You might want to use a “ball toss” strategy for getting student to share. The ball toss strategy involves you giving the ball to the first student who then shares. When that person is finished, he or she throws it to someone else who shares, and so on. This strategy is fun for students, and keeps everyone involved, since they don’t know when they might need to catch the ball and share.
6. Reading Round Two: With the sharing of the first article as background, have each student read one of four articles related to agriculture and water use in the United States. When they are finished reading, have the students share what they learned, using the ball toss strategy, if desired. Again, encourage students to take notes on what they learned from the sharing.
7. Reading Round Three: Have students use the same reading, sharing, and note taking strategies to examine articles related to water in Africa and international issues related to irrigation.

CLOSING THE LESSON

8. Divide the class into small groups of three or four. Indicate that in this concluding activity, they will be using a climograph puzzle to make clearer some similarities between the United States and Africa in terms of water and agriculture
9. Distribute a copy of the **Climograph Puzzle** and the **Climograph Matrix** handouts to each student. Have the students work in their groups to cut up the puzzle and reassemble it on the matrix, following the directions on the handout. Encourage them to use their textbooks and atlases and on-line resources to help them in their task. You may want to announce that the first group to finish wins.
10. You should circulate among the groups to monitor their progress and to ask and answer questions, as necessary.
11. When the groups have finished the puzzles, review the puzzle as a class to emphasize some of the similarities between the US and Africa in terms of crops grown, water availability, and temperature.

Agriculture and Water

Eric Mendelman


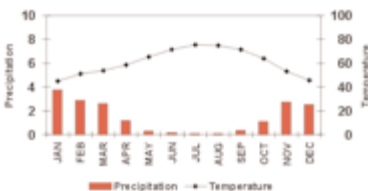



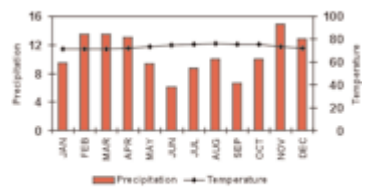
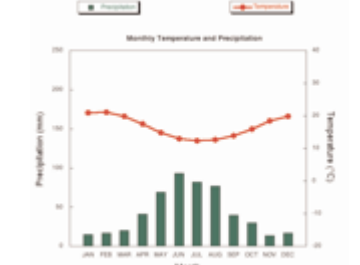


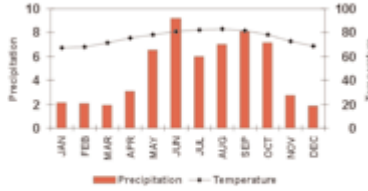
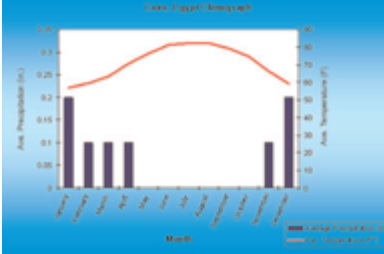

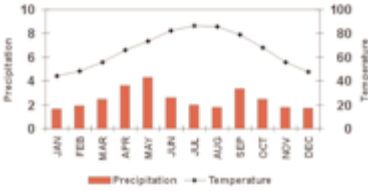
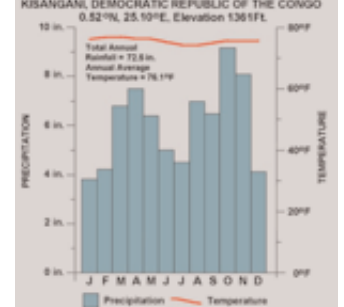
Agriculture requires a specific range of inputs and conditions to be successful. **Water** is one of the most important factors in agriculture's success. Without water, agriculture, and ultimately, humans would not exist. So all water is important, but it is not all the same. **Water sources** vary and the price, characteristic and quality of water will vary according to the source. Rainfall is the cheapest water source. Rainfall dependent agriculture, which is practiced extensively in Asia and Africa, requires a minimum of 10 inches of annual rainfall without irrigation. Because agriculture requires plentiful rain to grow crops and requires a reduction in rain to facilitate harvests, the timing of the rain is also very important. Of course, we can't always count on nature to deliver the rain at the exact time it is needed. So irrigation has many advantages. If you've ever wondered why we have established agriculture in the desert using irrigation, it's because people have moved to these areas and have worked to establish local food source. In addition there are advantages to growing irrigated crops in desert conditions. Farmers, for example, can easily time water distribution to when plants need it. Arid areas also have fewer insects and disease to manage. The disadvantage, however, is that building and maintaining an irrigation system of canals and pumps is far more expensive than a rain dependent systems. But irrigation can be efficient enough to help farmers produce crops at a rate that covers their costs. And once the irrigation system is in place, it costs significantly less to operate.

Another source of water is groundwater, which must be pumped from the underground aquifers. Groundwater quality can be on the salty side and have high mineral content which can harm soils. Some aquifers that provide groundwater like the Ogallala in the Midwest are being depleted for agriculture and other purposes. In other words, we are using the water faster than it can be replenished. Replenishment of groundwater is known as recharge. Aquifers recharge at different rates. On the one hand, the Ogallala aquifer recharges very slowly. The Edwards Aquifer in Central Texas, on the other hand, recharges very quickly.

Water can also be obtained through desalination, which is very expensive. Desalination removes salt from the water from either ocean water or salty groundwater using high amounts of energy. The desalination process produces a salty brine that must be disposed of safely. Desalination may become a viable source of water for agriculture as water battles between large cities and agriculture intensify. Water battles have a tendency to intensify because water is bought and sold in markets. As cities grow along with their demand for water, the owners of the water find it more profitable to sell water to the cities than to an agricultural interest.

Climograph Puzzle

The chart below is scrambled. Look for similarities and determine the correct order of the images. Cut out the boxes and then glue them in the right place on the matrix chart. Under each set, compare and contrast the climates and crops between the US and Africa. Important notes: Consider the role of irrigation. The cities are meant to represent a certain climate type – the farming will be in the rural area of that climate type, and usually not in the city itself.

Climate type and crop	Climograph - US	Climograph - Africa
 <p>cotton wheat</p>	<p>Sacramento, California</p>  <p>Lat.: 38° 31' N Long.: 121° 30' W Elevation: 17 ft. asl Total Annual Precip.: 17.52" Avg. Annual Temp.: 60.8°F</p>	 <p>Nairobi, Kenya Elev: 1820 m Lat: 01 o 16' S Long: 36 o 48' E</p>
<p>grapes/ wine olives</p>   <p>citrus</p>	<p>Hilo, Hawaii</p>  <p>Lat.: 19° 43' N Long.: 155° 04' W Elevation: 27 ft. asl Total Annual Precip.: 128.15" Avg. Annual Temp.: 73.6°F</p>	 <p>Cape Town, South Africa Elev: 17.1 m Lat: 33 o 54' S Long: 18 o 32' E</p>
 <p>sugarcane - US</p>  <p>coffee – Africa</p>	<p>Miami, Florida</p>  <p>Lat.: 25° 49' N Long.: 80° 17' W Elevation: 7 ft. asl Total Annual Precip.: 57.55" Avg. Annual Temp.: 75.6°F</p>	 <p>Cairo, Egypt Elev: 116.1 m Lat: 29 o 52' N Long: 31 o 20' E</p>
 <p>bananas</p>	<p>Dallas-Fort Worth, Texas</p>  <p>Lat.: 32° 54' N Long.: 97° 02' W Elevation: 551 ft. asl Total Annual Precip.: 29.46" Avg. Annual Temp.: 66.0°F</p>	 <p>KISANGANI, DEMOCRATIC REPUBLIC OF THE CONGO 0.52°N, 25.10°E, Elevation 1361ftL Total Annual Rainfall = 72.8 in. Annual Average Temperature = 76.1°F</p>

Climograph Matrix

Climate type and crop	Climograph - US	Climograph - Africa

Lesson Three

The Geography of . . .

OPENING THE LESSON

1. Have students form groups of two or three.
2. Indicate to students that in this lesson, each group will get to select articles, on a topic of interest to them, related to agriculture and development. Each group will be assigned to a computer to research the topic further, with the goal of preparing and presenting a presentation to the class designed to show what they learned about the topic.
3. Have groups select their articles and assemble at a computer for their own use. Students can also use their own electronic devices.
4. Have the groups assign each member a role: fact checker, product designer, and presenter. Encourage the team members to work together on all elements of the project, but remind them that the students' roles define who has the final word and who is most responsible for a particular element.

DEVELOPING THE LESSON

5. Distribute a copy of the **SHEEP** chart (Social, Historical, Economic, Environmental, and Political) to each group. Have the groups use the chart while working on their topic to make sure that they cover a variety of issues in their research and presentations. Remind them to “Count your SHEEP”.
6. Give the groups the rest of the first class period and about 15 minutes of the second class period to complete their research and develop their presentations. As they work, ask the groups to decide on a presentation format, based on the interests and abilities of their group members. This may be a poster, a handout, a skit, an interview, or an electronic presentation such as a Power Point or a streaming video. Indicate that their products **MUST** have an illustration and facts that reflect the SHEEP for their topics. Encourage the students to be creative. Emphasize that the presentations should be interesting as well as informative.
7. You might want to circulate among the groups to monitor their progress and to ask and answer questions, as necessary.

CONCLUDING THE LESSON

8. When each group has completed its research and developed its presentation, invite individual groups to give their presentations in front of the class. You can ask presenters questions to clarify or extend what they have said.

SHEEP Chart

Social	Historical	Economic	Environmental	Political

Lesson Four

Dead Zones

OPENING THE LESSON

1. Begin the lesson by showing the video **Dead Zone** from YouTube. It is about 3 minutes in length.
2. Indicate that in this lesson, students will be investigating the “Dead Zone” that exists in the Gulf of Mexico and off the west coast of Africa and determining how dead zones are related to agriculture in the United States and Africa.

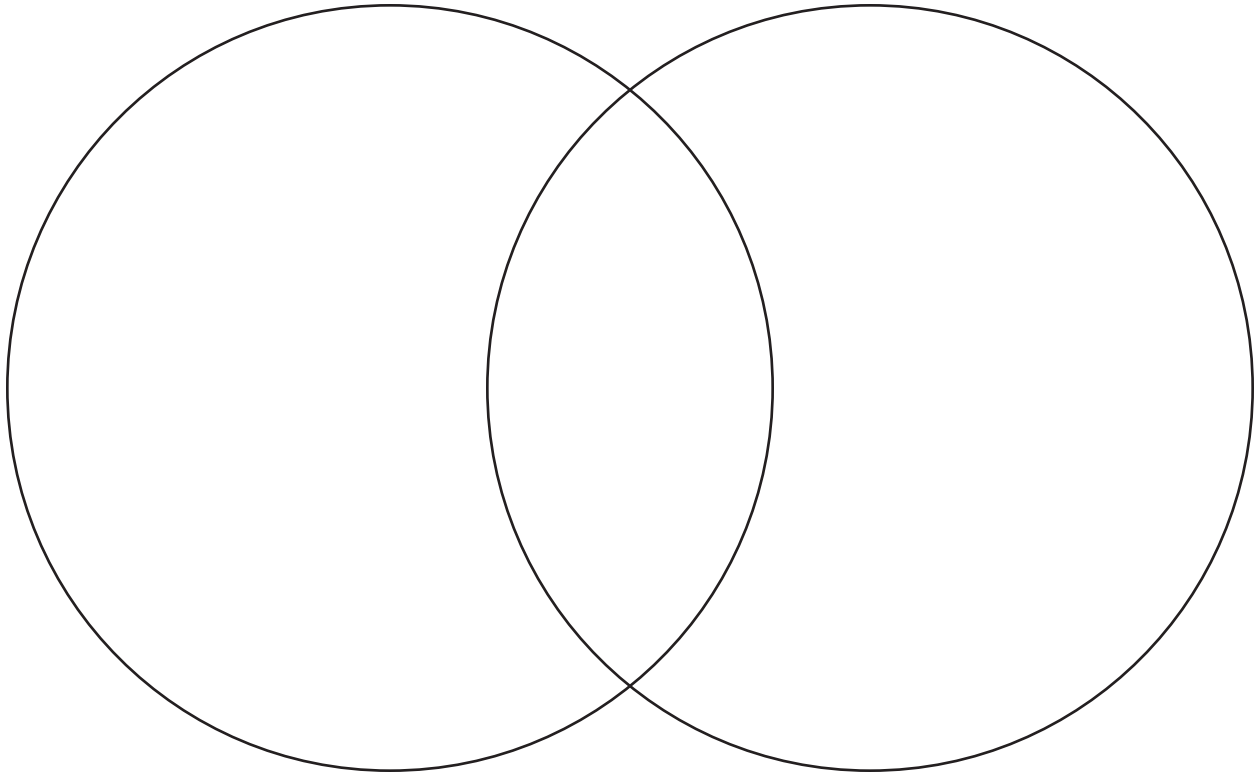
DEVELOPING THE LESSON

3. Distribute an article about dead zones in the U.S. or Africa to each student. Using a variety of articles will allow for a richer discussion.
4. Ask the students to write five questions about the article they are reading. Encourage students to ask questions that go beyond asking simply for recall information. Ask them to write questions that focus on **comprehension**, using verbs such as compare and contrast; **application**, using verbs such as estimate and demonstrate; **analysis**, using verbs such as differentiate and predict; **synthesis**, using verbs such as combine and propose, and **evaluation**, using verbs such as conclude and judge. For more on using Bloom’s Taxonomy to create questions, see Bloom’s Taxonomy (<http://frank.mtsu.edu/~studskl/glocks.htm>)
5. When students finish reading their articles and writing five questions, ask them to exchange the article and the questions with a partner, who has read a different article and written questions related to that article. Have the partners then read the second article and answer the questions associated with it. Students can hand in their questions and answers, at the end of the class, for a grade.
6. When students are finished reading their second articles and answering the questions posed by their partners, have the students form groups with students who have read other articles. **NOTE:** You may want to use the [Animal Noises procedure](#) for forming groups. If you use this procedure, the **Animal Noises Chart**, can be used to create individual animal noise slips for students to use to find their groups
7. Project the **Venn Diagram** transparency on the board. Ask each group to create a Venn Diagram of their own to record the information shared.
8. Have the groups share what they learned from the articles they read and record similarities and differences between dead zones in the United States and Africa on their Venn Diagrams.

CONCLUDING THE LESSON

9. When groups have finished sharing their articles and recording similarities and differences on their Venn Diagrams, have each group share one similarity or difference with the class on the Venn Diagram transparency at the front of the class. As students present their findings, you can ask presenters questions to clarify or extend what they have said.
10. To conclude the lesson, have students create four questions, on four pieces of paper, based on information they learned in the lesson. Have them use a “**pop corn**” [procedure](#) to share their questions with classmates. That is, have them crumple up their individual questions and throw them up in the air. After a few rounds of throwing the questions around the class, have each students grab up three or four questions, answer them, and hand them in.

Venn Diagram



Animal Noise

COW	PIG	CHICKEN
HORSE	DOG	CAT
COW	PIG	CHICKEN
HORSE	DOG	CAT