

Name: _____ Instructor: _____

Food for Thought: The Globalization of Agriculture

▶ ACTIVITY 3: REMOTE SENSING AND AGRICULTURAL LAND USE CHANGE

Activity 3 involves using satellite images to determine land use change in three areas of Latin America (Figure 8.11). You will look at earlier and later satellite images for each area, and you'll measure changes between the two years that occurred during the globalization of agriculture.

- To start your activity, click on the *Student Companion Site* at www.wiley.com/college/kuby. (For students using WileyPlus, log on to your class Web site, select the *Assignment* tab, locate and click on this assignment, and follow all instructions.)
- Select this chapter from the drop-down list and then click on Computerized Chapter Activities.
- Click on *Activity 3: Remote Sensing and Agricultural Land-Use Change*.

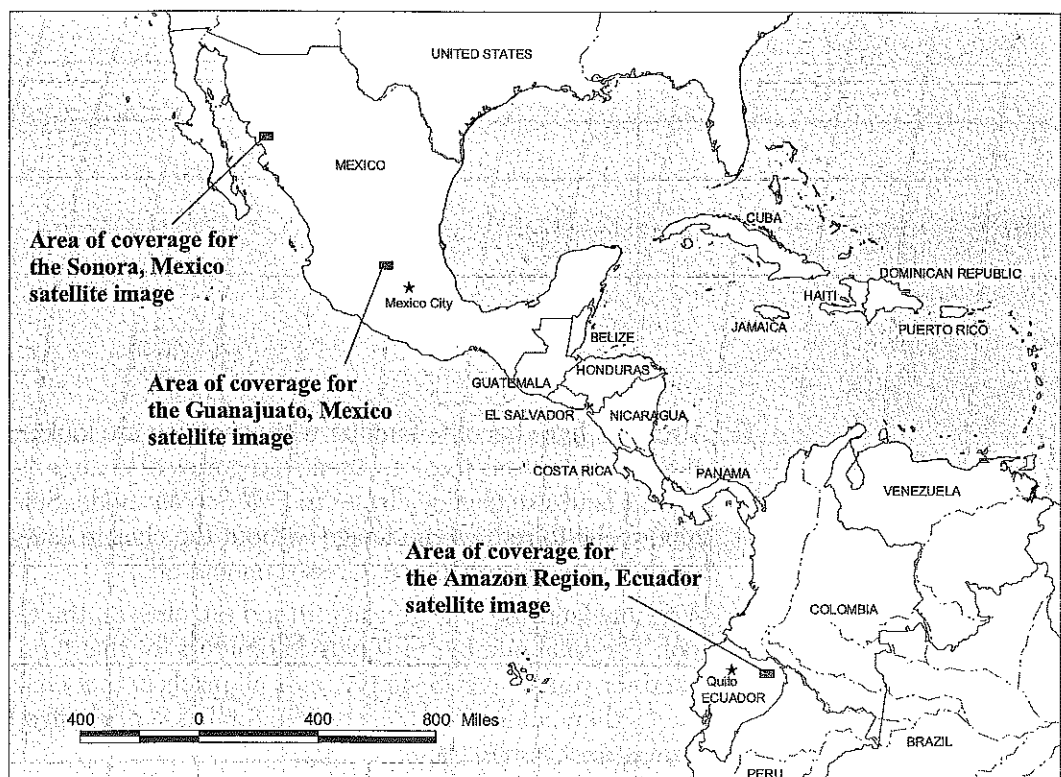


Figure 8.11 Case study areas in Latin America for land use change activity.

The first scene is an area in Sonora, Mexico, where desert has been converted into irrigated agriculture. Irrigating the desert was begun at the end of the nineteenth century by U.S. investors. After the Mexican government completed large dams in the 1940s and 1950s, irrigated agriculture rapidly filled the desert areas on the lower deltas of rivers that flow out of the mountains. This process continued throughout the late twentieth century. Now canals bring water to fields throughout coastal areas. Agribusiness is a huge industry here, with crops such as wheat, cotton, and vegetables grown for the Mexican and global markets.

- D. You initially will see a satellite image from April 12, 1973. Below the image is an interpretation of the land cover you see.
- E. Click on *2000 Scene* and the screen changes to an image of the same place from April 6, 2000. Toggle back and forth between the two dates and look for areas that change. Note that when the later scene appears, you have the option to view this date in “natural color,” which could help you to interpret the image (natural color is not available in the early scene because what we see as blue light was not collected by the sensor).
- F. Click on *Split Screen* to view the images side by side.
- G. Return to *Full Scene* and click *Photos on the Ground* to see photographs and interpretive text of that area.

3.1. What were the major land uses in 2000?

- H. After you have become familiar with what you are looking at, select any of the four buttons that represent categories of change. Look closely at all four land-use change classes in *Full Screen* mode. Select the 1973 or 2000 scene to redraw the image without the change category on and then toggle the land-use Change Classes on and off.
- I. With any land-use change class turned on, click on the *Calculate Area* tool. The total number of square kilometers for that type of change is listed for you. The GIS simply finds all pixels in that change class and counts them and then calculates the total area of change based on the known pixel resolution.

3.2. Which of the four types of change affected the most land? _____
 How many square kilometers were affected? _____

3.3. For the answer to Question 3.2, describe the spatial pattern (if any) of where the change took place.

3.4. Fill in the following table, describing how this change affected people and their environment in both Mexico and the United States and Canada. Identify the positive and negative effects (the winners and losers) in both regions.

	Positive Effects	Negative Effects
In Mexico		
In the United States and Canada		

3.5. Rank the remaining three classes of change in decreasing order of area changed and briefly explain what is occurring in each class.

a. Second-most-important change:

b. Third-most-important change:

c. Fourth-most-important change:

- J. Click on *Guanajuato, Mexico*, in the lower right margin. The second scene is in central Mexico in the states of Guanajuato and Querétaro. This area of central Mexico is called the *Bajío*, a rich agricultural area worked by Native Americans for centuries. Traditional peasant agriculture consisted of small plots where people grew a mixture of crops for market and subsistence. The staple crops traditionally have been corn (maize), beans, squash, and chilies. Today much of this is changing as Mexico produces export crops such as broccoli, cauliflower, lettuce, and strawberries for the U.S. market. Production is now more mechanized, with fewer traditional mixed-crop fields and more monoculture. Just as farmers in the United States do, small farmers in Mexico are selling out to agribusiness corporations that have better access to capital, technology, and global markets and can take advantage of economies of scale.

You will initially see a scene from March 28, 1976. Repeat the steps you did for the Sonora image so that you become familiar with this area. Note that the second image date is March 20, 2000.

3.6. What were the major land uses in 2000?

3.7. Which of the four types of change affected the most land? _____

How many square kilometers were affected? _____

3.8. For the answer to Question 3.7, describe the spatial pattern (if any) of where the change took place (note the presence of mountains to the north, south, and east of the photo, where it would be very difficult to farm).

3.9. Fill in the following table describing how this change has affected people and their environment in both Mexico and the United States and Canada. Identify the positive and negative effects (the winners and losers) in both regions.

	Positive Effects	Negative Effects
In Mexico		
In the United States and Canada		

3.10. Rank the remaining three classes of change in decreasing order of area changed and briefly explain what is occurring in each class:

a. Second-most-important change:

b. Third-most-important change:

c. Fourth-most-important change:

K. Click on *Amazon Region, Ecuador*, in the lower right margin. The third and final scene is from the Amazon rain forest in eastern Ecuador, where much deforestation has occurred since the 1970s. Initial development was for oil, but settlers followed using the roads built by the oil companies. The types of satellite images used in these scenes did not allow us to distinguish among different post-deforestation land uses, but studies of the region have shown that about 70 percent of the deforested area is ranch land for grazing cattle. Of the other 30 percent, some is for crops such as oil palm. Most of the farms are not sustainable because of the infertile rain-forest soils and will be converted to ranch land later unless the land-owners have the money to invest in heavy applications of fertilizer.

The initial scene is of the Amazon rain forest in eastern Ecuador in 1986. You should look at the later scene from 1996, photos on the ground and experiment with split and full screen just as you did with the previous two images.

L. For this area, we have given you three buttons that show deforested areas (for 1977, 1986, and 1996), and two buttons that show change in the deforested areas, from 1977 to 1996 and from 1986 to 1996. Also included are two other GIS layers showing *Roads* and *Oil Wells* that you can turn on and off for reference.

3.11. What were the major land uses in 1996?

3.12. What was the total deforested area in 1977? _____

3.13. How many square kilometers of rain forest were cleared between 1977 and 1996? _____

3.14. How many square kilometers of rain forest were cleared between 1986 and 1996? _____

M. Turn on the Change Class for deforestation between 1977 and 1996.
Click on the *Oil Wells* and *Roads* links to turn these layers on and off.

3.15. Describe the spatial pattern (if any) of where the change took place. In particular, does most of the land appear to have been cleared for oil-well construction or for other land uses? Are there many areas cleared that are far away from roads and rivers, and if not, why not?

3.16. Fill in the following table describing how this change affected people and their environment in both Ecuador and the United States and Canada. Identify the positive and negative effects (the winners and losers) in both regions.

	Positive Effects	Negative Effects
In Ecuador		
In the United States and Canada		

N. When you have finished, close all browser windows.