



Module 2, Investigation 1: Briefing

Is there a future for subsistence agriculture?

Background

Will subsistence agriculture continue to feed the billions of people that currently depend upon it? Unlike the large-scale, surplus-producing, industrial farmers in the developed countries of North America and Europe, subsistence farmers produce only enough to feed themselves and their families. Subsistence agriculture, which is mainly found in the developing countries in Asia, Africa, and Latin America, feeds half of the world's population. More important is the fact that the population in the developing countries is increasing much faster than it is in the developed countries. Intensive subsistence rice farming supports nearly three billion people, mostly in Asia. (Much smaller numbers of people practice other forms of subsistence agriculture, such as shifting cultivation in humid tropical regions and nomadism in dry regions.) Subsistence ways of life, which are based on ancient practices far removed from modern technology and urban industrial livelihood patterns, are disappearing. This investigation will help you speculate about the role subsistence agriculture will play in feeding the populations of the developing world in the 21st century.

Objectives

In this investigation, you will

- describe and locate three major types of subsistence agriculture,
- develop expertise about Asian intensive subsistence agriculture,
- interpret NASA satellite imagery to identify challenges to the survival of intensive subsistence agriculture, and
- debate the future of intensive subsistence agriculture.

Part 1. Where is subsistence agriculture found?

Imagine that you are a geographer working for the United Nations Food and Agriculture Organization (FAO). You are a member of an FAO team assigned to investigate the role of intensive subsistence agriculture in the world. You will debate whether this type of agriculture will continue to support populations in the developing world in the 21st century.

Three main types of subsistence agriculture are

- a) pastoral nomadism,
- b) shifting cultivation, and
- c) intensive subsistence.

Describe these types by completing the table for Log Question 1. In addition to the information in this activity, you should use atlases and other print or electronic reference materials to complete the tables.

Your team should now use the remainder of this investigation to develop expertise about intensive subsistence agriculture.

Part 2. How is intensive subsistence agriculture practiced?

Intensive subsistence agriculture maximizes food production on relatively small fields that are carefully cultivated, fertilized, and irrigated. Intensive subsistence agriculture occupies less than 10 percent of the world's land area but supports about half of the world's population. Intensive subsistence agriculture dominates in regions with large, densely settled populations, such as India, China, and Southeast Asia (Figures 2 and 3).

Intensive subsistence agriculture can support large populations. Families must produce enough food to survive on very small parcels of land. To ensure as much food production as possible:

- no land is wasted,
- fertilizer (usually manure) is used,
- double cropping is common,
- the same fields are planted every year,
- livestock are usually not allowed to graze on land that could be used for crops, and
- little grain is planted for animal feed.

Rice is widely grown by subsistence farmers in much of Southeast Asia, Southeast China, and East India. Rice production involves several steps. Farmers use water buffalo or oxen to plow the field, or paddy. The paddy is then flooded (Figure 2). Dry seeds are then scattered through the field, or seedlings are transplanted from a nursery (Figure 3). The plants grow submerged in water for about three-fourths of the warm, wet growing season, and harvesting is done by



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hand. This wet rice cultivation must be done on flat land (like river valleys and delta regions). As the need for expanded production rises, many farmers terrace the hillsides of river valleys to produce more flat land.

Wet rice cultivation requires a constant supply of water through irrigation and drainage. Figure 4 is a Space Shuttle image of Bangkok, Thailand, showing the network of canals used for irrigation for agriculture and domestic water consumption.



Figure 2: Chinese rice farmer using a hand-operated pump to draw water from a canal

Source: <http://www.fao.org/NEWS/FOTOFILER/Ph9716-e.htm>, FAO photo by F. Botts



Figure 3: Indian women farmers transplanting rice

Although women produce more than half the food grown globally, in many countries their nutritional needs are met only after men and children have had enough.

Source: <http://www.fao.org/NEWS/FOTOFILER/PH9737-e.htm>, FAO photo by G. Bizzari



Figure 4: Space Shuttle photography of Bangkok, Thailand

In an infrared photograph, the vegetation appears reddish in hue. In this west-looking view, the city of almost four million people has a vast network of canals that are used for irrigation and drainage.

Source: <http://images.jsc.nasa.gov/images/pao/STS45/10064754.htm>



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Part 3: How is wet rice traditionally cultivated in China?

Farmers in some of the more remote parts of China (such as Hunan, Jiangxi, Anhui, inland parts of Fujian and Zhejiang, inland/mountain parts of Guangdong, Guangxi, Guizhou, and some areas of Sichuan) still practice traditional wet rice farming. They plant two crops of rice a year (double-cropping) where it is warm and wet. In the double-cropping cycle, farmers

- turn the soil with an iron-tipped wooden plow pulled by a water buffalo early in March and August;
- rake the plowed soil smooth, fertilize, and water the plot (they must keep the water in the rice field at the proper level as the plants grow);
- transplant rice seedlings from seedbeds into the prepared plot from the middle of March and August (the entire family works in the field taking seedlings by the bunch and pushing them into the soft, water-covered soil, as shown in Figure 3);
- weed the crop in April and September (weeding is done by hand, and everyone old enough for such work participates);

- weed and fertilize again in May and October;
- allow the rice to stand to “draw starch” to fill the hull of the kernels (they let water out of the fields when the kernels draw enough starch, and both soil and stalks dry under the Sun); and
- harvest in late June or early July and in November; they cut off rice plants a few inches above the ground with a sickle; then they separate the rice from the other parts of the crop (Figure 5), which are used for fuel.

When harvest work is done, farmers begin plowing for the next crop. They use the slack season of the rice crop for vegetable gardening. In the hot and damp period of late spring and summer, they grow eggplant and several varieties of squash and beans. After harvesting a crop of vegetables, they turn the soil and break up the clods with a digging hoe, and level it with an iron rake to prepare for a new crop. They weed vegetables constantly, water with the long handled wooden dipper two or three times a day, and fertilize often (Yang 1959).

[Answer Question 2 on Log.](#)



Figure 5: Women winnowing rice in Myanmar

Source: <http://www.fao.org/NEWS/FOTOFIL/PH9722-e.htm>, FAO photo by G. Bizzarri



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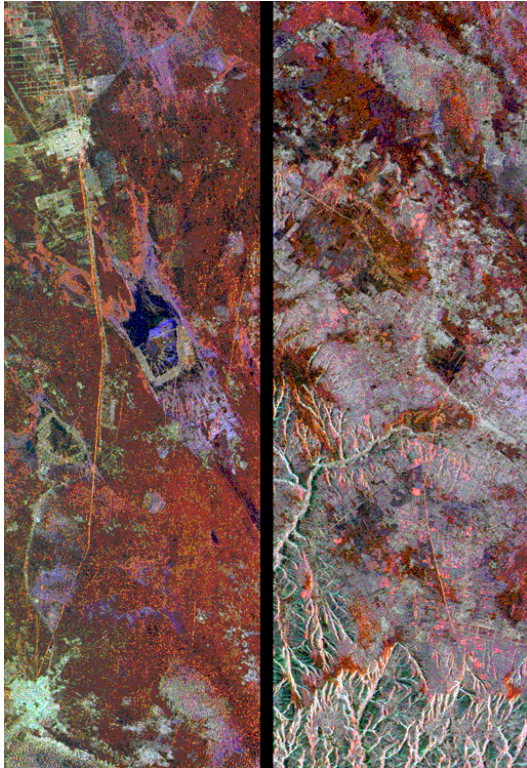


Figure 6: Intensive subsistence wheat agriculture around the Great Wall, north-central China

This radar image, taken on August 3, 1995, shows a segment of the Great Wall. Most of the image is taken up by rectangular patterns indicating agricultural development, primarily wheat fields. The Great Wall appears as a thin orange band, running from the top to the bottom of the left image. The wall is easily detected from space by radar because its steep, smooth sides provide a prominent surface for reflection of the radar beam.

Source: <http://www.jpl.nasa.gov/radar/sircxsar/gwall.html>



Figure 7: Mulberry fields and fish ponds in Jiangsu province in eastern China

Source: <http://www.fao.org/NEWS/FOTOFIL/PH9811-e.htm>, FAO photo by H. Zhang

Part 4. What are other types of intensive subsistence agriculture?

In addition to wet rice cultivation, intensive subsistence agriculture also occurs in drier areas where irrigation is available to provide water for crops during dry seasons. The land is still fully planted with a variety of grains and other crops. These include wheat, barley, oats, corn, sorghum, millet, soybeans, cotton, hemp, and flax. For example, intensive subsistence wheat agriculture is found around the Great Wall of China in a desert region of north-central China, about 700 kilometers west of Beijing (Figure 6).

In many wet areas, aquaculture, or fish farming, is practiced, usually integrated with agriculture (Figures 7 and 8). Fish provide an important source of protein. In a world of land and water scarcity, fish ponds have an advantage over feedlots in producing low-cost animal protein. In contrast to meat production, which is concentrated in industrial countries, some 85 percent of fish



Figure 8: Indian workers harvest carp raised in an inland aquaculture pond

Source: <http://www.fao.org/NEWS/FOTOFIL/ph9711-e.htm>, FAO photo by I. de Borhegyi



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farming is in developing countries. China, where fish farming began more than 3,000 years ago, accounted for 21 million tons of the 31 million tons of world aquaculture output in 1998. India was a distant second with 2 million tons. Other developing countries with large aquaculture production include Bangladesh, Indonesia, and Thailand (Brown 2000).

Complete Question 3 on the Log.

Part 5. What are the challenges to intensive subsistence agriculture in the 21st century?

This investigation began by posing the question of whether intensive subsistence agriculture will continue in the 21st century. The answer to this question may depend upon current and future challenges to this form of agriculture. Examine Figure 9 for clues to one important challenge to subsistence agriculture, and write your observations on the Log at Question 4.

To consider another challenge to intensive subsistence agriculture, study the image in Figure 10, which shows an area in the southern part of Borneo, in Indonesia, and record your observations in the Log at Question 5.

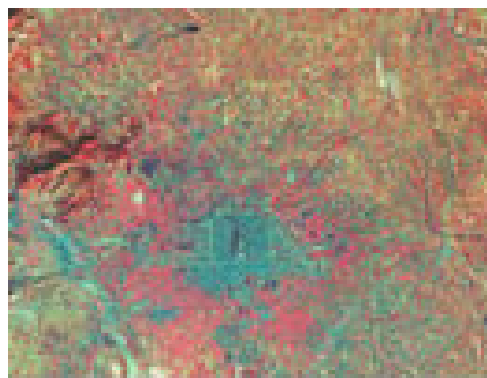
Figure 9: Urban expansion of Beijing, China, over 15 years, as seen by the growth of the area in light blue color, which is the signature of concrete in the infrared image

Source: http://see.gsfc.nasa.gov/edu/SEES/global/class/Chap_8/8_Js/8-03.jpg

Beijing, China, LANDSAT scene 123/32

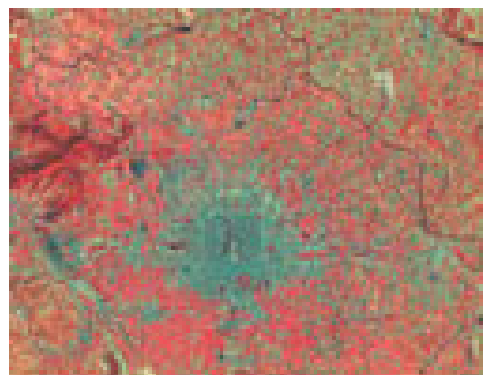
Data extract is 35 kilometers wide

26 Oct 1976



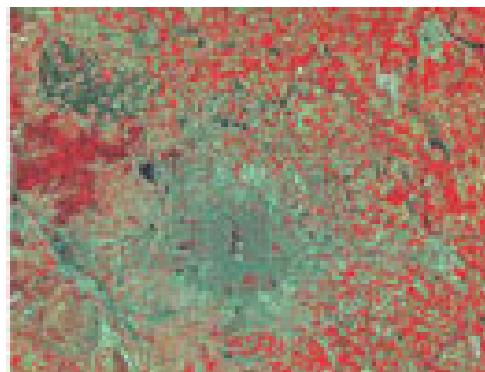
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Now that you have completed a basic investigation of intensive subsistence agriculture, your team should:

- Brainstorm arguments *either for or against* the proposition that intensive subsistence agriculture will continue to play a significant role in feeding the populations of the developing world.
- List these arguments on your Log at Question 6.
- You can use these arguments in a debate on the proposition.

References

Brown, Lester R. 2000. Fish farming may soon overtake cattle ranching as a food source. *Worldwatch Institute Alert* 2000-9.

Conklin, H.C. Hanunoo agriculture, FAO Forestry Development Paper No. 12. In Getis, Getis, Fellmann. 1995. *Human geography. Landscapes of human activities*. Fourth Edition. Wm. C. Brown Publishers, Dubuque, Iowa, page 261.

Yang, C.K. *A Chinese village in early communist transition*. Cambridge, Massachusetts: Massachusetts Institute of Technology, 1959. In Getis, Getis, Fellmann. 1995. *Human geography. Landscapes of human activities*. Fourth Edition. Wm. C. Brown Publishers, Dubuque, Iowa, page 263.



Figure 10: Space Shuttle view of a portion of the Kalimantan region in southern Borneo, Indonesia, (3.5S, 113.5E) taken in September, 1991

Source: <http://images.jsc.nasa.gov/images/pao/STS48/10065058.htm>



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1. Use individual or group research to complete the table below.

Characteristic	Pastoral Nomadism	Shifting Cultivation	Intensive Subsistence
3 countries representative of type	1) 2) 3)	1) 2) 3)	1) 2) 3)
Climate			
Percentage of world land area covered			
Population density (high, medium, or low)			
Percentage of world population supported			
Output per unit area (high, medium, or low)			
Output per unit of human effort (high, medium, or low)			
Other			



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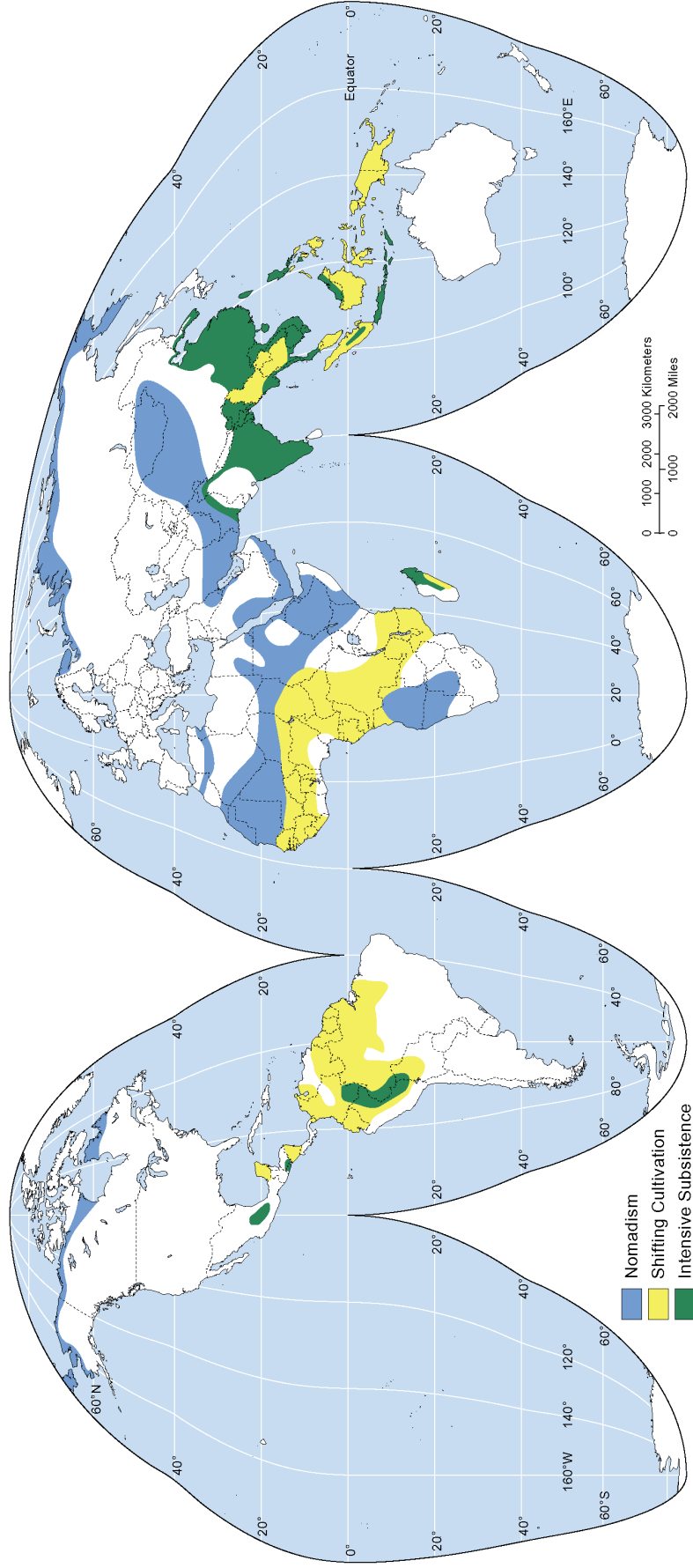


Figure 1: World agricultural practices map



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2. On the timeline below, write in the annual activities of traditional wet rice double-cropping in China. Write the steps for crop #1 on the left and for crop #2 on the right.

	January	
	February	
	March	
	April	
	May	
	June	
	July	
	August	
	September	
	October	
	November	
	December	

3. Identify six important features of intensive subsistence agriculture on your own as you read the Briefing.

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____



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4. Using the information on Figure 9, provide a *quantitative* description of the changes over the 15-year period shown by the three images. How do these changes challenge subsistence agriculture?

5. What do you think is shown in Figure 10, and how might this be related to intensive subsistence agriculture?

6. List three arguments, *either for* or *against* the proposition that subsistence agriculture will continue to play a significant role in feeding the populations of the developing world in the 21st century.
