Indonesian government forced abandonment of this traditional system in an effort to promote more productive growing techniques, disaster ensued. Without the water temple rituals, irrigation coordination fell apart, and water shortages and pest infestation became the norm. This led to lower and uneven field yields, plus resentment toward those with better harvests. Eventually, the old system was restored because it worked better. The point of this example is that cultural beliefs, no matter how irrelevant they may seem to outsiders, are often anything but irrelevant if one is to understand another society’s subsistence or any other long-established collective practice.

**MODES OF SUBSISTENCE**

Human societies all across the world have developed a cultural infrastructure that is compatible with the natural resources they have available to them and within the limitations of their various habitats. Each mode of subsistence involves not only resources but also the technology required to effectively capture and utilize them, as well as the kinds of work arrangements that are developed to best suit a society’s needs. In the next few pages, we will discuss the major types of cultural infrastructure, beginning with the oldest and most universal mode of subsistence: food foraging.

**FOOD–FORAGING SOCIETIES**

Before the domestication of food plants and animals, all people supported themselves through food foraging, a mode of subsistence involving some combination of hunting, fishing, and gathering wild plant foods. When food foragers had the earth to themselves, they had their pick of the best environments. But gradually areas with rich soils and ample supplies of water were appropriated by farming societies and, more recently, by industrial and postindustrial societies. As a result, small foraging communities were edged out of their traditional habitats by these expanding groups.

Today at most a quarter of a million people (less than 0.005 percent of the world population of about 6 billion) still support themselves mainly as foragers. They are found only in the world’s most marginal areas—frozen Arctic tundra, deserts, and inaccessible forests—and typically lead a migratory existence that makes it impractical to accumulate many material possessions. Because foraging cultures have nearly disappeared in areas having a natural abundance of food and fuel resources, anthropologists are necessarily cautious when it comes to making generalizations about the ancient human past based on in-depth studies of still-existing foraging groups that have adapted to more marginal habitats.

Anthropological research shows that forager diets are typically ample and balanced and that foragers are less likely to experience severe famine than farmers. The material possessions of foragers may be limited, but so is their desire to amass things. Notably, they have plenty of leisure time for concentrating on family ties, social life, and spiritual development—apparently far more than people living in farming and industrial societies. Such findings clearly challenge the once widely held view that foragers live a miserable existence.

All modern food foragers have had some degree of interaction with neighbors whose ways of life often differ radically from their own. For example, the food-foraging Mbuti pygmies of the Republic of Congo’s Ituri rainforest have a complex interdependent relationship with their neighbors, Bantu- and Sudanic-speaking peoples who are farmers. They exchange meat and other products of the forest for farm produce and manufactured goods. During part of the year, these pygmies live in their trading partner’s village and are incorporated into his kin group, even to the point of allowing him to initiate their sons.

It is important to note that present-day people who subsist by hunting, fishing, and wild plant collection are not following an ancient way of life because they do not know any better. Rather, they have been forced by circumstances into situations where foraging is the best means of survival or they simply prefer to live this way. In fact, foraging constitutes a rational response to particular ecological, economic, and sociopolitical realities. Moreover, for at least 2,000 years, hunters, fishers, and gatherers have met the demands for commodities such as furs, hides, feathers, ivory, pearls, fish, nuts, and honey within larger trading networks. Like everyone else, most food foragers are now part of a larger system with social, economic and political relations extending far beyond regional, national, or even continental boundaries.

**Characteristics of Foraging Communities**

The hallmarks of food-foraging societies, particularly those still (or until recently) surviving in marginal areas that are not as naturally rich in food and fuel, include mobility, small group size, flexible division of labor by gender, food sharing, egalitarianism, communal property, and rarity of warfare.

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*food foraging* Hunting, fishing, and gathering wild plant foods.
Although much has been written on the theoretical importance of hunting for shaping the supposedly competitive and aggressive nature of the human species, most anthropologists are unconvinced by these arguments. To be sure, warlike behavior on the part of food-foraging people is known, but such behavior is a relatively recent phenomenon in response to pressure from expansionist states. In the absence of such pressures, food-foraging peoples are remarkably nonaggressive and place more emphasis on peacefulness and cooperation than they do on violent competition. We touch on each of the other characteristics below.

Mobility
Food foragers move as needed within a circumscribed region that is their home range to tap into naturally available food sources. In pursuit of wild game, they are often aided by hunting dogs. Although there are countless varieties of dogs, they all descend from Asian wolves first domesticated more than 15,000 years ago. Some groups, such as the Ju/'hoansi in the Kalahari Desert of southern Africa who depend on the reliable and highly drought-resistant mongongo nut, may keep to fairly fixed annual routes and cover only a restricted territory. Others, such as the traditional Shoshone in the western highlands of North America, had to cover a wider territory, their course determined by the local availability of the erratically productive pine nut.

A crucial factor in this mobility is availability of water. The distance between the food supply and water must not be so great that more energy is required to fetch water than can be obtained from the food.

Small Group Size
Another characteristic of the food-foraging adaptation is the small size of local groups, typically fewer than a hundred people. No completely satisfactory explanation for this has been offered, but both ecological and social factors are involved. Among the ecological factors is the **carrying capacity** of the land—the number of people that the available resources can support at a given level of food-getting techniques. This requires adjusting to seasonal and long-term changes in resource availability. A social factor is the **density of social relations** (the number and intensity of interactions among camp members). Higher social density means more opportunities for conflict.

Both carrying capacity and social density are complex variables. Carrying capacity involves not only the immediate presence of food and water but also the tools and work necessary to secure them, as well as short- and long-term fluctuations in their availability. Social density involves not only the number of people and their interactions but also the circumstances and quality of those interactions, as well as the mechanisms for regulating them. A mob of a hundred angry strangers has a different social density than the same number of neighbors enjoying themselves at a block party.

Among food-foraging populations, social density always seems in a state of flux as people spend more or less time away from camp and as they move to other camps, either on visits or more permanently. Among the Ju/'hoansi of southern Africa, for example, exhaustion

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carrying capacity  The number of people that the available resources can support at a given level of food-getting techniques.
density of social relations  The number and intensity of interactions among the members of a camp.
of local food resources, conflict within the group, or the desire to visit friends or relatives living elsewhere cause people to leave one group for another. As Canadian anthropologist Richard Lee notes, "Ju love to go visiting, and the practice acts as a safety valve when tempers get frayed. In fact, the Ju usually move, not when their food is exhausted, but rather when only their patience is exhausted."8

If a camp has so many children as to create a burden for the working adults, some young families may be encouraged to join others where fewer children live. Conversely, groups with few children may actively recruit families with young offspring in order to ensure the group’s survival. Redistribution of people, then, is an important mechanism for regulating social density, as well as for assuring that the size and composition of local groups is suited to local variations in resources. Thus, cultural adaptations help transcend the limitations of the physical environment.

In addition to seasonal or local adjustments, food foragers must make long-term adjustments to resources. Most food-foraging populations stabilize at numbers well below the carrying capacity of their land. In fact, the home ranges of most food foragers can support from three to five times as many people as they typically do. In the long run, it may be more adaptive for a group to keep its numbers low rather than to expand indefinitely and risk destruction by a sudden and unexpected natural reduction in food resources. The population density of foraging groups surviving in marginal environments today rarely exceeds one person per square mile—a very low density.

How food-foraging peoples regulate population size relates to two things: how much body fat they accumulate and how they care for their children. Ovulation requires a certain minimum of body fat, and in traditional foraging societies, this is not achieved until early adulthood. Hence, female fertility peaks between the early and mid-20s, and teenage pregnancies—at least, successful ones—are virtually unknown.9 Once a child is born, its mother nurses it several times each hour, even at night, and this continues over a period of four or five years. The constant stimulation of the mother’s nipple suppresses the level of hormones that promote ovulation, making conception less likely, especially if work keeps the mother physically active, and she does not have a large store of body fat to draw on for energy.10

Frequent nursing of children over four or five years acts to suppress ovulation among food foragers such as Bushmen. As a consequence, women give birth to relatively few offspring at widely spaced intervals.

Continuing to nurse for several years, women give birth only at widely spaced intervals. Thus, the total number of offspring remains low but sufficient to maintain stable population size.

Flexible Division of Labor by Gender
Some form of division of labor has been observed in all human societies and is probably as old as human culture. Among food foragers, the hunting and butchering of large game as well as the processing of hard or tough raw materials are almost universally masculine occupations. By contrast, women’s work in foraging societies usually focuses on collecting and processing a variety of plant foods, as well as other domestic chores that can be fit to the demands of breastfeeding and do not endanger pregnancy and childbirth.

Among food foragers today, the work of women is no less arduous than that of men. Ju/'hoansi women,

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for example, may walk as many as 12 miles a day two or three times a week to gather food, carrying not only their children but also, on the return home, anywhere from 15 to 33 pounds of food. Still, they do not have to travel quite as far afield as do men on the hunt, and their work is usually less dangerous than hunting. Also, their tasks require less rapid mobility, do not need complete and undivided attention, and are readily resumed after interruption.

All of this is compatible with those biological differences that remain between the sexes. Certainly women who are pregnant or have infants to nurse cannot travel long distances in pursuit of game as easily as men can. By the same token, of course, women may have preferred and been better at the less risky task of gathering. To say that differing gender roles among food foragers are compatible with the biological differences between men and women is not to say that they are biologically determined. Among the Great Plains Indians of North America, for example, are quite a few reported cases of women who gained fame as hunters and warriors—both historically regarded as men’s activities. In fact, the division of labor by gender is often far less rigid among food foragers than it is in most other types of society. Thus, Ju/'hoansi males, willingly and without embarrassment, as the occasion demands, will gather wild plant foods, build huts, and collect water, even though all are regarded as women’s work.

The nature of women’s work in food-foraging societies is such that it can be done while taking care of children. Typically, it is also work that can be in company with other women, which provides adult companionship and opportunities for sharing childrearing tasks and useful ideas, venting frustrations, idle chatter, gossip, and laughter. The food-gathering activities of women play a major role in the survival of their group: Research shows that contemporary food foragers may obtain up to 60 or 70 percent of their diets from plant foods, with perhaps some fish and shellfish provided by women (the exceptions tend to be food foragers living in Arctic regions, where plant foods are not available for much of the year).

Although women in food-foraging societies may spend some time each day gathering plant food, men do not spend all or even the greatest part of their time hunting. The amount of energy expended in hunting, especially in hot climates, is often greater than the energy return from the kill. Too much time spent searching out game might actually be counterproductive. Energy itself is derived primarily from plant carbohydrates, and it is usually the female gatherers who bring in the bulk of the calories. A certain amount of meat in the diet, though, guarantees high-quality protein that is less easily obtained from plant sources, for meat contains exactly the right balance of all of the amino acids (the building blocks of protein) the human body requires. No one plant food does this, and in order to get by without meat, people must hit on exactly the right combination of plants to provide the essential amino acids in the correct proportions.
Food Sharing
Another key feature of human social organization associated with food foraging is the sharing of food among adults. It is easy enough to see why sharing takes place, with women supplying one kind of food and men another. Among the Ju/'hoansi, women have control over the food they collect and can share it with whomever they choose. Men, by contrast, are constrained by rules that specify how much meat is to be distributed and to whom. Thus, a hunter has little effective control over the meat he brings into camp. For the individual hunter, meat sharing is really a way of storing it for the future: His generosity, obligatory though it might be, gives him a claim on the future kills of other hunters. As a cultural trait, food sharing has the obvious survival value of distributing resources needed for subsistence.

Relative to this is the importance of the camp as the center of daily activity and the place where food sharing actually occurs. Among nonhuman primates (and probably among human ancestors until they controlled the use of fire), activities tend to be divided between feeding areas and sleeping areas, and the latter tend to be shifted each evening. Historically known food-foraging people, however, live in camps of some permanence, ranging from the dry season camps of the Ju/'hoansi, which serve for the entire winter, to the wet season camps of the Hadza in Tanzania, which are centered on berry picking and honey collection and serve for a few days or weeks at most. Moreover, human camps are more than sleeping areas; people are in and out all day—eating, working, and socializing in camps to a greater extent than any other primates.

Egalitarian Social Relations
An important characteristic of the food-foraging society is its egalitarianism. Because food foragers are usually highly mobile and lack animal or mechanical transportation, they must be able to travel without many encumbrances, especially on food-getting expeditions. By necessity, the material goods they carry with them are limited to the barest essentials, which include implements for hunting, gathering, fishing, building, and cooking. (For example, the average weight of an individual’s personal belongings among the Ju/'hoansi is just under 25 pounds.) In this context, it makes little sense for them to accumulate luxuries or surplus goods, and the fact that no one owns significantly more than another helps to limit status differences. Age and sex are usually the only sources of important status differences.

It is important to realize that status differences by themselves do not constitute inequality, a point that is all too easily misunderstood, especially where relations between men and women are concerned. In most traditional food-foraging societies, women did not and do not defer to men. To be sure, women may be excluded from some rituals that males participate in, but the reverse is also true. Moreover, the fruits of women’s labor are not controlled by men but by the women themselves. Nor do women sacrifice their autonomy even in societies in which male hunting, rather than female gathering, brings in the bulk of the food.

Such was the case, for example, among the Innu (Montagnais) Indians of Labrador. Theirs was a society in which the hunt was of overwhelming importance. For their part, women manufactured clothing and other necessities but provided much less of the food than is common among food foragers. Until recently, women as well as men could be shamans. Nevertheless, women were excluded from ritual feasts having to do with hunting—but then, so were men excluded from ritual feasts held by women. Basically, each gender carried out its own activities, with neither meddling in those of the other. Early missionaries to the Innu hunting bands lamented that men had no inclination to make their wives obey them and worked long and hard to convince the Indians that civilization required men to impose their authority on women. But after 300 years of pressing this point, missionaries achieved only limited success.

Food foragers make no attempt to accumulate surplus foodstuffs, often an important source of status in agrarian societies. This does not mean that they live constantly on the verge of starvation, for their environment is their natural storehouse. Except in the coldest climates (where a surplus must be set aside to see people through the long, lean winter season) or in times of acute ecological disaster, some food can almost always be found in a group’s territory. Because food resources are typically distributed equally throughout the group (share and share alike is the order of the day), no one achieves the wealth or status that hoarding might bring. In such a so-
Cultural Adaptations and Technology among Foragers

Habitat as well as technology plays an important role in shaping the characteristics of foraging life discussed above. The mobility of food-foraging groups may depend on the availability of water, as among the Ju/'hoansi, or of game animals and other seasonal resources, as among the Mbuti in the Republic of Congo in Central Africa. Different hunting technologies and techniques may also play a part in determining movement, as well as population size, and division of labor by gender.

Consider, for example, the Mbuti pygmies in the Ituri tropical forest. All Mbuti bands hunt elephants with spears. However, for other game, some of the bands use bows and others use large nets. Those equipped with nets have a cooperative division of labor in which men, women, and children collaborate in driving antelope and other game into the net for the kill. Usually, this involves very long hours and movement over great distances as participants surround the animal(s) and beat the woods noisily to chase the game in one direction toward the great nets. Since this sort of “beat-hunt” requires the cooperation of seven to thirty families, those using this method have relatively large camps. Among Mbuti bow hunters, on the other hand, only men go after the game. These archers tend to stay closer to the village for shorter periods of time and live in smaller groups, typically of no more than six families. While there exists no significant difference in overall population densities of net and bow hunting areas, archers generally harvest a greater diversity of animal species, including monkeys.11

FOOD-PRODUCING SOCIETIES

After tool making, which enabled humans to consume significant amounts of meat as well as plant foods, the next truly momentous event in human history was the domestication of plants and animals. Over time, this achievement transformed cultural systems, with humans developing new economic arrangements, social structures, and ideological patterns based either on plant cultivation, breeding and raising animals, or a mixture of both.

The gradual transition from food foraging to food production first took place about 10,000 years ago in Southwest Asia (the Fertile Crescent, including the Jordan River Valley and neighboring regions in the Middle East). This was the beginning of the Neolithic or New Stone Age, in which peoples possessed stone-based technologies and depended on domesticated plants and/or animals. Within the next few thousand years, similar early transitions to agricultural economies took place independently in other parts of the world where human groups began to grow and (later) alter wild cereal plants such as wheat, maize (corn), and rice; legumes such as beans; gourds such as squash; and tubers such as potatoes. They did the same with a number of wild animal species ranging in their hunting territories and began to domesticate goats, sheep, pigs, cattle, and llamas (Figure 7.2).

Because these activities brought about a radical transformation in almost every aspect of their cultural systems, Australian-born archaeologist Gordon Childe introduced the term Neolithic revolution to refer to the profound culture change associated with the early domestication of plants and animals. Today it is more commonly referred to as the Neolithic transition. Marking the beginning of what is traditionally known as the New Stone Age, in which peoples possessed stone-based technologies and depended on domesticated plants and/or animals.

Chapter Seven/Patterns of Subsistence

Stone Age, this shift changed the very nature of human society. As humans became increasingly dependent on domesticated crops, they mostly gave up their mobile way of life and settled down to till the soil, sow, weed, protect, harvest, and safely store their crops. No longer on the move, they could build more permanent dwellings and began to make pottery for storage of water, food, and so on.

Just why this change came about is one of the important questions in anthropology. Since food production by and large requires more work than food foraging, is more monotonous, is often a less secure means of subsistence, and requires people to eat more of the foods that foragers eat only when they have no other choice, it is unlikely that people voluntarily became food producers.

Initially, it appears that food production arose as a largely unintended by-product of existing food-management practices. Among many examples, we may consider the Paiute Indians, whose desert habitat in the western highlands of North America includes some oasis-like marshlands. These foragers discovered how to irrigate wild crops in their otherwise very dry homeland, thus increasing the quantity of wild seeds and bulbs to be harvested. Although their ecological intervention was very limited, it allowed them to settle down for longer periods in greater numbers than otherwise would have been possible.

Unlike the Paiute, who just stopped short of a Neolithic transition, other groups elsewhere in the world continued to transform their landscapes in ways that favored the appearance of new varieties of particular plants and animals, which came to take on increasing importance for people’s subsistence. Although probably at first accidental, it became a matter of necessity as growth outstripped people’s ability to sustain themselves through food foraging. For them, food production became a subsistence option of last resort.
Crop Cultivation in Gardens: Horticulture

With the advent of plant domestication, some societies took up horticulture (hortus, “garden” in Latin) in which small communities of gardeners cultivate crops with simple hand tools, using neither irrigation nor the plow. Typically, horticulturists cultivate several varieties of food plants together in small, hand-cleared gardens. Because they do not usually fertilize the soil, they use a given garden plot for only a few years before abandoning it in favor of a new one. Horticulturists often can (and sometimes do) grow enough food for their subsistence, and many occasionally produce more than they need for purposes such as inter-village feasts and exchange.

Many horticulturists, however, do not depend exclusively on their gardens for their year-round subsistence. As already indicated by the example of Paiute Indian subsistence practices, societies categorized as food foragers by anthropologists may also engage in some wild food plant management. Likewise, horticulturists do not completely give up food foraging. Although their major food supplies may come from their gardens, they will also hunt game, fish, and collect wild plants foods in the forest whenever they need or get a chance.

One of the most widespread forms of horticulture, especially in the tropics, is slash-and-burn cultivation, also known as swidden farming, in which the natural vegetation is cut, the slash is subsequently burned, and crops then planted among the ashes. Unfortunately, widespread use of fire in connection with the clearing of vast tracts of Amazonian or Indonesian forest for cattle raising and other development schemes has led many people to see this kind of farming in a negative light. In fact, it is an ecologically sophisticated and sustainable way of raising food, especially in the tropics, when carried out under the right conditions: low population densities and adequate amounts of land. It mimics the diversity of the natural ecosystem, growing several different crops in the same field. Mixed together, the crops are less vulnerable to pests and plant diseases than a single crop.

Not only is the system ecologically sound, but it is far more energy efficient than modern farming methods used in developed countries such as the United States where natural resources such as land and fuel are still relatively cheap and abundant, and many farms operate with financial support in the form of government subsidies or tax breaks. While high-tech farming requires more energy input than it yields, swidden farming produces between 10 and 20 units of energy for every unit expended. A good example of how such a system works is provided by the Mekranoti Kayapo Indians of Brazil’s Amazon forest, profiled in the following Original Study.
Gardens of the Mekranoti Kayapo

The planting of a Mekranoti garden always follows the same sequence. First, men clear the forest and then burn the debris. In the ashes, both men and women plant sweet potatoes, manioc, bananas, corn, pumpkins, papaya, sugar cane, pineapple, cotton, tobacco, and annatto, whose seeds yield achiote, the red dye used for painting ornaments and people’s bodies. Since the Mekranoti don’t bother with weeding, the forest gradually invades the garden. After the second year, only manioc, sweet potatoes, and bananas remain. And after three years or so there is usually nothing left but bananas. Except for a few tree species that require hundreds of years to grow, the area will look like the original forest twenty-five to thirty years later.

This gardening technique, known as slash-and-burn, is one of the most common in the world. At one time critics condemned the technique as wasteful and ecologically destructive, but today we know that, especially in the humid tropics, slash-and-burn may be one of the best gardening techniques possible.

Continuous high temperatures encourage the growth of the microorganisms that cause rot, so organic matter quickly breaks down into simple minerals. The heavy rains dissolve these valuable nutrients and carry them deep into the soils, out of the reach of plants. The tropical forest maintains its richness because the heavy foliage shades the earth, cooling it and inhibiting the growth of the decomposers. A good deal of the rain is captured by leaves before ever reaching the ground.

When a tree falls in the forest and begins to rot, other plants quickly absorb the nutrients that are released. In contrast, with open-field agriculture, the sun heats the earth, the decomposers multiply, and the rains quickly leach the soils of their nutrients. In a few years a lush forest, if cleared for open one-crop agriculture, can be transformed into a barren wasteland.

A few months after the Mekranoti plant banana and papaya, these trees shade the soil, just as the larger forest trees do. The mixing of different kinds of plants in the same area means that minerals can be absorbed as soon as they are released; corn picks up nutrients very fast, while manioc is slow. Also, the small and temporary clearings mean that the forest can quickly reinvade its lost territory.

Because decomposers need moisture as well as warmth, the long Mekranoti dry season could alter this whole picture of soil ecology. But soil samples from recently burned Mekranoti fields and the adjacent forest floor showed that, as in most of the humid tropics, the high fertility of the Indians’ garden plots comes from the trees that are burned there, not from the soil, as in temperate climates.

Getting a good burn is a tricky operation. Perhaps for this reason its timing was left to the more experienced and knowledgeable members of the community. If the burn is too early, the rains will leach out the minerals in the ash before planting time. If too late, the debris will be too wet to burn properly. Then, insects and weeds that could plague the plants will not die and few minerals will be released into the soil. If the winds are too weak, the burn will not cover the entire plot. If they are too strong, the fire can get out of hand.

Shortly after burning the plots and clearing away some of the burned debris, people began the long job of planting, which took up all of September and lasted into October. In the center of the circular garden plot the women dug holes and threw in a few pieces of sweet potatoes. After covering the tubers with dirt they usually asked a male—one of their husbands or anyone else who happened to be nearby—to stomp on the mound and make a ritual noise resembling a Bronx cheer. This magic would ensure a large crop, I was told. Forming a large ring around the sweet potatoes, the Indians rapidly thrust pieces of manioc stems into the ground, one after the other.

When grown, the manioc stems form a dense barrier to the sweet potato patch, and some of the plants must be cut down to gain entrance. Outside of the ring of manioc, the women plant yams, cotton, sugar cane, and annatto. Banana stalks and papaya trees, planted by simply throwing the seeds on the ground, form the outermost circle. The Indians also plant corn, pumpkins, watermelons, and pineapple throughout the garden. These grow rapidly and are harvested long before the manioc matures. The garden appears to change magically from corn and pumpkins to sweet potatoes and manioc without replanting.

Mekranoti gardens grew well. A few Indians complained now and then about a peacock that had eaten a watermelon they were looking forward to eating, or that had reduced their corn harvest. Capybara, large rodents usually found near the river banks, were known for their love of sugar cane, but in general the animals seemed to leave the crops alone. Even the leaf-cutting ants that are problems in other areas did not bother the Mekranoti. Occasionally a neighbor who had not planted a new garden would make off with a prized first-year crop, such as pumpkin, watermelon, or pineapple. But even these thefts were rare. In general, the Mekranoti could depend on harvesting whatever they planted.

Eventually, I wanted to calculate the productivity of Mekranoti gardens. Western agronomists knew very little about slash-and-burn crop cultivation. They were accustomed to experiments in which a field was given over to one crop only, and in which the harvest happened all at once. Here, the plants were all mixed together, and people harvested piecemeal whenever they needed something. The manioc could stay in the
In contrast to horticulture, agriculture (agri, “field” in Latin) is growing food plants like grains, tubers, fruits, and vegetables in soil prepared and maintained for crop production. This form of more intensive food production involves using technologies other than hand tools, such as irrigation, fertilizers, and the wooden or metal plow pulled by harnessed draft animals. The cultural ecological sophistication of some early agriculturalists is illustrated in this chapter’s Anthropology Applied feature. In the so-called developed countries of the world, agriculture relies on fuel-powered tractors to produce food on larger plots of land.

Unlike horticulturists, agriculturists generally grow surplus crops—providing not only for their own needs but food for those of various full-time specialists and nonproducing consumers as well. This surplus may be traded or sold for cash, or it may be coerced out of the farmers through taxes, rent, or tribute (forced gifts acknowledging submission or protection) paid to landowners or other dominant groups. These landowners and specialists—such as traders, carpenters, blacksmiths, sculptors, basket makers, and stonecutters—typically reside in substantial towns or cities, where political power is centralized in the hands of a socially elite class. Dominated by more powerful groups and markets, much of what the farmers do is governed by political and economic forces over which they have little control.

The distinction between horticulture and agriculture is not always an easy one to make. For example, the Hopi Indians of the North American Southwest, in addition to flood plain farming, also irrigate plots near springs, while using simple hand tools. Moreover, they produce for their own immediate needs and live in small towns without centralized political government.

Early food producers have developed several major crop complexes: two adapted to dry uplands and two to tropical wetlands. In the dry uplands of Southwest Asia, for example, farmers time their agricultural activities with the rhythm of the changing seasons, cultivating wheat, barley, oat, flax, rye, and millet. In the tropical wetlands of Southeast Asia, rice and tubers such as yams and taro are cultivated. In the Americas, people have adapted to natural environments similar to those of Africa and Eurasia, but have cultivated their own indigenous plants. Typically, maize, beans, squash, and the potato are grown in drier areas, whereas manioc is extensively grown in the tropical wetlands.

Characteristics of Agricultural Societies

One of the most significant correlates of plant cultivation was the development of fixed settlements, in which farming families reside together near their cultivated fields. While food foragers stay close to their food by moving around to follow nature’s seasonal fluctuations, food producers stay close to theirs by not straying too far from their gardens or farmlands. The task of food production lent itself to a different kind of social organization. Because the hard work of some members of the agricultural population was devoted to farming, there was greater time available for other pursuits. As a result, the need for a more formal system of organizing work and assigning tasks became more evident.

food-producing societies can be:

- 8.5 hours Gardening
- 6.0 hours Hunting
- 1.5 hours Fishing
- 1.0 hour Gathering wild foods
- 33.5 hours All other jobs

Altogether, the Mekranoti need to work less than 51 hours a week, and this includes getting to and from work, cooking, repairing broken tools, and all of the other things we normally don’t count as part of our work week.


Crop Cultivation: Agriculture

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Unlike horticulturists, agriculturists generally grow surplus crops—providing not only for their own needs but food for those of various full-time specialists and nonproducing consumers as well. This surplus may be traded or sold for cash, or it may be coerced out of the farmers through taxes, rent, or tribute (forced gifts acknowledging submission or protection) paid to landowners or other dominant groups. These landowners and specialists—such as traders, carpenters, blacksmiths, sculptors, basket makers, and stonecutters—typically reside in substantial towns or cities, where political power is centralized in the hands of a socially elite class. Dominated by more powerful groups and markets, much of what the farmers do is governed by political and economic forces over which they have little control.

The distinction between horticulture and agriculture is not always an easy one to make. For example, the Hopi Indians of the North American Southwest, in addition to flood plain farming, also irrigate plots near springs, while using simple hand tools. Moreover, they produce for their own immediate needs and live in small towns without centralized political government.

Early food producers have developed several major crop complexes: two adapted to dry uplands and two to tropical wetlands. In the dry uplands of Southwest Asia, for example, farmers time their agricultural activities with the rhythm of the changing seasons, cultivating wheat, barley, oat, flax, rye, and millet. In the tropical wetlands of Southeast Asia, rice and tubers such as yams and taro are cultivated. In the Americas, people have adapted to natural environments similar to those of Africa and Eurasia, but have cultivated their own indigenous plants. Typically, maize, beans, squash, and the potato are grown in drier areas, whereas manioc is extensively grown in the tropical wetlands.

Characteristics of Agricultural Societies

One of the most significant correlates of plant cultivation was the development of fixed settlements, in which farming families reside together near their cultivated fields. While food foragers stay close to their food by moving around to follow nature’s seasonal fluctuations, food producers stay close to theirs by not straying too far from their gardens or farmlands. The task of food production lent itself to a different kind of social organization. Because the hard work of some members of the agricultural population was devoted to farming, there was greater time available for other pursuits. As a result, the need for a more formal system of organizing work and assigning tasks became more evident.

food-producing societies can be:

- 8.5 hours Gardening
- 6.0 hours Hunting
- 1.5 hours Fishing
- 1.0 hour Gathering wild foods
- 33.5 hours All other jobs

Altogether, the Mekranoti need to work less than 51 hours a week, and this includes getting to and from work, cooking, repairing broken tools, and all of the other things we normally don’t count as part of our work week.

Anthropology Applied

Agricultural Development and the Anthropologist  •  Ann Kendall

Gaining insight into the traditional practices of indigenous peoples, anthropologists have often been impressed by the ingenuity of their knowledge. This awareness has spread beyond the profession to the Western public at large, giving birth to the popular notion that indigenous groups invariably live in some sort of blissful oneness with the environment. But this was never the message of anthropologists, who know that traditional people are only human, and like all human beings, are capable of making mistakes. Yet, just as we have much to learn from their successes, so can we learn from their failures.

Archaeologist Ann Kendall is doing just this in the Patacancha Valley in the Andes Mountains of southern Peru. Kendall is director and founder of the Cusichaca Trust, near Oxford, England, a rural development organization that revives ancient farming practices. In the late 1980s, after working for ten years on archaeological excavations and rural development projects, she invited botanist Alex ChepstoLusty of Cambridge University to investigate climatic change and paleoecological data. His findings, along with Kendall’s, provided evidence of intensive farming in the Patacancha Valley, beginning about 4,000 years ago. The research showed that over time widespread clearing to establish and maintain farm plots, coupled with minimal terracing of the hillsides, had resulted in tremendous soil loss through erosion. By 1,900 years ago, soil degradation and a cooling climate had led to a dramatic reduction in farming. Then, about 1,000 years ago, farming was revived, this time with soil-sparing techniques.

Kendall’s investigations have documented intensive irrigated terrace construction over two periods of occupation, including Inca development of the area. It was a sophisticated system, devised to counteract erosion and achieve maximum agricultural production. The effort required workers to haul load after load of soil up from the valley floor. In addition, they planted alder trees to stabilize the soil and to provide both firewood and building materials. So successful was this farming system by Inca times that the number of people living in the valley quadrupled to some 4,000, about the same as it is now. However, yet another reversal of fortune occurred when the Spanish took over Peru and the terraces and trees here and elsewhere were allowed to deteriorate.

Armed with these research findings and information and insights gathered through interviews and meetings with locals, the Cusichaca Trust supported the restoration of the terraces and 5.8 km of canal. The effort relied on local labor working with traditional methods and materials—clay (with a cactus mix to keep it moist), stone, and soil. Local families

Mixed Farming: Crop Growing and Animal Breeding

As noted above, indigenous food-producing cultures in the western hemisphere depended primarily on growing domesticated indigenous crops such as manioc, corn, and beans. With some exceptions, including the Aymara and Quechua, who traditionally also keep llamas and alpacas in their high-altitude homeland in the Andes Mountains of South America (see the Biocultural Connection feature), American Indians obtained sufficient meat, fat, leather, and wool from wild game.

On the other side of both oceans, however, Eurasian and African food-producing peoples often do not have an opportunity to obtain enough vitally important animal proteins from wild game, fish, or fowl (although they would not pass up a rare chance to catch some). Instead, many of these farming cultures have developed a mixed subsistence strategy and combine
have replanted 160 hectares of the reno-
vated pre-conquest terraces with maize,
potatoes, and wheat, finding the plots
up to ten times more productive than
they were. Among other related accom-
plishments, twenty-one water systems
have been installed, which reach more
than 800 large families, and a traditional
concept of home-based gardens has been
adapted to introduce European-style
vegetable gardens to improve diet and
health and to facilitate market gardener-
ing. Since 1997, these projects have been
under a new and independent local rural
development organization known as
ADESA.

The Cusichaca Trust is now continuing
its pioneering work in areas of extreme
poverty in Peru further to the north, such
as Apurimac and Ayacucho, using tried
and tested traditional technology in the
restoration of ancient canal and terrace
systems.

(Adapted from K. Krajick (1998). Green-
farming by the Incas? Science 281, 323. The
2003 update and elaboration by textbook
authors is based on personal communi-
cation with Kendall and Cusichaca Trust
reports. For more information see www
cusichaca.org.)

crop cultivation with animal husbandry. Thus, in ad-
dition to growing crops like cereals, tubers, or vege-
tables, they may also breed and raise animals for food and
other purposes, including selling or trading. The variety
of wild animals domesticated by humans in Africa and
Eurasia includes chickens, ducks, geese, rabbits, pigs,
goats, sheep, cattle, camels, dromedaries, donkeys, and
horses.

Depending on cultural traditions, ecological circum-
stances, and animal habits, some species are kept in barns
or fenced-off fields, while others may range quite freely
in and around the settlement or designated pastures, al-
beit under supervision, branded or otherwise marked by
their owners as private property. For instance, in some
English farming communities (not unlike Papua vil-
lages in New Guinea) it was historically not unusual to
find ear-marked pigs freely roaming in the surrounding
woodlands in search of acorns and any other food ap-
pealing to their omnivorous appetite.

Likewise, many ancient agricultural communities
adapted to high altitude environments from the Alps to
the Himalayas have traditionally herded livestock (cows,
sheep, horses, and so on) in high summer pastures, leav-
ing their narrow lowland valleys for alternative use—
farming grains, keeping orchards, growing vegetables
and hay for animal winter food. After the crop harvest,
before the weather turns cold and snow covers the
higher pastures, those who left the village to tend the
herds bring the animals back to the valley for the winter
season. This “vertical” seasonal movement of livestock
between high altitude summer pastures and lowland
valleys is known as transhumance.12

ethnicity in an alpine valley (with a new introduction). Berkeley:
University of California Press; see also Jones, S. (2005). Transhun-
mance re-examined. Journal of the Royal Anthropological Institute 11
(4), 841–842.
Pastoralism

One of the more striking examples of human adaptation to the environment is pastoralism—breeding and managing large herds of domesticated grazing (and browsing) animals, such as goats, sheep, cattle, horses, llamas, or camels. Unlike the forms of animal husbandry discussed above, pastoralism is a specialized way of life centered on breeding and herding animals.

Completely dependent on livestock for daily survival, families in pastoral cultures may own herds of hundreds of grazing animals whose needs for food and drink determine the pastoralists’ everyday routines. When a dozen or more herding families join each other, their collective herds may number in the thousands and sometimes even a few hundred thousand. Unlike crop-cultivators who need to remain close to their fields, pastoral peoples do not usually establish permanent settlements since they must follow or drive their large herds to new pastures on a regular basis. Like their migratory herds, most pastoralists must be mobile and have adjusted their way of life accordingly.

Nomadic Pastoralism:
Bakhtiari Herders in the Zagros Mountains

Nomadic pastoralism is an effective way of living—far more so than sheep or cattle ranching—in environments that are too dry, cold, steep, or rocky for farming, such as the vast, arid grasslands that stretch eastward from northern Africa through the Arabian Desert, across the plateau of Iran and into Turkistan and Mongolia. Today, in Africa and Asia alone, more than 21 million people are pastoralists, still migrating with their herds. These nomadic groups regard movement as a natural part of life. Although some herding groups depend on nearby farmers for certain supplies, and may even earn more from other sources than from their own herds, the nomadic herding lifestyle remains central to their identities.

Counted among the world’s pastoral groups are the Bakhtiari, a fiercely independent people who live in the unforgiving Zagros Mountains of western Iran. The Bakhtiari way of life, uniquely adapted to the seasonal fluctuations in their rugged mountainous environment, involves moving with their grazing animals from winter pastures in low steppe lands to summer pastures on high plateaus. For many thousands of years the Bakhtiari have tended herds of goats and fat-tailed sheep this way. Their lives revolve around these major seasonal migrations needed to provide good grazing lands for their flocks—long hazardous journeys that take them over mountains as high as 12,000 feet and through deep chasms and churning watercourses.

Each fall, before the harsh winter comes to the mountains, these nomads load their tents and other belongings on donkeys and drive their flocks down to the warm plains that border Iraq in the west. Here the grazing land is excellent and well watered during the winter months. In the spring, when the low-lying pastures dry up, the Bakhtiari return to the mountain valleys, where a new crop of grass is sprouting. For this trek, they split into five groups, each containing about 5,000 individuals and 50,000 animals.

The return trip north is especially dangerous because the mountain snows are melting and the gorges are full of turbulent, ice-cold water rushing down from the mountain peaks. This long trek is further burdened by the newborn spring lambs and goat kids. Where the watercourses are not very deep, the nomads ford them. Deeper channels, including one river that is a half-mile wide, are crossed with the help of inflatable goatskin rafts, on which they place infants and elderly or infirm family members, as well as lambs and kids. Men swim alongside the rafts, pushing them through the icy water. If they work from dawn to dusk, the nomads can get all of the people and animals across the river in five days. Not surprisingly, dozens of animals drown each day.

In the mountain passes, where a biting wind numbs the skin and brings tears to the eyes, the Bakhtiari trek a rugged slippery trail. Climbing the steep escarpments is dangerous, and often the stronger men must carry their children and the baby goats on their shoulders as they make their way over the ice and snow to the lush mountain valley that is their destination. During each

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pastoralism Breeding and managing large herds of domesticated grazing animals, such as goats, sheep, cattle, horses, llamas, or camels.
migration the nomads may cover as many as 200 miles. The journey is familiar but not predictable. It can take weeks, for the flocks travel slowly and require constant attention. Men and older boys walk the route, driving the sheep and goats as they go. Women and children usually ride atop donkeys, along with tents and other equipment.

Reaching their destination, the Bakhtiari set up tents—traditionally black goat-hair shelters woven by the women. The tents are a fine example of adaptation to a changing environment. The goat-hair cloth retains heat and repels water during the winter and keeps out heat during the summer. These portable homes are easy to erect, take down, and transport. Inside, the furnishings are sparse and functional, but also artful. Heavy felt pads or elaborate wool rugs, also woven by the women, cover the ground, and pressed against the inside walls of the tent are stacks of blankets, goatskin containers, copper utensils, clay jugs, and bags of grain.

Central to Bakhtiari subsistence, sheep and goats provide milk, cheese, butter, meat, hides, and wool. Women and girls spend considerable time spinning wool into yarn—sometimes doing so while riding atop donkeys on the less rugged parts of their migration. They use the yarn not only to make rugs and tents, but also clothing, storage bags, and other essentials.

Labor division among the Bakhtiari is according to gender. The chief task of the men is tending the flocks. The women cook, sew, weave, care for the children, and carry fuel and water. With men owning and controlling the animals, which are of primary importance in Bakhtiari life, women have generally lacked both economic and political power. The Bakhtiari live in the political state of Iran but have their own traditional system of justice, including laws and a penal code. They are governed by tribal leaders, or khans, men who are elected or inherit their office. Most Bakhtiari khans grew wealthy when oil was discovered in their homeland around the start of the 20th century, and many of them are well educated, having attended Iranian or foreign universities.

Despite this, and although some of them own houses in cities, the khans spend much of their lives among their people in the mountains. Such prominence of men in both economic and political affairs is common among pastoral nomads; theirs is very much a man’s world. That said, elderly Bakhtiari women eventually may gain a good deal of power. And some women of all ages today are gaining a measure of economic control by selling their beautiful handmade rugs to traders, which brings in cash to their households.

Although pastoral nomads like the Bakhtiari depend greatly on their large herds of grazing animals to meet their daily needs, they do trade surplus animals, wool, and woven rugs with farmers or merchants in exchange for crops and valued commodities such as flour, dried fruit, spices, tea, metal knives, pots and kettles, cotton or linen textiles, guns and (more recently) lightweight plastic containers, sheets, and so on. In other words, there are many ties that connect them to surrounding agricultural and industrial societies.

**Intensive Agriculture and Nonindustrial Cities**

With the intensification of agriculture, some farming villages grew into towns and even cities (Figure 7.3). In these larger population centers, individuals who had
previously been engaged in farming were freed to specialize in other activities. Thus, craft specialists such as carpenters, blacksmiths, sculptors, basket makers, and stonemasons contribute to the vibrant, diversified life of the city.

Unlike horticulturists and pastoralists, city dwellers are only indirectly concerned with adapting to their natural environment. Far more important is the need to adapt to living and getting along with their fellow urbanites. Urbanization brings with it a new social order: Marked inequality develops as society becomes more complex, and people are ranked according to how much control they hold over resources, the kind of work they do, their gender, or the family they are born into. As social institutions cease to operate in simple, face-to-face groups of relatives, friends, and acquaintances, they become more formal and bureaucratic, with specialized political institutions.

With urbanization came a sharp increase in the tempo of human cultural change. Writing was invented, trade intensified and expanded, the wheel and the sail were invented, and metallurgy and other crafts were developed. In many early cities, monumental buildings, such as royal palaces and temples, were built by thousands of men, often slaves taken in war. These feats of engineering still amaze modern architects and engineers. The inhabitants of these buildings—the ruling class composed of nobles and priests—formed a central government that dictated the social and religious rules to be followed and carried out by the merchants, craft specialists, warriors, servants, and other city dwellers.

Notably, these urbanized populations mostly depend for much of their daily food (such as bread, tortillas, vegetables, meat, fish, fruit, milk, butter, and cheese) and fuel (especially firewood for cooking and heating their dwellings) on what is produced or foraged in surrounding areas. For this reason, the urban ruling class has sought to widen its territorial power and political control over rural populations. This is how farmers who raised their own crops and livestock as they saw fit, and who determined themselves if and how much surplus they would produce, lost that traditional self-determination.

Once a dominant group managed to impose its rules on the farmers, it also took control over their capacity to produce more food than the farmers actually needed to survive. In other words, these farmers turned into peasants. One of the first anthropologists to study peasant communities was Eric Wolf, who defined them as “rural cultivators whose surpluses are transferred to a dominant group of rulers that uses the surpluses both to underwrite its own standard of living and to distribute the remainder to groups in society that do not farm but must be fed for their specific goods and services in turn.”

**The Aztec State**

The Aztec state, which developed in the Mexican highlands in the 15th century, is a good example of a highly developed urban society among America’s indigenous peoples and where an urban political elite also gained control over food production in the surrounding countryside. Its capital city Tenochtitlán (modern-day Mexico City) was located in a fertile valley 7,000 feet above sea level. Its population, along with that of its sister city Tlatelolco, reached about 200,000 in the early 16th century.

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This makes it five times more populous than the city of London at the same time.

The Aztec social order was stratified into three main classes: nobles, commoners, and serfs. The serfs were bound to the land and the lowest of this class were the slaves. Some had sold themselves into bondage; others were captives taken in war. The state was governed by an absolute monarch, assisted by a large number of government officials who oversaw various functions, such as maintenance of the tax system and the courts of justice, management of government storehouses, and control of military training.

As in early states elsewhere in the world, the foundation of Aztec society was intensive agriculture. Corn was...
the principal crop. Each family, allotted a plot of land by its kin group, cultivated any of a number of crops, including beans, squash, gourds, peppers, tomatoes, cotton, and tobacco. Only a few animals were domesticated; these included dogs and turkeys (both for eating).

As specialization increased in Aztec society, the market became an extremely important economic and social institution. In addition to the daily markets in each city, larger markets were held in the various cities at different times of year. Buyers and sellers traveled to these from the far reaches of the state. Trade networks between the Aztec capital and other cities brought goods such as chocolate, vanilla beans, and pineapples into Tenochtitlán. The market at Tlatelolco, Tenochtitlán’s sister city, was so huge that the Spanish compared it to that of Rome. At the Aztec markets, barter was the primary means of exchange. At times, however, cacao beans and cotton cloaks were used as a form of money. The market also served social functions. People went there not only to buy or to sell but also to meet other people and to hear the latest news.

At Tenochtitlán, with a total area of about 20 square miles, a huge temple and two lavish palaces stood in the central plaza, also called the Sacred Precinct. Surrounding this area were other ceremonial buildings belonging to each kin group. In the city proper stood the houses of the more affluent—graceful, multiroomed, one- and two-story stone and mortar buildings, each surrounding a flower-filled patio and built on a stone platform for protection against floods. It is estimated that there were about 60,000 houses in Tenochtitlán. The focal points of the city were the large pyramidal temples, where religious ceremonies, including human sacrifice, were held.

The Aztec capital sat on an island in the middle of a lake, which has since been drained and filled, and two aqueducts brought in fresh water from springs on the mainland. A 10-mile dike rimmed the eastern end of the city to prevent nearby salty waters from entering the lake around Tenochtitlán. Since the city was surrounded by water, it was unfortified and connected to the mainland by three causeways. Communication among different parts of the city was easy, and people could travel either by land or by water. A series of canals, with footpaths beside them, ran throughout the city. Thousands of canoes plied the canals, carrying passengers and cargo around the city. As in a modern city, housing in Tenochtitlán ranged from squalid to magnificent. Farmers’ huts made of wooden posts, thatched straw, and wattle plastered with mud were clustered on the outskirts of the city atop raised fields (chinampas) made of piles of mud and plant matter in the shallow lake and marshlands. While the Spanish invaders were very impressed by Tenochtitlán’s magnificence as one of the largest cities in the world, that did not prevent them from completely destroying it soon after their arrival in Mexico in 1519.

**INDUSTRIAL SOCIETIES**

Until about 200 years ago, human societies all across the world had developed a cultural infrastructure based on foraging, horticulture, agriculture, pastoralism, crafts, trade, or some combination of these. This changed with the invention of the steam engine in England, which brought about an industrial revolution that quickly spread to other parts of the globe. Machines and tools powered by water, wind, and steam (followed by oil, gas, and diesel fuel) replaced human labor and hand tools, increasing factory production and facilitating mass transportation.

Throughout the 1800s and 1900s, this resulted in large-scale industrialization of many societies. Technological inventions utilizing oil, electricity, and (since the 1940s) nuclear energy brought about more dramatic changes in social and economic organization on a worldwide scale. In the late 20th century, the electronic-digital revolution made the production and distribution of information the center of economic activity in some wealthy societies.

**Questions for Reflection**

1. Since the beginning of human history, our species has met the challenge of survival by adapting to different environments. In capturing essential natural resources, we have also modified these environments. Do you know any examples of landscapes radically transformed for economic reasons? Who benefits from such environmental changes in the long run?

2. What was so radical about the Neolithic transition that prompted some to refer to it as a revolution? Can you think of any equally radical changes in subsistence practices going on in the world today?

3. Consider the ideas of change and progress in light of the agricultural development project described in the Anthropology Applied box. Come up with your own definition of progress that goes beyond the standard idea of technological and material advancement.

4. Technological development in industrial societies often results in highly productive machines effectively replacing animal and human workers. Think of a useful mechanical device and consider its benefits and costs, not only to you but also to others.

5. When shopping for groceries in a supermarket, try to imagine the great chain of human hands that was involved in getting something as simple as a nice red apple from a distant orchard to your own mouth. How many people do you think handled the fruit to get it to you?