

PERSPECTIVES: AN OPEN INVITATION TO CULTURAL ANTHROPOLOGY

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LEARNING OBJECTIVES

- Identify the four modes of subsistence and describe the major activities associated with obtaining food in each system.
- Explain the difference between wild and domesticated resources and how plants and animals are domesticated.
- Explain the relationship between the subsistence system used in a society and the amount of private property or wealth differences that develop.
- Assess the ways in which subsistence systems are linked to expectations about gender roles.
- Categorize the social and economic characteristics associated with agriculture and describe the benefits and drawbacks of the agricultural subsistence system.
- Analyze the ways in which the global agricultural system separates producers from consumers and contributes to wealth differences.
- Appraise the ways in which human intervention in the environment has made it difficult to separate the “natural” from the human-influenced environment.

Think about the last meal you ate. Where did the ingredients come from? If it was a cheeseburger, where did the cow live and die? Now think about all the food you consume in a normal week. Can you identify the geographic origin of all the ingredients? In other words, how much do you know about the trip your food took to arrive at your plate? How much you know about where your food comes from would tell an anthropologist something about the **subsistence system** used in your community. A subsistence system is the set of practices used by members of a society to acquire food. If you are like me and you cannot say much about where your food comes from, then you are part of an agricultural society that separates food production from consumption, a recent development in the history of humans. People who come from nonagricultural societies have a more direct connection to their food and are likely to know where 100 percent of their food comes from.

Finding food each day is a necessity for every person no matter where that person lives, but food is not just a matter of basic survival. Humans assign symbolic meaning to food, observing cultural norms about what is considered “good” to eat and applying taboos against the consumption of other foods. Catholics may avoid meat during Lent, for instance, while Jewish and Islamic communities forbid the consumption of certain foods such as pork. In addition to these attitudes and preferences, every society has preferred methods for preparing food and for consuming it with others. The cultural norms and attitudes surrounding food and eating are known as **foodways**. By studying both the subsistence system used by a society to acquire food and the foodway associated with consuming it, anthropologists gain insight into the most important daily tasks in every society.

STUDYING SUBSISTENCE SYSTEMS

Since the need to eat is one of the few true human universals, anthropologists have studied subsistence systems from a variety of perspectives. One way to think about the importance of food for human populations is to consider the number of calories an individual must obtain every day in

order to survive. Anthropologists use the term **carrying capacity** to quantify the number of calories that can be extracted from a particular unit of land to support a human population. In his 1798 publication *An Essay on the Principle of Population*, Thomas Malthus argued, “the power of population is indefinitely greater than the power in the earth to produce subsistence for man.”¹ He suggested that human populations grow at an exponential rate, meaning the population climbs at a rate that is constantly increasing. However, the availability of resources in the environment increases at only an arithmetic rate, which means that left unchecked human populations would soon outstrip the environment’s ability to provide sustenance. Malthus famously argued that war, famine, and disease were “good” or at least “functional” in the sense that they kept populations from growing too large.



Figure 1: Carrying Capacity: The area in the orange box, which is not under cultivation, might provide enough resources for a family of four to survive for a year. An equivalent area, marked by the blue box, could provide enough resources for a significantly larger population under intensive agricultural cultivation.

While Malthus presented a grim view of humanity’s future, research suggests that the rate of human population growth, currently about one percent per year, is actually slowing. It is also not necessarily true that population growth has an entirely negative impact on human communities. The Danish economist Ester Boserup, for example, argued that human history reveals a connection between population growth and cultural innovation, particularly innovation in farming techniques. Because necessity is the mother of invention, she reasoned, the pressure of having more mouths to feed could be the dynamic that drives societies to develop new solutions.²

Modern anthropological studies of subsistence systems draw on insights and perspectives from several different fields, including biology, chemistry, and ecology, as well as a range of ethnographic techniques. This interdisciplinary perspective allows for cross-cultural comparison of human diets. In several decades of anthropological research on subsistence systems, anthropologists have observed that the quest for food affects almost every aspect of daily life. For instance, every person plays a role in society as a producer, distributor, or consumer of food. In the journey of a fish from the sea to the plate, for instance, we can see that in some societies, the same person can fill more than one of those roles, while in other societies there is more specialization. In a small fishing village, the same

person might catch the fish, distribute some extra to friends and family, and then consume the bounty that same day. In a city, the consumer of the fish at a fancy restaurant is not the same person who caught the fish. In fact, that person almost certainly has no knowledge of who caught, cleaned, distributed, and prepared the fish he or she is consuming. The web of social connections that we can trace through subsistence provide a very particular kind of anthropological insight into how societies function at their most basic level.



Figure 2: These images show how fish are harvested in two different subsistence systems. Consider the amount of investment and labor that went into the development of technologies that make mass fish farming, or aquaculture, possible compared to fishing with simple nets.

MODES OF SUBSISTENCE

Like all human systems, a society's subsistence system is intricately linked to other aspects of culture such as kinship, politics, and religion. Although we can study these systems in isolation, it is important to remember that in the real world all aspects of culture overlap in complex ways. Consider harvest rituals, for example, which are religious ceremonies focused on improving the food supply. These rituals are shaped by religious beliefs as well as the demands and challenges of obtaining food. Likewise, subsistence systems are the economic base of every society. Working to put food on the table is the essential task of every family or household, and this work is the basis of a **domestic economy** that interacts with the modes of production and modes of exchange described in the Economics chapter.

When anthropologists first began to examine subsistence systems, they started like all scientists do, with classification. Early on, anthropologists saw the benefit of grouping similar societies into types, or categories, based on the range of practices they used in the quest for food. These groupings allowed for comparisons between cultures. At a basic level, societies can be divided into those that have an **immediate return system** for finding food and those that have a **delayed return system**. The residents of a small fishing village who eat the fish they catch each day have an immediate return on their labor. Farmers who must wait several months between the time they plant seeds and the time they harvest have a delayed return system.

Beyond this basic division, anthropologists recognize four general types of food system known as **modes of subsistence**. The four modes of subsistence are foraging, pastoralism, horticulture, and agriculture. Each mode is defined by the tasks involved in obtaining food as well as the way members of the society are organized socially to accomplish these tasks. Because each mode of subsistence is tailored to particular ecological conditions, we can think of each culture's subsistence system as an

adaptation, or a set of survival strategies uniquely developed to suit a particular environment. Because culture shapes the way we view and interact with the environment, different societies can adapt to similar environments in different ways. **Foraging**, sometimes known as hunting and gathering, describes societies that rely primarily on “wild” plant and animal food resources. **Pastoralism** is a subsistence system in which people raise herds of domesticated livestock. **Horticulture** is the small-scale cultivation of crops intended primarily for subsistence. **Agriculture**, the subsistence system used in the United States, involves the cultivation of domesticated plants and animals using technologies that allow for intensive use of the land. Can all societies be categorized neatly into one of these modes? No. In fact, almost every society combines one or more of these strategies into their subsistence practices. For example, in the United States there are individuals who participate in all of these subsistence modes, including foraging. When anthropologists analyze a subsistence system, they look for the dominant mode of subsistence, or the most typical way that members of a society procure food. So, while some people in the United States grow their own food or hunt wild animals, the dominant mode of subsistence is agriculture, and people obtain food primarily by purchasing it.

Foraging

“Why should we plant, when there are so many mongongos in the world?”
—/Xashe, !Kung forager³

Foraging is a mode of subsistence defined by its reliance on wild plant and animal food resources already available in the environment rather than on domesticated species that have been altered by human intervention. Foragers use a remarkable variety of practices to procure meals. Hunting for animal protein is central to the foraging lifestyle and foragers capture and consume a wide variety of animals, from squirrels caught with a bow and arrow or blow dart to buffalo once killed by the dozens in communal hunts. Fishing for marine resources forms the basis for acquiring protein in many foraging communities and includes a range of practices from exploiting coastal shellfish and crab, to harvesting offshore resources such as deep sea fish and marine mammals such as whales and seals. Augmenting the protein from hunting or fishing, gathered wild plant resources, such as fruits, nuts, roots, tubers, and berries typically provide a large percentage of the calories that go into any meal. Gathering requires expert knowledge of where plant resources can be found, when they will be best to harvest, and how to prepare them for consumption. Foraging is the only immediate return subsistence system.

Foraging societies tend to have what is called a **broad spectrum diet**: a diet based on a wide range of resources. Many of the foods regularly eaten by foragers, such as insects and worms, would not necessarily be considered edible by many people in the United States. For example, many people do not know that earthworms are a good source of iron and high-quality protein, roughly equivalent to eggs, but that is exactly what anthropologists learned by studying the diet of foraging societies in Venezuela.⁴ Foragers are scientists of their own ecosystems, having acquired extensive knowledge of the natural world through experience that allows them to exploit many kinds of food resources. The Aché, a foraging group living in the subtropical rainforest in Paraguay, eat 33 different kinds of mammals, more than 15 species of fish, the adult forms of 5 insects, 10 types of larvae, and at least 14 kinds of honey. This is in addition to finding and collecting 40 species of plants.⁵ The !Kung foragers, who live in the Kalahari Desert in southern Africa, treasure the mongongo nut, which is tasty, high

in protein, and abundant for most of the year, but they also hunt giraffes, six species of antelope, and many kinds of smaller game like porcupine.⁶

In general, foraging societies are small, with low population densities of less than 5 people per square mile. Large families and communities are not necessarily desirable since more mouths to feed can equate to increased pressure to find food. Another factor that contributes to a lower population density is the fact that it is more difficult for the young and the elderly to participate in food procurement. Children only gradually acquire the skills necessary to successfully find food and generally do not make significant contributions to the group until their teenage years. Likewise, elders who can no longer produce enough food themselves expect to be cared for by others.⁷

One important hallmark of foraging societies is their egalitarian social structure. Stark differences in wealth, which characterize many societies, are rare in foraging communities. One reason for this is that foragers have a different perspective on private property. Foraging societies tend to move their camps frequently to exploit various resources, so holding on to a lot of personal possessions or “wealth” is impractical. Foragers also place a high cultural value on generosity. Sharing of food and other resources is a social norm and a measure of a person’s goodness. Those who resist sharing what they have with others might be ridiculed, or could even become social outcasts.⁸ Over the long term, daily habits of giving and receiving reinforce social equality. This practice is also an important survival strategy that helps groups get through times of food scarcity.

Though foragers have high levels of social equality, not everyone is treated exactly the same. Gender inequality exists in many communities and develops from the fact that work among foragers is often divided along gender lines. Some jobs, such as hunting large animals, belong to men whose success in hunting gives them high levels of respect and prestige. While women do hunt in many communities and often contribute the majority of the group’s food through gathering, their work tends not to be as socially prestigious.⁹ Likewise, elders in foraging communities tend to command respect and enjoy a higher social status, particularly if they have skills in healing or ritual activities.

Rule-Breaking Foragers

Nomadic lifestyles are the norm for most foragers, but there have been some societies that have broken this rule and developed large-scale sedentary societies. This was possible in areas with abundant natural resources, most often fish. Historically, fishing formed the foundation of large-scale foraging societies in Peru, the Pacific Northwest (the Kwakwaka’wakw), and Florida (the Calusa). These societies all developed advanced fishing technologies that provided enough food surplus that some people could stop participating in food procurement activities.

The Kwakwaka’wakw of the Pacific Northwest provide an excellent example. In that region, the salmon that spawn in the rivers are so abundant that they could support sedentary populations of a size that would normally be associated with intensive agriculture. Because there was a surplus of food, some members of society were able to pursue other full-time occupations or specializations such as working as artisans or even becoming “chiefs.” This led to wealth differences and social inequality that would not normally be found in a foraging community. Conscious of the corrosive effect of wealth and status differences on their community, the Kwakwaka’wakw developed a tradition of [potlatch](#), a kind of “extreme gift-giving” to neutralize some of these tensions.

Assessing the Foraging Lifestyle

In 1651, the English philosopher Thomas Hobbes became one of the first scholars to comment on foragers, describing their lifestyle as “nasty, brutish, and short.” We now realize that his viewpoint was colored by ethnocentrism and, more specifically, Eurocentrism. Hobbes, as well as many scholars that came after him, viewed Western societies as the pinnacle of social evolution and viewed less technologically advanced societies as deficient, antiquated, or primitive, a perspective that persisted well into the twentieth century.

In the 1960s, the anthropological perspective on foragers changed when Marshall Sahlins suggested that these communities were “the original affluent society.” He argued that foragers had an idyllic life, in which only a small percentage of the day was spent “working,” or acquiring resources, and most of the day was spent in leisure and socializing, leading to stronger community and family bonds:

Hunter-gatherers consume less energy per capita per year than any other group of human beings. Yet when you come to examine it the original affluent society was none other than the hunter’s—in which all the people’s material wants were easily satisfied. To accept that hunters are affluent is therefore to recognize that the present human condition of man slaving to bridge the gap between his unlimited wants and his insufficient means is a tragedy of modern times.¹⁰

Today anthropologists recognize that foraging, far from being primitive, is one of the most effective and dynamic subsistence systems humans have ever developed, yet Sahlins’ conception of the original affluent society is overly romantic. Foraging is a challenging lifestyle; some groups spend up to 70 hours per week collecting food. The amount of leisure time and relative comfort of the foraging lifestyle vary significantly based on differences in the availability of food and environmental conditions.¹¹

Contemporary studies of foraging also recognize that foragers have rarely lived in isolation. Throughout the world, foragers have lived near farming populations for hundreds or even thousands of years. Conflicts and competition for resources with non-foraging societies have characterized the foraging experience and foragers, with their relatively small population size and limited technology, have often been on the losing end of these confrontations. Government policies containing foragers to small “reservation” areas or forcing them to settle in towns have had catastrophic effects on foragers, as has the destruction through agricultural and industrial development of the ecosystems on which many groups once depended. A sad worldwide pattern of exploitation and marginalization is the reason that many foragers today live in dwindling communities in marginal ecological zones.¹²

The Built Environment and Domesticated Landscapes

None of us live in a natural environment. Current research on the causes of global climate change have demonstrated that humans are having a profound effect on the Earth and its ecosystems, but it would be a mistake to conclude that human effects on the environment are a recent development. Humans have been making environmental alterations for a long time and we have been engaged in a process of domesticating the planet for several thousand years. For this reason, no part of the

planet can really be considered 100 percent “natural.” When anthropologists study subsistence, they gain a window into the ways in which cultures have co-evolved with their environments, a field of study known as **historical ecology**. Analysis of the ways in which cultures and the environment are mutually interconnected, demonstrates that there is no way to separate the “natural” world from the human-influenced world, or what anthropologists refer to as the **built environment**.

This can be seen by considering the historical ecology of the Nukak, a group of foragers who live in the Amazon rainforest near the headwaters of the Rio Negro along the southern border between Colombia and Venezuela and whose subsistence demonstrates the blurry line between foraging and agriculture and “natural” and “domesticated.” [The Nukak](#) are a small linguistic and ethnic group who are part of the larger culture known as Makú. The Nukak were the last among the Makú to be contacted by the outside world and perhaps owing to this fact, they practice the most “traditional” way of life. The Nukak were not known to the public at large until 1988, when a group of 41 individuals came in contact with a school in the rural town of Calamar, in southeastern Colombia.

The Nukak are a highly mobile group of foragers who make an average of between 70 and 80 residential moves a year. The frequency of their moves changes seasonally: infrequent short-distance moves in the wet season, and more frequent long-distance moves occurring in the dry season. Anthropologist Gustavo Politis, who spent years living with the Nukak, observed that the Nukak will never occupy the same camp twice, even if they are moving to an area where an old camp is still in good shape. When they establish a camp, they remove all the light brush and some of the medium-sized trees, leaving a few medium-sized trees and all the large trees intact.

Due to the selective nature of the forest clearing, a habitat, which can most readily be described as a “wild orchard,” is produced. This wild orchard offers nearly perfect conditions for the germination and growth of seeds because the large trees provide enough shade to prevent the invasion of vines and shrubs. As the Nukak use the camp and consume fruit they have gathered, they discard the uneaten portions, including the seeds. Significantly, the kinds of fruit the Nukak tend to eat in their camps are the ones that have hard outer seed cases. Once discarded in a Nukak campsite, these seeds have a higher chance of germinating and growing in the abandoned camp than they do in other parts of the rainforest. The result is that Nukak territory is peppered with wild orchards that have high concentrations of edible plants, and the forest reflects a pattern of human intervention long after the Nukak have departed.¹³

The Nukak are an important case study in the Amazon for a number of reasons. They are a testament to the ability of small foraging groups to domesticate landscapes in active ways that greatly increase the productivity of the environment. They do this even though they are not “farmers” and will not always utilize the resources they help create. In addition, the Nukak demonstrate that no place in the Amazon can be considered *pristine* if a group such as the Nukak have ever lived there. The same can be said for the rest of the planet.

The Domestication of the Dog and Cooperative Hunting

Although the transition from foraging to agriculture is often described as the Agricultural Revolution, archaeological evidence suggests this change took a long time. The earliest species humans chose to domesticate were often not staple crops such as wheat, corn, rice, or cows, but utilitarian species. For instance, bottle gourds were domesticated for use as water containers before the invention of pottery. Dogs were domesticated as early as 15,000 years ago in eastern Asia from their wild ancestor the wolf. Although it is unlikely that dogs were an important source of food, they did play a role in subsistence by aiding

humans who relied on hunting the Ice Age megafauna such as woolly mammoths. Dogs played such a critical role in hunting that some archaeologists believe they may have contributed to the eventual extinction of the woolly mammoths.¹⁴ Dogs were also valued for their role as watchdogs capable of protecting the community from predators and invaders.



Figure 3: The woolly mammoth was hunted to extinction in North America at the end of the last ice age. It is possible that dogs played a role in hunting these and other large game animals.

Pastoralism

“To us, a co-wife is something very good, because there is much work to do. When it rains . . . the village gets mucky. And it’s you who clears it out. It’s you who . . . looks after the cows. You do the milking . . . and your husband may have very many cows. That’s a lot of work. . . . So Maasai aren’t jealous because of all this work.”

—Maiyani, Maasai woman¹⁵

Pastoralism is a subsistence system that relies on herds of domesticated livestock. Over half of the world’s pastoralists reside in Africa, but there are also large pastoralist populations in Central Asia, Tibet, and arctic Scandinavia and Siberia. The need to supply grazing fields and water for the livestock requires moving several times a year. For that reason, this subsistence system is sometimes referred to as nomadic pastoralism. In Africa, for instance, a nomadic lifestyle is an adaptation to the frequent periods of drought that characterize the region and put stress on the grazing pastures. Pastoralists may also follow a nomadic lifestyle for other reasons such as avoiding competition and conflict with neighbors or avoiding government restrictions.

Pastoralists can raise a range of different animals, although most often they raise herd animals such as cows, goats, sheep, and pigs. In some parts of South America, alpaca and llama have been domesticated for centuries to act as beasts of burden, much like camels, horses, and donkeys are used in Asia and Africa. Pastoralists who raise alpacas, donkeys, or camels, animals not typically considered food, demonstrate an important point about the pastoralist subsistence system. The goal of many

pastoralists is not to produce animals to slaughter for meat, but instead to use other resources such as milk, which can be transformed into butter, yogurt, and cheese, or products like fur or wool, which can be sold. Even animal dung is useful as an alternate source of fuel and can be used as an architectural product to seal the roofs of houses. In some pastoral societies, milk and milk products comprise between 60 and 65 percent of the total caloric intake. However, very few, if any, pastoralist groups survive by eating only animal products. Trade with neighboring farming communities helps pastoralists obtain a more balanced diet and gives them access to grain and other items they do not produce on their own.



Figure 4: A Typical Maasai Herd: Although women do most of the work of tending the herd, only men are allowed to own cattle

A community of animal herders has different labor requirements compared to a foraging community. Caring for large numbers of animals and processing their products requires a tremendous amount of work, chores that are nonexistent in foraging societies. For pastoralists, daily chores related to caring for livestock translate into a social world structured as much around the lives of animals as around the lives of people.

The Maasai, a society of east African pastoralists whose livelihood depends on cows, have been studied extensively by anthropologists. Among the Maasai, domestic life is focused almost entirely around tasks and challenges associated with managing the cattle herds. Like many pastoralist communities, the Maasai measure wealth and social status according to the number of animals a person owns. However, raising cattle requires so much work that no one has the ability to do these jobs entirely on his or her own. For the Maasai, the solution is to work together in family units organized around polygynous marriages. A household with multiple wives and large numbers of children will have more labor power available for raising animals.

Pastoralism and Gender Dynamics

The example of the Maasai demonstrates the extent to which a subsistence system can structure gender roles and the division of labor between the sexes. In Maasai society, women do almost all of the work with the cows, from milking several times each day to clearing the muck the cows produce. Despite doing much of the daily work with cattle, Maasai women are not permitted to own cattle. Instead, the cattle belong to the men, and women are given only “milking rights” that allow them to use the products of the female animals and to assign these animals to their sons. Men make all decisions about slaughtering, selling, and raising the cattle. Lack of cattle ownership means that women do not have the same opportunities as men to build wealth or gain social status and the woman’s role in Maasai society is subordinate to man’s. This same pattern is repeated in many pastoralist societies, with women valued primarily for the daily labor they can provide and for their role as mothers.

While women lack the political and economic power enjoyed by Maasai men, they do exercise some forms of power within their own households and among other women. They support each other in the daily hard work of managing both cattle and domestic responsibilities, for instance sharing in childcare, a practice based on the belief that “men care about cattle while women care about children.”¹⁶ Because most marriages are arranged by elders, it is common for women to engage in love affairs with other men, but women keep each other’s secrets; telling anyone about another woman’s adultery would be considered an absolute betrayal of solidarity. Women who resist their husband’s authority by having love affairs are also resisting larger claims of male authority and ownership over them.¹⁷

Pastoralism and Private Property

As discussed previously, foragers tend to have little private property. Obtaining food from the natural environment and living a highly mobile lifestyle does not provide the right conditions for hoarding wealth, while the strong value on sharing present in foraging communities also limits wealth differences. Pastoralists, in contrast, have a great deal of personal property: most of it in the form of animals, a kind of “money on legs,” but also in the form of household objects and personal items like clothing or jewelry that pastoralists can keep more easily than foragers because they do not move as frequently.

Ownership of the grazing land, water supply, and other resources required for livestock is a trickier matter. Generally, these natural resources are treated as communal property shared by everyone in the society. Pastoralists may range over hundreds of miles throughout the year, so it would be highly impractical to “own” any particular plot of land or to try fencing it to exclude outsiders as is commonly done by agriculturalists. Sharing resources can lead to conflict, however, both within pastoralist societies and between pastoralists and their neighbors. In an influential essay, *Tragedy of the Commons* (1968), Garrett Hardin pointed out that people tend not to respect resources they do not own. For instance, pastoralists who have a personal interest in raising as many cattle of their own as possible may not be particularly motivated to preserve grass or water resources in the long term. Do pastoralists destroy the environments in which they live? Evidence from anthropological studies of pastoralist communities suggests that pastoralists do have rules that regulate use of land and other resources and that these restrictions are effective in conserving environmental resources.

The Maasai, for instance, have a complex land-management system that involves rotating pastures seasonally and geographically to preserve both grass and water. Research conducted in Kenya and

Tanzania suggests that these grazing practices improve the health and biodiversity of the ecosystem because grazing cattle cut down the tall grasses and make habitats for warthogs, Thomson's gazelle, and other species. In addition, the large swaths of community land managed by the Maasai stabilize and support the vast Serengeti ecosystem. Ecologists estimate that if this land were privately owned and its usage restricted, the population of wildebeest would be reduced by one-third. Since thousands of tourists visit the Serengeti each year to view wildlife, particularly the migration of the wildebeest, which is the largest mammal migration in the world, the Maasai's communal land management is worth an estimated \$83.5 million to the tourist economies of Kenya and Tanzania.¹⁸

Despite the sophistication of their land and animal management techniques, pastoralists today face many pressures. The growth of the tourism industry in many countries has led to increased demand for private land ownership to support safari centers, wild game parks, and ecolodges. The steady growth of human populations and intensive agriculture has also led to the widespread encroachment of cities and farms into traditional pastoralist territories. Persistent drought, famine, and even civil war threaten some pastoralist groups, particularly in central Africa. Meanwhile, pastoralists continue to experience tense relationships with their agricultural neighbors as both groups compete for resources, disputes that are intensifying as global warming leads to more intense heat and drought in many world regions.

Horticulture

"Yams are persons with ears. If we charm they hear."

—Alo, Trobriand Island farmer¹⁹

Have you ever grown a garden in your backyard? How much time did you put into your garden? How much of your diet did the garden yield? People whose gardens supply the majority of their food are known as **horticulturalists**. Horticulture differs in three ways from other kinds of farming. First, horticulturalists move their farm fields periodically to use locations with the best growing conditions. For this reason, horticulture is sometimes known as shifting cultivation. Second, horticultural societies use limited mechanical technologies to farm, relying on physical labor from people and animals, like oxen that may be used to pull a plow, instead of mechanical farm equipment. Finally, horticulture differs from other kinds of farming in its scale and purpose. Most farmers in the United States sell their crops as a source of income, but in horticultural societies crops are consumed by those who grow them or are exchanged with others in the community rather than sold for profit.

Horticultural societies are common around the world; this subsistence system feeds hundreds of thousands of people, primarily in tropical areas of south and central America, Southeast Asia, and Oceania. A vast array of horticultural crops may be grown by horticulturalists, and farmers use their specialized knowledge to select crops that have high yield compared to the amount of labor that must be invested to grow them. A good example is manioc, also known as cassava. Manioc can grow in a variety of tropical environments and has the distinct advantage of being able to remain in the ground for long periods without rotting. Compared to corn or wheat, which must be harvested within a particular window of time to avoid spoiling, manioc is flexible and easier to grow as well as to store or distribute to others. Bananas, plantains, rice, and yams are additional examples of popular horticultural crops. One thing all these plants have in common, though, is that they lack protein and other important nutrients. Horticultural societies must supplement their diets by raising animals such as pigs and chickens or by hunting and fishing.



Figure 5: Bean plants grow up the stalk of a corn plant, while squash vines grow along the ground between corn stalks, inhibiting weed growth, an innovative technique developed by indigenous farmers in the Americas thousands of years ago.

Growing crops in the same location for several seasons leads to depletion of the nutrients in the soil as well as a concentration of insects and other pests and plant diseases. In agricultural systems like the one used in the United States, these problems are addressed through the use of fertilizers, pesticides, irrigation, and other technologies that can increase crop yields even in bad conditions. Horticulturalists respond to these problems by moving their farm fields to new locations. Often this means clearing a section of the forest to make room for a new garden, a task many horticulturalists accomplish by cutting down trees and setting controlled fires to burn away the undergrowth. This approach, sometimes referred to as “slash-and-burn,” sounds destructive and has often been criticized, but the ecological impact is complex. Once abandoned, farm fields immediately begin to return to a forested state; over time, the quality of the soil is renewed. Farmers often return after several years to reuse a former field, and this recycling of farmland reduces the amount of forest that is disturbed. While they may relocate their farm fields with regularity, horticulturalists tend not to move their residences, so they rotate through

gardens located within walking distance of their homes.

Horticulturalists practice multi-cropping, growing a variety of different plants in gardens that are biodiverse. Growing several different crops reduces the risk of relying on one kind of food and allows for intercropping, mixing plants in ways that are advantageous. A well-known and ingenious example of intercropping is the practice of growing beans, corns, and squash together. Native American farmers in the pre-colonial period knew that together these plants, sometimes called “the three sisters,” were healthier than they were if grown separately. Rather than completely clearing farmland, horticulturalists often maintain some trees and even weeds around the garden as a habitat for predators that prey on garden pests. These practices, in addition to skillful rotation of the farmland itself, make horticultural gardens particularly resilient.

Food as Politics

Because daily life for horticulturalists revolves around care for crops, plants are not simply regarded as food but also become the basis for social relationships. In the Trobriand Islands, which are located in the Solomon Sea north of Papua New Guinea, yams are the staple crop. Just as a Maasai pastoralist gains respect by raising a large herd of animals, Trobriand Island farmers earn their reputations by having large numbers of yams. However, this is not as easy as it might seem. In Trobriand Island society every man maintains a yam garden, but he is not permitted to keep his entire crop. Women

“own” the yams and men must share what they grow with their daughters, their sisters, and even with their wives’ family members. Other yams must be given to the chief or saved to exchange on special occasions such as weddings, funerals, or festivals. With so many obligations, it is not surprising that the average man would have trouble building an impressive yam pile on his own. Fortunately, just as men have obligations to others, so too can they expect gifts from their sisters’ husbands and their friends in the community.

A large pile of yams, displayed proudly in a man’s specially constructed yam house, is an indication of how well he is respected by his family and friends. Maintaining these positive relationships requires constant work, and men must reciprocate gifts of yams received from others or risk losing those relationships. Men who are stingy or mean spirited will not receive many yams, and their lack of social approval will be obvious to everyone who glances at their empty yam houses. The chief has the largest yam house of all, but also the most obligations. To maintain the goodwill of the people, he is expected to sponsor feasts with his yam wealth and to support members of the community who may need yams throughout the year.

So central are yams to Trobriand Island life that yams have traditionally been regarded not as mere plants, but as living beings with minds of their own. Farmers talk to their yams, using a special tone and soft voice so as not to alarm the vegetables. Men who have been initiated into the secret practices of yam magic use incantations or magical charms to affect the growth of the plants, or alternatively to discourage the growth of a rival’s crop. Yams are believed to have the ability to wander away from their fields at night unless magic is used to keep them in place. These practices show the close social and spiritual association between farmers and their crops.

Civilizing Beans

Beans are often associated with gastrointestinal problems, namely flatulence. It turns out that this is related to the history of the domestication of the bean. Beans, along with maize and squash, were one of the most important crops domesticated by Native Americans in the New World. The benefits of eating beans are best understood when viewed in relation to maize cultivation. From a purely nutritional point of view, beans are a good source of protein while corn is not. Corn is also deficient in the essential amino acids lysine and tryptophan. Eating maize and beans together provides more protein for hardworking farmers. In addition, maize and beans have a mutually beneficial relationship in the garden. Thanks to a symbiotic relationship with a bacteria known as *Rhizobium*, beans and almost all legumes fix usable nitrogen in the soil, increasing fertility for other plants grown nearby. When intercropped, maize benefits from this nitrogen fixing, and beans benefit from being able to attach their vines to the strong stalks of the maize. Squash, which grows large leaves that spread widely across the ground, are also beneficial to intercrop with maize and beans because the leaves reduce pest and weed invasion by providing ground cover.

Despite being nutritious and useful in the garden, beans were domesticated relatively late. In Mexico, there is evidence of bean domestication around 1000 BC, a thousand years later than the domestication of corn.²⁰ This is probably because of the gastrointestinal problems that come with eating beans. The flatulence is the result of certain chemicals found in the wild beans that were ancestral to today’s domesticated species. The lack of digestibility surely made beans an unappetizing food in early human communities. However, soaking beans before cooking them and then boiling them over direct heat for several hours reduces these chemicals and makes beans much easier to stomach. The ability to boil water was the key to bringing beans to the table.

Archaeological studies in Central America have revealed that the invention of pottery was the technological breakthrough needed to boil beans. A particular type of pottery known as the “culinary shoe pot” was one of these technological innovations. The pots are used by placing the “foot” of the pot in the coals of a fire so heat can be transmitted through the vessel for long periods of time. Pots of this design have been found in the archaeological record throughout Central America in sites dating to the same period as the beginning of bean domestication and pots of similar design continue to be used throughout that region today. This example demonstrates the extent to which the expansion of the human diet has been linked to innovations in other areas of culture.



Figure 6: A Culinary Shoe Pot from Oaxaca, Mexico. Courtesy of the Burke Museum of Natural History and Culture, Catalog Number 2009–117/536



Figure 7: Clay Cooking Pots in the Republic of Suriname. Courtesy of [Karina Noriega](#). All rights reserved

Agriculture

“The adoption of agriculture, supposedly our most decisive step toward a better life, was in many ways a catastrophe from which we have never recovered.”

—Jared Diamond ²¹

Agriculture is defined as the cultivation of domesticated plants and animals using technologies such as irrigation, draft animals, mechanization, and inputs such as fertilizers and pesticides that

allow for intensive and continuous use of land resources. About 10,000 years ago, human societies entered a period of rapid innovation in subsistence technologies that paved the way for the emergence of agriculture. The transition from foraging to farming has been described as the **Neolithic Revolution**. Neolithic means “new stone age,” a name referring to the very different looking stone tools produced during this time period. The Neolithic was characterized by an explosion of new technologies, not all of them made from stone, which were geared toward agricultural tasks, rather than hunting or processing gathered plant foods. These new tools included scythes for harvesting plants, and adzes or hoes for tilling the soil. These technological developments began to dramatically improve yields and allow human communities to support larger and larger numbers of people on food produced in less space. It is important to remember that the invention of agriculture was not necessarily an advance in efficiency, because more work had to go in to producing more food. Instead, it was an *intensification* of horticultural strategies. As a subsistence system, agriculture is quite different from other ways of making a living, and the invention of agriculture had far-ranging effects on the development of human communities. In analyzing agriculture and its impacts, anthropologists focus on four important characteristics shared by agricultural communities.

The first characteristic of agriculture is reliance on a few **staple crops**, foods that form the backbone of the subsistence system. An example of a staple crop would be rice in China, or potatoes in Ireland. In agricultural societies, farmers generally grow a surplus of these staple crops, more than they need for their own tables, which are then sold for profit. The reliance on a single plant species, or **mono-cropping**, can lead to decreased dietary diversity and carries the risk of malnutrition compared to a more diverse diet. Other risks include crop failure associated with bad weather conditions or blight, leading to famine and malnutrition, conditions that are common in agricultural communities.

A second hallmark of agriculture is the link between intensive farming and a rapid increase in human population density. The archaeological record shows that human communities grew quickly around the time agriculture was developing, but this raises an interesting question. Did the availability of more food lead to increases in human population? Or, did pressure to provide for a growing population spur humans to develop better farming techniques? This question has been debated for many years. Ester Boserup, who studied the emergence of agriculture, concluded that growth in human populations preceded the development of agriculture, forcing communities to develop innovations in technology. However, the improved productive capabilities of agriculture came at a cost. People were able to produce more food with agriculture, but only by working harder and investing more in the maintenance of the land. The life of a farmer involved more daily hours of work compared to the lifestyle of a forager, so agricultural communities had an incentive to have larger families so that children could help with farm labor. However, the presence of more children also meant more mouths to feed, increasing the pressure to further expand agricultural production. In this way, agriculture and population growth became a cycle.

A third characteristic of agriculture is the development of a division of labor, a system in which individuals in a society begin to specialize in certain roles or tasks. Building houses, for instance, becomes a full-time job separate from farming. The division of labor was possible because higher yields from agriculture meant that the quest for food no longer required everyone's participation. This feature of agriculture is what has allowed nonagricultural occupations such as scientists, religious specialists, politicians, lawyers, and academics to emerge and flourish.

The emergence of specialized occupations and an agricultural system geared toward producing surplus rather than subsistence changed the economics of human communities. The final charac-

teristic of agriculture is its tendency to create wealth differences. For anthropologists, agriculture is a critical factor explaining the origins of social class and wealth inequality. The more complex an economic system becomes, the more opportunities individuals or factions within the society have to manipulate the economy for their own benefit. Who do you suppose provided the bulk of the labor power needed in early agricultural communities? Elites found ways to pass this burden to others. Agricultural societies were among the first to utilize enslaved and indentured labor.

Although the development of agriculture is generally regarded as a significant technological achievement that made our contemporary way of life possible, agriculture can also be viewed as a more ominous development that forced us to invest more time and labor in our food supply while yielding a lower quality of life.²² Agriculture created conditions that led to the expansion of social inequality, violent conflict between communities, and environmental degradation. For these reasons, some scientists like Jared Diamond have argued that the invention of agriculture was humanity's worst mistake.

The Origins of Agriculture

Some of the most contested and exciting questions in anthropology center on the origins of agriculture. How did humans come to adopt an agricultural way of life? What came first, permanent settlements or agriculture? Did agriculture develop first in places with rich natural resources, or in places where making a living from the land was more difficult? Why did agriculture arise nearly simultaneously in so many world regions? These questions are primarily investigated by archaeologists, anthropologists who study cultures of the past by recovering the material remains of their settlements. Archaeological evidence suggests that the transition to agriculture occurred over a long period of time, across many generations.

Lewis Binford, an archaeologist who studied the origins of agriculture, observed that humans were living in permanent settlements before the end of the last ice age 10,000–12,000 years ago. He believed that as human populations grew, some communities were forced into marginal natural environments where it was difficult to get food from foraging, pastoralism, or horticulture. He argued that the pressure of living in these “tension zones” led to agricultural innovation.²³ Although inventing agriculture might seem like a challenge for humanity, the cultural anthropologist Leslie White pointed out that by this time in human history all communities had substantial practical knowledge of the natural world and the plant and animal species they depended on for survival. “The cultivation of plants required no new facts or knowledge. Agriculture was simply a new kind of relationship between man—or more properly, woman—and plants.”²⁴ By moving plants into new environments and controlling their growth, people were able to ensure a better food supply.

This may explain why domestication arose, but why did it take so long for humans to develop agriculture? Why did many societies all over the world develop agriculture nearly simultaneously? One possible answer is found in the climate change that followed the end of the last ice age. Warming temperatures and shifting environmental zones led to the extinction of the megafauna human hunters had been relying upon such as musk ox, woolly mammoth and woolly rhinoceros, and giant deer. Many animals once preyed on these species, such as the cave lion and spotted hyena, but humans may have adapted culturally by reorienting their diets toward domesticated plant and animal species.

There are some other interesting theories about how and why agriculture developed. Brian Hayden, an archaeologist specializing in political ecology, the use of resources to achieve political goals, has suggested that agriculture arose as some members of society

began to accumulate resources in order to sponsor feasts and give gifts designed to influence others. This “feasting theory” suggests that agriculture was not a response to the necessities of survival, but part of a quest for power among some members of society.²⁵ This model is intriguing because it explains why some of the earliest domesticates such as chili peppers and avocados are not staple foods and are not even particularly nutritious. In fact, many of the earliest plants cultivated were not intended to produce food for meals, but rather to produce ingredients for alcoholic beverages.

For example, the wild ancestor of corn, a plant called teosinte, has an edible “ear” so small that it would have cost more calories to chew than the nutrition it provided. This led some archaeologists to theorize that it was in fact the sweetness in the stalk of the plant that farmers wanted to utilize to ferment a corn-based alcoholic beverage still consumed in many parts of Central America called *chicha*. It might have been that only after years of cultivating the crop for its stalk that farmers found uses for the ear, which later was selectively bred to grow to the sizes we are familiar with today.

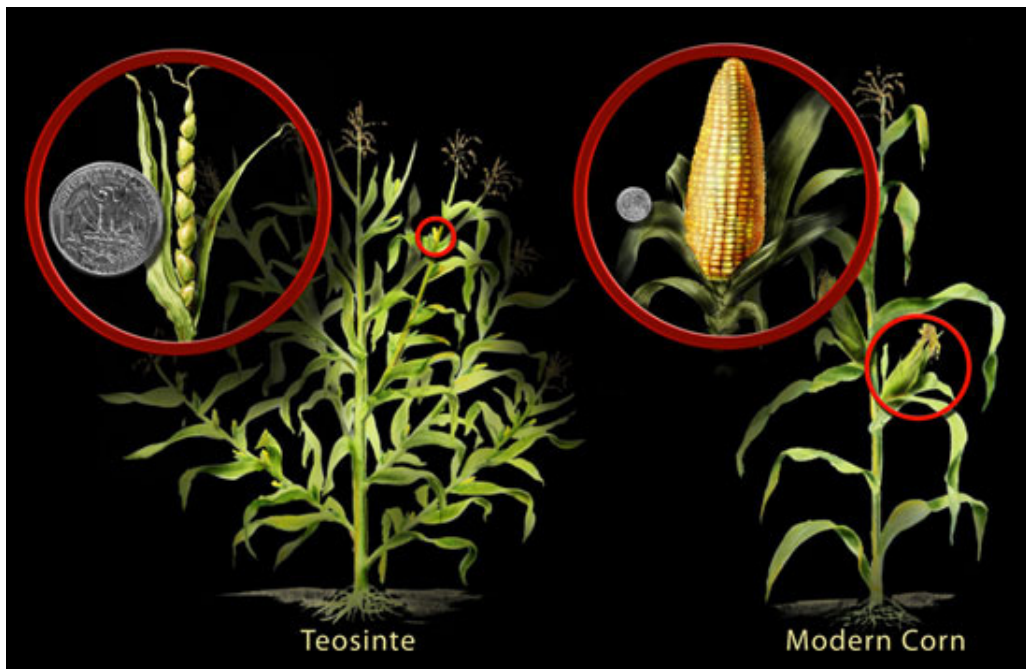


Figure 8: Domestication involves the manipulation of plant and animal species to promote characteristics that are useful to the gardeners, such as the size. The evolution of the modern corn from the ancestral teosinte followed selective breeding practices of farmers in the Americas.

THE GLOBAL AGRICULTURE SYSTEM

“We can indeed eliminate the scourge of hunger in our lifetime. We must be the Zero Hunger generation.”

—José Graziano da Silva, Director General of the Food and Agricultural Organization of the United Nations²⁶

Despite agriculture's tremendous productivity, food shortages, malnutrition, and famines are common around the world. How can this be? Many people assume that the world's agricultural systems are not capable of producing enough food for everyone, but this is incorrect. Evidence from agricultural research demonstrates that there is enough worldwide agricultural capacity to feed everyone on the planet.²⁷ The problem is that this capacity is unevenly distributed. Some countries produce much more food than they need, and others much less. In addition, distribution systems are inefficient and much food is lost to waste or spoilage. It is also true that in an agricultural economy food costs money, and worldwide many people who are starving or undernourished lack food because they cannot pay for it, not because food itself is unavailable.

Let's return for a moment to the concept of meals and where our food actually comes from. Walking down the aisles of our local grocery store, we are surrounded by products that come from far away: apples from Chile, coffee from Guatemala, beans from India. This is evidence that our economy is organized around what anthropologists refer to as a **world system**, a complex web through which goods circulate around the globe. In the world system, complex chains of distribution separate the producers of goods from the consumers. Agricultural products travel long distances from their points of origin to reach consumers in the grocery store, passing through many hands along the way. The series of steps a food like apples or coffee takes from the field to the store is known as a **commodity chain**.

The commodity chain for agricultural products begins in the farms where plant and animal foods are produced. Farmers generally do not sell their produce directly to consumers, but instead sell to large food processors that refine the food into a more useable form. Coffee beans, for instance, must be roasted before they can be sold. Following processing, food moves to wholesalers who will package it for sale to retail establishments like grocery stores. As foods move through the commodity chain,



Figure 9: Links in the Commodity Chain for Coffee: As the coffee changes hands from the growers, to the exporters, to the importers, and then to the retail distributors, the value of the coffee increases. Consider the differences in wage between these workers.

they become more valuable. Coffee beans harvested fresh from the field are worth \$1.40 per pound to the farmer, but sell for \$10–\$20 at Starbucks.²⁸

The fact that food is more valuable at the end of the commodity chain than at the beginning has several consequences for human communities. The most obvious of these is the reality that farming is not a particularly lucrative occupation, particularly for small-scale farmers in developing countries. Though their labor makes profit for others, these farmers see the lowest financial returns. Another effect of global commodity chains is that food moves very far from its point of origin. For wealthy people, this means having access to a variety of foods in the grocery store, including things like strawberries or mangos in the middle of winter, but in order to serve markets in wealthy countries, food is diverted away from the locales where it is grown. When quinoa, a high-protein grain grown in Bolivia, became popular with health enthusiasts in wealthy countries, the price of this food more than tripled. Local populations began to export their quinoa crop rather than eating it, replacing this nutritious traditional food with white bread and Coca-Cola, which were much cheaper, but contributed to increased rates of obesity and diabetes.²⁹ The global travels of the food supply have also affected social relations that were once strengthened by participation in food growing and sharing. Distance and competition have replaced these communal experiences. Many people yearn for more connection with their food, a sentiment that fuels things like “foodie culture,” farm-to-table restaurants, and farmer’s markets.

CONCLUSION

This chapter began with a consideration of meals, but revealed that each individual meal is part of a diet generated through a particular subsistence system. Many of our daily experiences, including our attitudes, skills, and relationships with others, are influenced by our subsistence system. Knowing that the Earth has been transformed for thousands of years by human subsistence activities, we must also consider the ways in which our future will be shaped by the present. Are we managing our resources in a sustainable way? How will we continue to feed growing populations in the future? Think about it next time you sit down to eat a meal.

DISCUSSION QUESTIONS

1. A hallmark of agriculture is the separation of food production from food consumption; many people know almost nothing about where their food has come from. How does this lack of knowledge affect the food choices people make? How useful are efforts to change food labels to notify shoppers about the use of farming techniques such as genetic modification or organic growing for consumers? What other steps could be taken to make people more knowledgeable about the journey that food takes from farm to table?
2. The global commodity chains that bring food from many countries to grocery stores in the United States give wealthy consumers a great variety of food choices, but the farmers at the beginning of the commodity chain earn very little money. What kinds of solutions might help reduce the concentration of wealth at the end of the commodity chain?
3. Mono-cropping is a feature of industrial food production and has the benefit of producing staple foods like wheat and corn in vast quantities, but mono-cropping makes our diet less diverse. Are the effects of agricultural mono-cropping reflected in your own everyday diet? How many different plant foods do you eat on a regular basis? How difficult would it be for you to obtain a more diverse diet by shopping in the same places you shop now?

GLOSSARY

Agriculture: the cultivation of domesticated plants and animals using technologies that allow for intensive use of the land.

Broad spectrum diet: a diet based on a wide range of food resources.

Built environment: spaces that are human-made, including cultivated land as well as buildings.

Carrying capacity: a measurement of the number of calories that can be extracted from a particular unit of land in order to support a human population.

Commodity chain: the series of steps a food takes from location where it is produced to the store where it is sold to consumers.

Delayed return system: techniques for obtaining food that require an investment of work over a period of time before the food becomes available for consumption. Farming is a delayed return system due to the passage of time between planting and harvest. The opposite is an **immediate return system** in which the food acquired can be immediately consumed. Foraging is an immediate return system.

Domestic economy: the work associated with obtaining food for a family or household.

Foodways: the cultural norms and attitudes surrounding food and eating.

Foraging: a subsistence system that relies on wild plant and animal food resources. This system is sometimes called “hunting and gathering.”

Historical ecology: the study of how human cultures have developed over time as a result of interactions with the environment.

Horticulture: a subsistence system based on the small-scale cultivation of crops intended primarily for the direct consumption of the household or immediate community.

Modes of subsistence: the techniques used by the members of a society to obtain food. Anthropologists classify subsistence into four broad categories: foraging, pastoralism, horticulture, and agriculture.

Mono-cropping: the reliance on a single plant species as a food source. Mono-cropping leads to decreased dietary diversity and carries the risk of malnutrition compared to a more diverse diet.

Neolithic Revolution: a period of rapid innovation in subsistence technologies that began 10,000 years ago and led to the emergence of agriculture. Neolithic means “new stone age,” a name referring to the stone tools produced during this time period.

Pastoralism: a subsistence system in which people raise herds of domesticated livestock.

Staple crops: foods that form the backbone of the subsistence system by providing the majority of the calories a society consumes.

Subsistence system: the set of skills, practices, and technologies used by members of a society to acquire and distribute food.

World system: a complex economic system through which goods circulate around the globe. The world system for food is characterized by a separation of the producers of goods from the consumers.

ABOUT THE AUTHOR

Isaac Shearn earned his PhD in 2014 at the University of Florida and is an adjunct professor at the Community College of Baltimore County. His work focuses on the archaeology and ethnohistory of the Caribbean and South America, with a focus on public archaeology, developing inclusive and participatory methods. His ongoing research in Dominica allows him to pursue his second major passion in life besides archaeology: music. He has played drums for a Dominican reggae band since 2010.



BIBLIOGRAPHY

- Binford, Lewis. "Post-Pleistocene adaptations." In *New Perspectives in Archeology*, edited by Sally Binford and Lewis Binford, 313–41. New York: Aldine, 1968.
- Boserup, Ester. *The Conditions of Agricultural Growth: The Economics of Agrarian Change Under Population Pressure*. Rutgers, NJ: Transaction Publishers, 2005.
- Diamond, Jared. "The Worst Mistake in the History of the Human Race," *Discover*, May 1987, <http://discovermagazine.com/1987/may/02-the-worst-mistake-in-the-history-of-the-human-race>
- Fiedel, Stuart J. "Man's Best Friend -- Mammoth's Worst Enemy? A Speculative Essay on the Role of Dogs in Paleoindian Colonization and Megafaunal Extinction." *World Archaeology* 37 (2005): 11–25.
- Food and Agriculture Organization of the United Nations. *The State of Food Insecurity in the World*. Rome: The United Nations, 2015.
- . "World Hunger Falls to Under 800 Million, Eradication Possible." World Food Program, May 27, 2015, <https://www.wfp.org/news/news-release/world-hunger-falls-under-800-million-eradication-next-goal-0>
- Fortune, R. F. *Sorcerers of Dobu: The Social Anthropology of the Dobu Islanders of the Western Pacific*. London: G. Routledge and Sons, 1963 [1932].
- Hardin, Garrett. "Tragedy of the Commons." *Science* 162 no. 3859 (1968): 1243–1248.
- Hawkes, Kristen and James F. O'Connell. "Affluent Hunters? Some Comments in Light of the Alyawara Case." *American Anthropologist* 83(1981): 622–626.
- Hawkes, Kristen, Kim Hill and James F. O'Connell. "Why Hunters Gather: Optimal Foraging and the Aché of Eastern Paraguay." *American Ethnologist* 9 (1982):379–398.
- Hayden, Brian. "The Proof is in the Pudding: Feasting and the Origins of Domestication." *Current Anthropology* 50 (2009):597–601, 708–9.
- Lee, Richard B. *The !Kung San: Men, Women, and Work in a Foraging Society*. Cambridge: Cambridge University Press, 1979.
- . "What Hunters Do for a Living, or, How to Make Out on Scarce Resources." In *Man the Hunter*, edited by Richard Lee and Irven DeVore. Chicago: Aldine, 1968.
- Lee, Richard B. and Irven DeVore, editors. *Man the Hunter*. New York: Aldine, 1968.
- Llewellyn-Davies, Melissa. "Two Contexts of Solidarity." In *Women United, Women Divided: Comparative Studies of Ten Contemporary Cultures*, edited by Patricia Caplan and Janet M. Bujra. Bloomington, IN: Indiana University Press 1979.
- Malthus, Thomas. *An Essay on the Principle of Population*. London: J. Johnson, 1798.
- Nelson, Fred. "Natural Conservationists? Evaluating the Impact of Pastoralist Land Use Practices on Tanzania's Wildlife Economy." *Pastoralism: Research, Policy and Practice* 2012.

- Paoletti, Maurizio G., E. Buscardo, D.J. Vanderjagt, A. Pastuszyn, L. Pizzoferrato, Y.S. Huang, L.T. Chuang, M. Millon, H. Cerda, F. Torres, and R.H. Glew. "Nutrient Content of Earthworms Consumed by Ye'Kuana Amerindians of the Alto Orinoco of Venezuela." *Proceedings of the Royal Society: Biological Sciences* 270 (2003): 249–257.
- Politis, Gustavo. *Nukak: Ethnoarchaeology of an Amazonian People*. Walnut Creek, CA: Left Coast Press, 2007.
- Rosenberg, Harriet G. "Complaint Discourse, Aging, and Caregiving Among the !Kung San of Botswana." In *The Cultural Context of Aging*, edited by Jay Sokolovsky, 19–41. New York: Bergin and Garvey, 1990.
- Sahlins, Marshall. "The Original Affluent Society." In *Stone Age Economics*, edited by Marshall Sahlins, 1–39. London: Tavistock, 1972.
- Wallace, Melanie and Sanford Low. *Maasai Women*, Film, Produced by Michael Ambrosino. Watertown: CT: Documentary Educational Resources, 1980.
- White, Leslie. *The Evolution of Culture: The Development of Civilization to the Fall of Rome*. New York: McGraw Hill, 1959.

NOTES

1. Thomas Malthus, *An Essay on the Principle of Population* (London: J. Johnson, 1798), 4.
2. Ester Boserup, *The Conditions of Agricultural Growth: The Economics of Agrarian Change Under Population Pressure* (Rutgers, NJ: Transaction Publishers, 2005).
3. Richard B. Lee, "What Hunters Do for a Living, or, How to Make Out on Scarce Resources," in *Man the Hunter*, ed. Richard Lee and Irven DeVore (Chicago: Aldine, 1968), 33.
4. Maurizio G.Paoletti, E. Buscardo, DJ Vanderjagt, A Pastuszyn, L Pizzoferrato, YS Huang, et al., "Nutrient Content of Earthworms Consumed by Ye'Kuana Amerindians of the Alto Orinoco of Venezuela," *Proceedings of the Royal Society: Biological Sciences* 270 (2003): 249–257.
5. Kristen Hawkes, Kim Hill and James F. O'Connell, "Why Hunters Gather: Optimal Foraging and the Aché of Eastern Paraguay," *American Ethnologist* 9 (1982):379–398.
6. Richard Lee, *The !Kung San: Men, Women, and Work in a Foraging Society* (Cambridge: Cambridge University Press, 1979).
7. For more information about intergenerational dynamics among foragers see Kathryn Keith "Childhood Learning and the Distribution of Knowledge in Foraging Societies," *Archaeological Papers of the American Anthropological Association* 15 (2005): 27–40 and Harriet G. Rosenberg, "Complaint Discourse, Aging, and Caregiving among the !Kung San of Botswana," in *The Cultural Context of Aging*, ed. Jay Sokolovsky (New York: Bergin and Garvey, 1990)19–41. The quotation is from Rosenberg page 29.
8. For a discussion of generosity and sharing in foraging communities see Lorna Marshall, "Sharing, Talking, and Giving: Relief of Social Tensions among !Kung Bushmen," *Africa: Journal of the International African Institute* 31(1961):231–249 and Lester Hiatt, "Traditional Attitudes to Land Resources," in *Aboriginal Sites, Rites and Resource Development*, ed. R. M. Berndt (Perth: University of Western Australia Press. 1982) 13–26.
9. Richard B. Lee and Irven DeVore, eds. *Man the Hunter* (New York: Aldine, 1968).
10. Marshall Sahlins, "The Original Affluent Society," in *Stone Age Economics*, ed. Marshall Sahlins (London: Tavistock, 1972) 1–39.
11. Kristen Hawkes and James F. O'Connell, "Affluent Hunters? Some Comments in Light of the Alyawara Case," *American Anthropologist* 83(1981): 622–626.
12. See for example Robert J. Gordon, *The Bushman Myth: The Making of a Namibian Underclass* (Boulder, CO: Westview Press, 2000).
13. Gustavo Politis, *Nukak: Ethnoarchaeology of an Amazonian People* (Walnut Creek, CA: Left Coast Press, 2007).
14. Stuart J. Fiedel, "Man's Best Friend -- Mammoth's Worst Enemy? A Speculative Essay on the Role of Dogs in Paleoindian Colonization and Megafaunal Extinction," *World Archaeology* 37 (2005): 11–25.
15. Melanie Wallace and Sanford Low, *Maasai Women*, Film, Produced by Michael Ambrosino (1980, Watertown: CT: Documentary Educational Resources).
16. Melissa Llewellyn-Davies, "Two Contexts of Solidarity," in *Women United, Women Divided: Comparative Studies of Ten Contemporary Cultures*, ed. Patricia Caplan and Janet M. Bujra (Bloomington, IN: Indiana University Press 1979), 208.
17. *Ibid.*, 234.
18. Fred Nelson, "Natural Conservationists? Evaluating the Impact of Pastoralist Land Use Practices on Tanzania's Wildlife Economy," *Pastoralism: Research, Policy and Practice* 2012.
19. R. F. Fortune, *Sorcerers of Dobu: The Social Anthropology of the Dobu Islanders of the Western Pacific* (London: G. Routledge and Sons, 1963 [1932]),107–109.

20. For more information about the archaeological evidence for the timing of bean domestication, see Michael Blake, John E. Clark, Barbara Voorhies, George Michaels, Michael W. Love, Mary E. Pye, Arthur A. Demarest, and Barbara Arroyo, "Radiocarbon Chronology for the Late Archaic and Formative Periods on the Pacific Coast of Southeastern Mesoamerica," *Ancient Mesoamerica* 6 (1995):161–183. Another useful source is Lawrence Kaplan and Thomas F. Lynch, "Phaseolus (Fabaceae) in Archaeology: AMS Radiocarbon Dates and their Significance for Pre-Columbian Agriculture," *Economic Botany* 53 no. 3(1999): 261–272. There is also interesting linguistic evidence that the word for bean entered the Mayan language around 3400 BC. For more information, see Cecil H Brown, "Prehistoric Chronology of the Common Bean in the New World: The Linguistic Evidence." *American Anthropologist* 108 no.3 (2006): 507–516
23. Lewis Binford, "Post-Pleistocene Adaptations," in *New Perspectives in Archeology*, ed. Sally and Lewis Binford, 313–41 (New York: Aldine, 1968).
24. Leslie White, *The Evolution of Culture: The Development of Civilization to the Fall of Rome* (New York: McGraw Hill, 1959), 284.
25. Brian Hayden, "The Proof is in the Pudding: Feasting and the Origins of Domestication," *Current Anthropology* 50 (2009):597–601, 708–9.
21. Jared Diamond, "The Worst Mistake in the History of the Human Race," *Discover*, May 1987, <http://discovermagazine.com/1987/may/02-the-worst-mistake-in-the-history-of-the-human-race>
22. See for example Marshall Sahlins' argument in *Stone Age Economics* (Chicago: Aldine Atherton, 1972).
26. Food and Agriculture Organization of the United Nations, "World Hunger Falls to Under 800 Million, Eradication Possible," May 27, 2015, accessed May 10, 2015, <https://www.wfp.org/news/news-release/world-hunger-falls-under-800-million-eradication-next-goal-0>
27. Food and Agriculture Organization of the United Nations, *The State of Food Insecurity in the World* (Rome: FAO, 2015)
28. Information about the current prices paid to coffee farmers is available from the International Coffee Organization: http://www.ico.org/coffee_prices.asp
29. This phenomenon has been observed in many countries. For an ethnographic analysis of the health effects of the decline of traditional foods in Guatemala, see Emily Yates-Doerr, *The Weight of Obesity: Hunger and Global Health in Postwar Guatemala* (Berkeley: University of California Press, 2015).