CHAPTER 2

# Out of the Mud: Farming and Herding after the Ice Age

▲ **Preparing a feast.** Traditionally, the usual staple crop of the Amazonian Yanomami of northern Brazil and southern Venezuela is a variety of banana, but they also cultivate manioc, which now occupies up to 50 per cent of their fields. Bitter manioc is poisonous—which is an advantage against predators—and must be peeled, grated, and pulped to remove the toxic acid before being converted into soup or bread for human consumption.

## In This Chapter




It was a really big party. But no one now knows what the celebration was for. Early in the third millennium B.C.E., on a hilltop at Hambledon in southwest England, in the midst of a complex of ceremonial enclosures and defensive earthworks, people gathered for purposes we can no longer identify, but one thing is obvious from the archaeological record. They were there to eat and drink. They brought a mixture of food with them. They got some of it, such as venison, by hunting. Other items, especially the large quantities of hazlenuts, were the fruit of gathering. But there were also foods the people produced for themselves by herding and farming: cattle, pigs, sheep, and wheat and barley that had already been cleaned of chaff. They intended to eat the food, not store it, because the site is strewn with the fragments of broken plates and cups, but there are few remains of large containers. Some of the animals they reared were enormous, yielding 600 pounds of meat, organ meats, and fat, and on some of the days of feasting at the site, two or three such creatures were butchered at one time. So these were gatherings of hundreds or thousands of people, who knew how to breed livestock for size. The people who lived in the area at the time exhibited strikingly varied food habits, which implies that there were different ranks or orders of society, marked by differences of diet. Most people lived mainly on meat and milk, but some ate only vegetable foods. They probably washed their feast down with wine, because archaeologists have found the remains of grapes and grape vines at the site.

The feasting at Hambledon Hill perhaps sprang from a hunter–gatherer way of life, which people in the region had not yet altogether abandoned in favor of farming. Once hunters kill a large animal, such as a deer or even a wild ox, they have to eat the meat quickly in communal meals before it rots. Yet the eaters who gathered at Hambledon were engaged in a huge transformation of their way of life—from foraging for food to growing and breeding it—that had already been going on for centuries in their part of the world and, in some places, for thousands of years. The transition has been gathering pace ever since and now includes most of the Earth's inhabitants.

To most people, in most societies, for most of the time, food is and always has been the most important thing in the world. Nothing can happen without it. Changes in how we get food and whether we get it are among history's biggest changes. During the global warming that followed the Ice Age, **husbandry**—breeding animals and cultivating crops—began to replace hunting and gathering and introduced the biggest

## FOCUS questions

**Why are** settled foragers often better off than farmers?

**What kinds** of environments are suited to herding?

**What kinds** of environments were suited to early agriculture?

**Where did** farming start, and what were the first crops farmers raised?

**Given the** disadvantages of agriculture, why did people in most areas of the world switch from foraging to farming?

change of all. The menu at the Hambledon feast—the mix of wild and cultivated plants, and hunted and domesticated meat—raises one of the most perplexing sets of problems in history: when, where, how, and why did people abandon the life of foragers and take up farming? Why did food procurers become food producers?

## THE PROBLEM OF AGRICULTURE

Husbandry happened in two distinct ways, involving different types of environments and different levels of environmental intervention. In some environments, people could exploit creatures that had a herd instinct by managing the herds, rather than by hunting them. Breeding enhanced qualities that evolution did not necessarily favor, such as docility; size; and yield of meat, milk, eggs, and fat. On the negative side, close contact between humans and animals often allowed disease-bearing organisms to thrive, threatening human lives and health and sometimes unleashing plagues. Otherwise, however, animal husbandry barely affected the environment. Herds, on the whole, kept to their traditional patterns of migration, and people continued to accompany them—driving the beasts rather than following them. Domesticated animals remained recognizably the heirs of their wild ancestors, and the landscapes through which they traveled did not change much, except that the herds' feeding and manure probably encouraged the grasses they ate to flourish at the expense of other plant species.

In other environments, however, plant husbandry involved massive human intervention. In the long run, tillage of the soil changed the world more than any previous innovation by *Homo sapiens*. From postglacial mud, people coaxed what we now call "civilization"—a way of life based on radically modifying the environment. Instead of merely trying to manage the landscape nature provided, farmers recarved it with fields and boundaries, ditches and irrigation canals. They stamped the land with a new look, a geometrical order. Agriculture enabled humans to see the world in a new way—to imagine that magic and science had the power to change nature. Such power, in turn, changed people's sense of where they fit into the panorama of life on Earth. Now they could become masters or, in more modest moments or cultures, stewards of creation.

Together, farming and herding revolutionized humans' place in their ecosystems. Instead of merely depending on other life forms to sustain us, we forged a new relationship of interdependence with those species we eat. We rely on them for food; they rely on us for their reproduction. Domesticated animals would not exist without humans. Husbandry was the first human challenge to evolution. Instead of evolving species through **natural selection**, farming and herding proceed by what might be called unnatural selection—sorting and selecting by human hands, for human needs, according to human agendas. In other words, we breed livestock and cultivate plants.

Herding and tilling also changed human societies. By feeding people on a vastly greater scale, agriculture allowed societies to get hugely bigger than ever before. We can only guess at the absolute figures, but in areas where farming has replaced foraging in modern times, population has increased fifty- or even a hundredfold. Larger populations demanded new forms of control of labor and food distribution, which, in turn, nurtured strong states and powerful elites. Society became more volatile and apparently less stable.

**The rice fields of Bali** in Indonesia are among the most productive in the world, using varieties of rice and techniques for farming it that are about 1,000 years old. Irrigation channels, maintained and administered by farmers' cooperatives, distribute water evenly among the terraces. Though originally a lowland crop, favoring swampy conditions, rice adapts perfectly to upland environments and to terrace farming.

In almost every case, for reasons we still do not understand, when people begin to practice agriculture, the pace of change quickens immeasurably and cumulatively. States and civilizations do not seem to last long. Societies that we think of as being the most highly evolved turn out to be least fitted for survival. Compared with the relative stability of forager communities, societies that depend on agriculture are prone to lurch and collapse. History becomes a path picked among their ruins.

In other words, farming is a disastrous and even a self-destructive option for many of the societies that adopt it: as we shall see in this chapter, it commonly brings devastating new diseases, oppressive political systems, and recurrent famines to many of the societies that choose it as their means of life. It is worth pausing to think about the implications. It shows that cultures do not necessarily change like living organisms, according to the rules of evolution. Typically, living creatures evolve because successful adaptations, which help the species survive, become generalized. Cultures, however, often respond to changes in their environments by adopting dysfunctional new features.

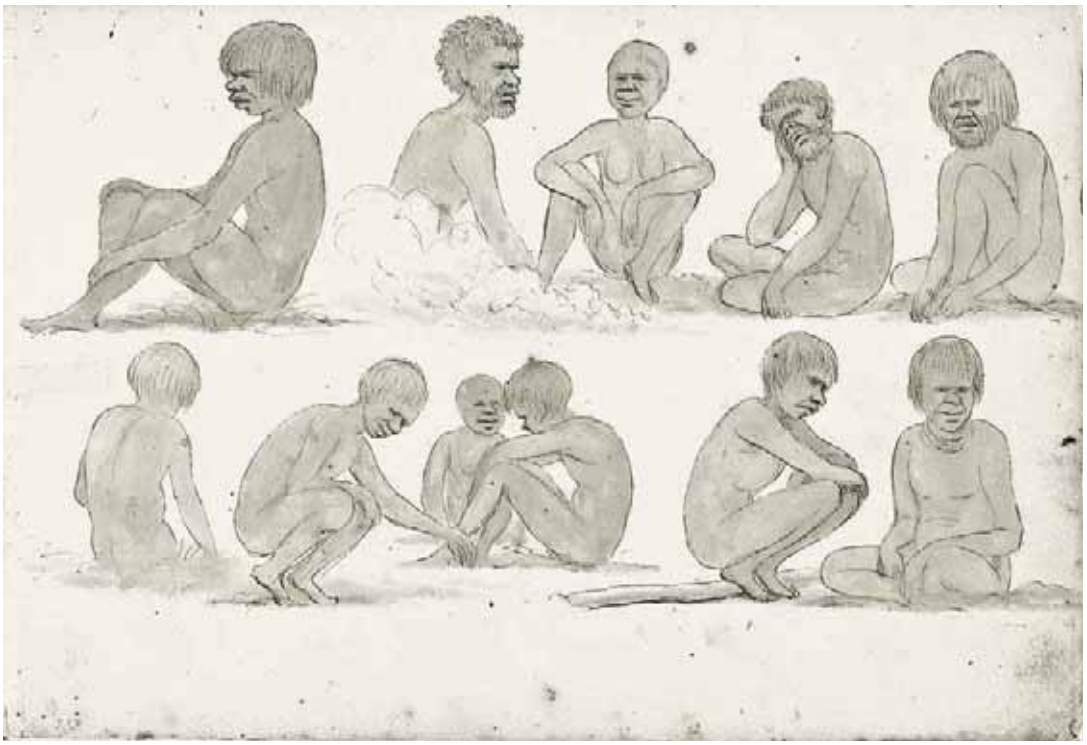
Farming is a perfect example. But until recently, historians rarely stopped to think about the high costs people incurred when they took it up. After all, agriculture has obvious advantages. Farmers can select the best specimens of edible crops and creatures, collect them in the most convenient places, crossbreed the livestock, and hybridize the plants to improve size, yield, or flavor. By these methods, small farming societies grow into bigger communities and build up large populations. Usually they go on to create cities and develop ever more complex technologies. For people who like living amid this kind of complexity, or who believe that history has a single "course" and that the same kind of changes are bound to happen everywhere, peoples who clung to foraging seem baffling.

## A Case in Point: Aboriginal Australians

In August 1770, the British navigator Captain James Cook reached the north coast of Australia, on the first of his spectacular voyages of exploration that charted the lands and limits of the Pacific Ocean. Near Cape York, he paused at an island he named Possession Island. For although his stated purpose was scientific, he was also an officer of the Royal Navy with orders to extend the British Empire. To Cook's mind, the island, though inhabited, was waiting to be grabbed. The natives could not be said to possess it because they had left no marks of possession on its soil. A wealth of plants that they could have domesticated—"fruits proper for the support of man"—was growing wild. Yet, Cook wrote, the people "know nothing of cultivation. . . . It seems strange."

Cook and others at the time saw only two explanations for why foragers, such as the **aborigines** in Australia, would reject agriculture: They were either stupid or subhuman. Early European painters in Australia depicted aborigines as apelike creatures, grimacing oddly and crawling in trees. The colonists ignored the natives, or, when they got in the way, hunted them down—as they would beasts. Not only did the native Australians reject agriculture, in some areas, they appeared to shun every technical convenience. On the island of Tasmania, in the extreme south of Australia, where the natives became extinct soon after European settlement began, they seemed to have forgotten every art of their ancestors: bows, boats, even how to kindle fire. In Arnhem Land, in the extreme north, they used boomerangs to make music but no longer as weapons for the hunt. Progress, which the European discoverers of Australia believed in fervently, seemed to have gone into reverse. Australia was not only on the exact opposite side of the world from England, it was a topsy-turvy place where everything was upside down.


MAP 2.1
**Australia**



**Aborigines.** "One seldom sees such gaiety in a ballroom as among these untaught savages." John Glover devoted many years to making drawings and paintings of the aboriginal Palawa people of Tasmania from 1820, when he first arrived in the island. In finished paintings—for which these drawings are sketches—he usually showed them dancing, resting, swimming, or climbing trees, always innocent, peaceful, and alien. By the time he died in 1849, the settlers' campaign of extermination and deportation had left only about 40 Palawa alive in Tasmania.

We can be certain, however, that if aborigines rejected agriculture or other practices Europeans considered progressive, it must have been for good reasons. The aborigines did not lack the knowledge necessary to switch from foraging to farming if they had wanted to do so. When they gathered wild yams or the root known as nardoo, they ensured that enough of the plant remained in the ground so that it would grow back. In many regions, too, they used fire to control the grazing grounds of kangaroos and concentrate them for hunting. Fire was a common recourse among herders to manage pasture and among tillers to renew the soil. Along the Murray and Darling rivers, aborigines even watered and weeded wild crops and policed their boundaries against human and animal predators (see Map 2.1).

The aboriginal Australians could also have systematically planted and irrigated crops, farmed the grubs they liked to eat, penned kangaroos, and even tried to domesticate them. (Kangaroos are cantankerous creatures, but people do make pets of them. Breeding selected specimens would probably produce a domestic strain in a few generations.) In the far north of Australia, aboriginal communities traded with the farming cultures of New Guinea. So, even if they hadn't developed agriculture on their own, they could have learned it from outsiders. If the aborigines did not farm, it must have been because they did not want to. In short, they were doing well without it. Similar cases all over the world support this conclusion. Where wild foods are abundant, there is no incentive to domesticate them. Of course, people often adopt practices that do them no good. We can concede this general principle, but, case by case, we still want to know why.

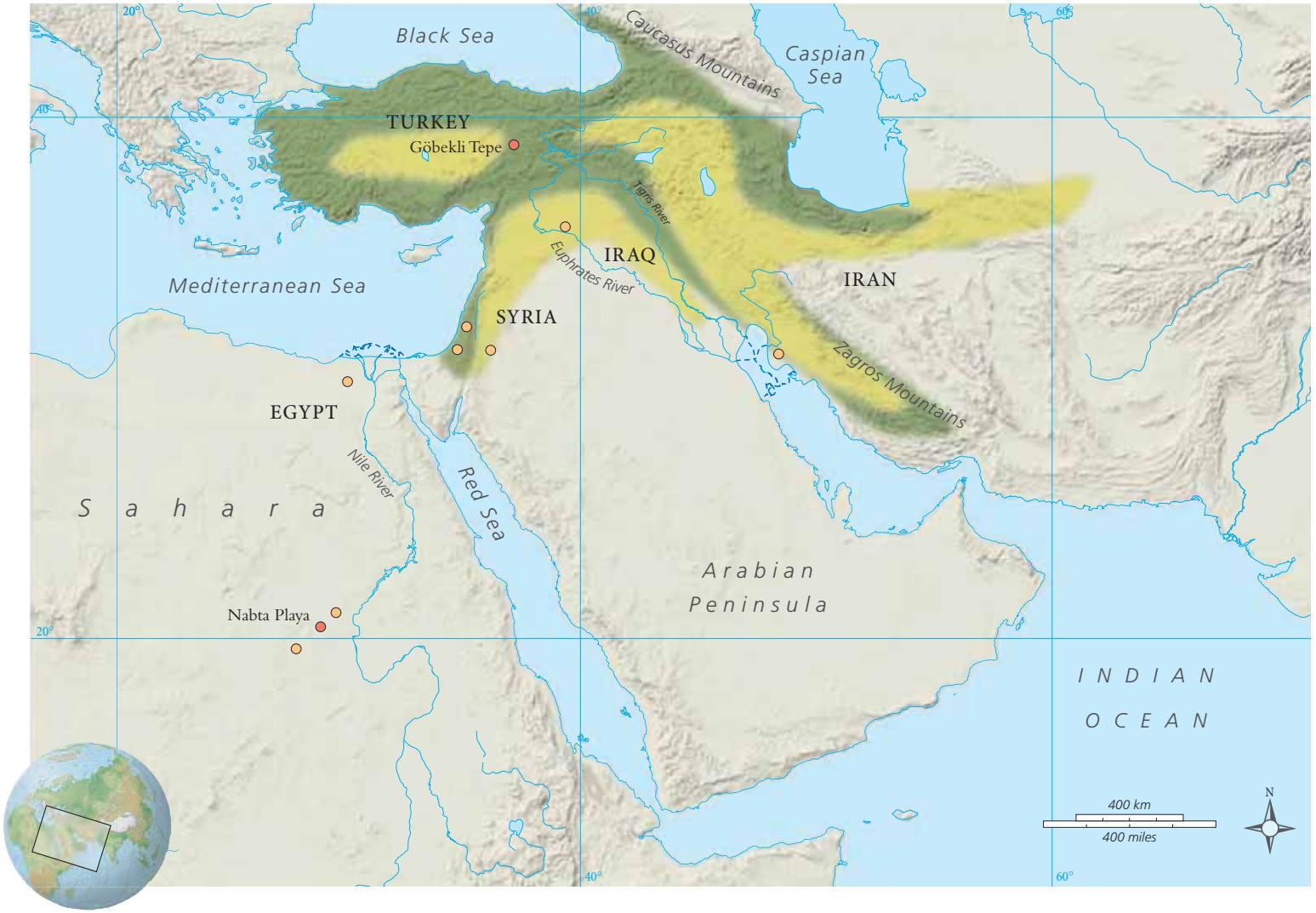
## Preagricultural Settlements

Under some conditions, people can settle in one place without the trouble of farming. Archaeological evidence in the region we now call the Middle East shows this. After the Ice Age ended about 15,000 B.C.E., a frontier zone between forest and grassland stretched across the eastern shore of the Mediterranean and what are now Iran, eastern Turkey, and Iraq (see Map 2.2). The forests were full of acorns, pistachios, and almonds, which gatherers ground into flour and paste. The grasslands bred vast quantities of wild grass with edible seeds. These foods could all be warehoused between harvests and had the additional advantage of ripening at different times. Dense herds of gazelle in the grasslands provided more nutrition for hunters to bring home. Food was so plentiful that foragers did not have to move around much to find it.

By about 14,000 to 15,000 years ago, permanent settlements arose throughout the region: clusters of dwellings with stone walls, or those made of wood on stone foundations, or cut from soft stone and roofed with reeds. The foragers who lived in these sedentary communities apparently kept to themselves.

**MAP 2.2**

### Preagricultural Settlements in the Middle East



**Jomon pottery.** Ten thousand years ago, the Jomon potters of Japan produced the world's earliest known earthenware vessels. Other pottery-making peoples also practiced farming, but the Jomon people were sedentary foragers—living in permanent or long-term settlements, but managing the environment in minimal ways and relying on abundant wild foods, including nuts, seeds, acorns, some 70 marine animal species, and land mammals—eating not just boar, deer, and hare, but also wolves, wildcats, flying squirrels, and monkeys.

**Women and work.** Archaeology can reconstruct how ancient people behaved by measuring the deformities in their skeletons. The woman whose toe this was lived in a community of early sedentary foragers in what is now Syria. She evidently spent much of her time kneeling, presumably to grind the acorns and kernels of wild wheat on which her people relied for food.

Villages had distinctive identities and habits, which almost amounted to badges of identity. Some favored gazelle toe bones for jewelry; others preferred fox teeth and partridge legs. These people married within their own communities to judge from the evidence of inherited physical characteristics. For example, in some villages, people were relatively short, while in others, they had distinctive dental patterns. These settlers cut what look like plans of their fields on limestone slabs, which suggests that they were territorial—that they had a sense of possession that Captain Cook would have recognized.

In sum, the lives of preagricultural settlers were so much like the lives of the early farmers who succeeded them that when archaeologists first found the foragers' villages in the 1930s, they assumed the inhabitants were farmers. But the settled foragers were actually better off than farmers. Their remains, on the whole, show better health and nutrition than the farming peoples who followed later in the same region. A diet rich in seeds and nuts had ground down their teeth, but—unlike the farmers—they have none of the streaked tooth-enamel common among people who suffer from food shortages.

Similar evidence of preagricultural settlements exists in other places. Take a few conspicuous examples. The Jomon people of central Honshu Island in Japan lived in permanent villages 13,000 years ago, feeding themselves by fishing and gathering acorns and chestnuts. They made pots for display, in elaborate shapes, modeled on flames and serpents, and lacquered them with tree sap. Their potters were, in a sense, magicians, transforming clay into objects of prestige and ritual. Underwater archaeology has recently discovered what seem to be the remains of substantial stone buildings of the Jomon period submerged offshore as the result of an ancient landslide. In the Egyptian Sahara, at Nabta Playa, about 40 plant species, including sorghum, a type of cereal grass, grew alongside hearths and pit ovens, evidence of settled life from about 10,000 years ago. In other parts of the central Sahara in the same period that had plenty of water and a cooler climate than now, foragers found sorghum and millet, another cereal grass. At Göbekli Tepe, a hilltop site in southeast Turkey, contemporaries who lived mainly by gathering wild wheat hewed 7-ton pillars from limestone. They erected them in a sunken chamber in their village and decorated them with carvings of snakes, boar, gazelles, cranes, and symbols that look suspiciously like writing.

What was life like in these earliest settlements? Small, permanent houses suggest that nuclear families—parents and children—predominated, though some sites clearly have communal work areas for grinding seeds and nuts. As for who did the work, the most stunning finding of recent archaeology in the Middle East suggests that work was probably shared between the sexes. The way skeletons are muscled suggests that women did slightly more kneeling (and therefore slightly more grinding of nuts and seeds) than men, and men did more throwing (and therefore more hunting) than women. But both sexes did both activities. Male and female bodies began to reconverge after a long period during which they had evolved to look different. As food production replaced hunting and gathering, war and child rearing became the main sex-specific jobs in society. The convergence between the physical features of men and women seems still to be in progress today. Indeed, it seems to be accelerating as men and women share more and more tasks, and the need for heavily muscled or big-framed bodies diminishes along with physically demanding jobs in much of the world.

## The Disadvantages of Farming

| Chronology: Early Forager Settlements | |
|---|---|
| 15,000 years ago | World emerges from the Ice Age |
| 14,000–15,000 years ago | Permanent settlements appear in Middle East |
| 13,000 years ago | Honshu Island, Japan |
| 10,000 years ago | Nabta Playa, Egypt; Göbekli Tepe, Turkey |
| (All dates are approximate) | |

Preagricultural communities do not simply progress to farming. If foraging produces abundance and security, it does not necessarily follow that farming can deliver more of the same. The consequences of adopting agriculture are by no means all positive. In the early stages of moving from foraging to farming, the food supply actually becomes less reliable because people depend on a relatively small range of farmed foods or even on a single species. As a result, a community becomes vulnerable to ecological disasters. Famine becomes more likely as diet narrows. Moreover, when people have to plant and grow food as well as gather it, they have to use up more energy to get the same amount of nourishment (although domesticated foods, once harvested, tend to be easier to process for eating). The need to organize labor encourages inequalities and exploitation. Concentrations of domesticated animals spread disease, such as smallpox, measles, rubella, chicken pox, influenza, and tuberculosis.

So the problem is really the opposite of what Cook supposed. It is farmers' behavior, not foragers' behavior, that is strange. Husbandry is not a step along a march of improvement because in some ways, it makes life worse. No one has described the problem better than the historian of agronomy, Jack L. Harlan:

> [P]eople who do not farm do about everything that farmers do, but they do not work as hard. . . . They understand the life cycles of plants, know the seasons of the year, and when and where the natural plant food resources can be harvested in great abundance with the least effort. There is evidence that the diet of gathering peoples was better than that of cultivators, that starvation was rare, . . . that there was a lower incidence of chronic disease and not nearly so many cavities in their teeth.

The question must be raised: Why farm? Why work harder for less nutritious food and a more capricious supply? Why invite famine, plague, pestilence, and crowded living conditions?

## HUSBANDRY IN DIFFERENT ENVIRONMENTS

Part of what is surprising about agriculture is that it is so common. Not only has almost the entire human world adopted it, but many peoples came to it independently of one another. Scholars used to suppose that agriculture was so extraordinary it must have begun in some particular spot and that **diffusion** spread it from there—carried by migrants or conquerors, or transmitted by trade, or imitated. The last 40 years of research have shown, on the contrary, that the transition to food production happened over and over again, in a range of regions and a variety of environments, with different foodstuffs and different techniques. The most obvious contrast in environments is between **herders** and **tillers**. Herding develops where plants are too sparse or indigestible to sustain

**Chukchi herder.** The choice between hunting and herding often depends on local and historical circumstances. Reindeer-herding is an ancient practice in much of northern Eurasia, whereas in North America, the caribou have remained wild. In extreme northeast Asia, close to America, the Chukchi long resisted the example of neighboring people and preferred hunting to herding. In the last two or three centuries, however, they have adopted the herdsman's vocation shown here.

## Making Connections | FORAGERS AND FARMERS COMPARED

| FORAGERS | FARMERS |
|---|---|
| **Food procurers**<br>hunt and gather | **Food producers**<br>husbandry (breed animals, cultivate crops) |
| **Fit into nature**<br>little environmental impact | **Change nature**<br>herders: some environmental impact tillers: massive environment impact |
| **Manage the landscape** | **Nature remade and reimagined** |
| **Dependence on wild animals and plants** | **Interdependence between humans, plants, and animals**<br>animals and plants exploited and domesticated |
| **Stable food supply**<br>nomadic foragers move in response to environmental change; sedentary foragers vulnerable to changes of climate | **Unstable food supply**<br>small range of farmed foods increases vulnerability to ecological disasters |
| **Stable population**<br>• relatively little labor needed<br>• population control available, mainly by managed lactation | **Expanding population**<br>• breeding livestock and cultivating plants leads to increased food supply and increased population<br>• concentrations of domesticated animals spread disease |
| **Stable society**<br>• kinship and age fix individual's place in society<br>• sexes usually share labor by specializing in different economic tasks | **Radically changed, unstable society**<br>• need to control labor and food distribution leads to social inequalities<br>• work shared between the sexes, increased reliance on female labor<br>• strong states develop with powerful elites, complex technologies |

human life, but animals can convert these plants into meat—an energy source that people can access by eating the animals. Tilling develops where the soil is suitable or enough ecological diversity exists to sustain plant husbandry or mixed farming of plants and animals.

## Herders' Environments

In three regions of the Earth—tundra, the evergreen forests of northern Eurasia, and great grasslands—it is not possible to grow enough humanly digestible plant foods to keep large numbers of people alive. In the tundra and evergreen forests, average temperatures are too low, the growing season is too short, the surface soil is too vulnerable to frost, and the subsoil, in some areas, is too frozen. These environments offer only two options. People can remain foragers—and primarily hunters, seeking the fat-rich species typical of such zones. The Inuit in the North American Arctic, for example, hunt seal and walrus. Or people can become herders, like the Sami and Samoyeds of northern Europe and northwest Asia, who live off reindeer.

Similarly, the soils of the world's vast grasslands—known as prairie in North America, pampa in South America, steppe in Eurasia, and the **Sahel** in Africa—have, for most of history, been unfavorable for tillage. The sod is mostly too difficult to turn without a steel plow. Except for patches of exceptionally favorable

soil, herding has been the only possible form of husbandry in these areas. The peoples of the Eurasian and African grasslands were probably herding by about 5000 B.C.E. In contrast, native American grassland dwellers of the New World retained a foraging way of life because available species—bison, various types of antelope—were, for the most part, more abundant for the hunt and less suitable for herding (see Map 2.3).

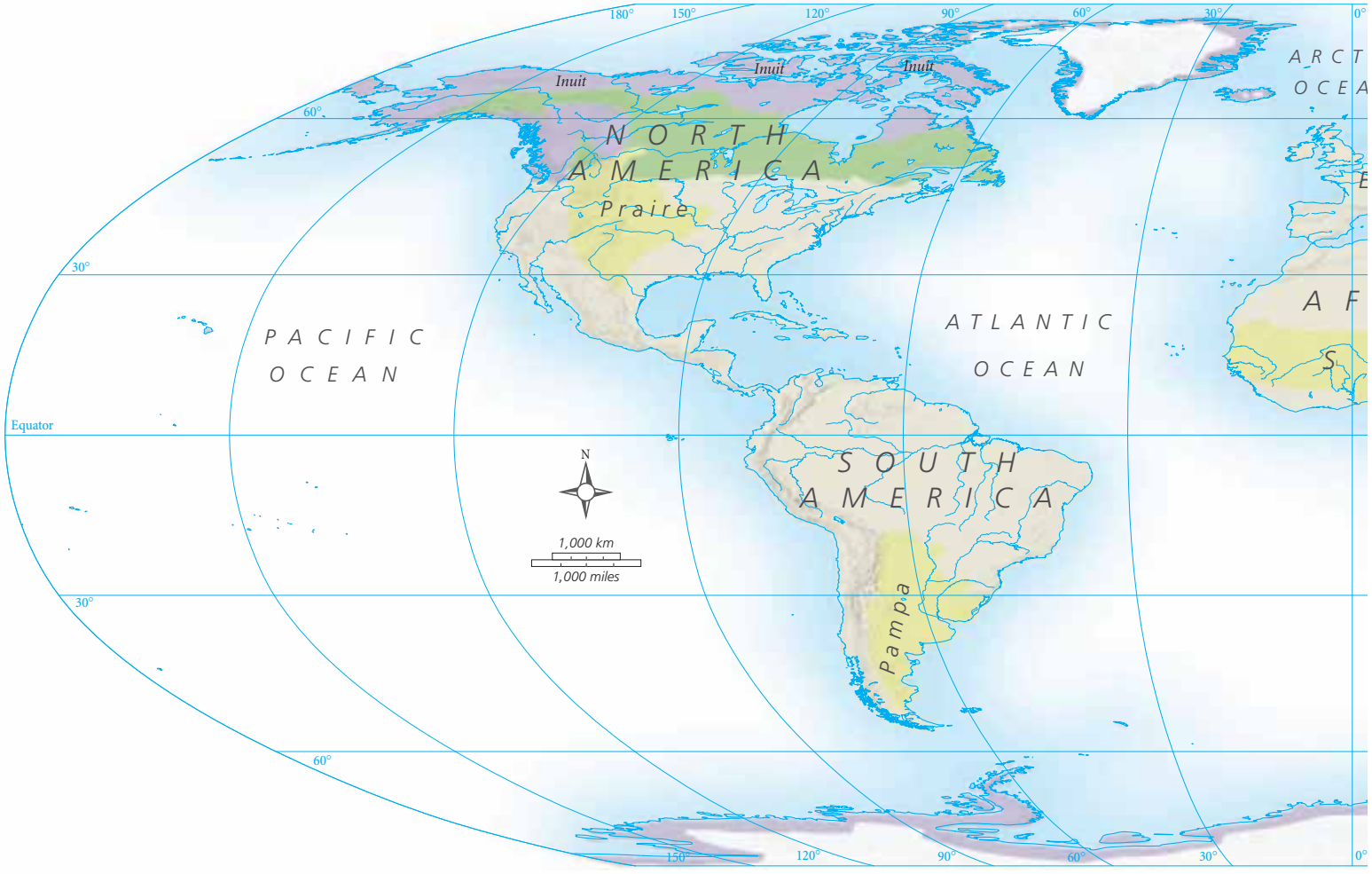
For those who choose it, herding has three special consequences. First, it imposes a mobile way of life. The proportion of the population who follow the herds—and, in some cases, it is the entire population—cannot settle into permanent villages. Herder peoples are not unwilling or unable to build permanently or on a large scale. The Scythians, for instance, people of the western Asian steppe who first domesticated the horse and invented the wheel and axle about 6,000 to 7,000 years ago, built impressive stone structures. But these were underground tombs, dwellings for the dead, while the living inhabited temporary camps. Some herding societies in Asia and Africa have become rich enough to found cities for elites or for specialists working outside of food production, such as craftsmen or miners. Indeed, as we shall see (Chapter 13), in the thirteenth century C.E., a city of this type, Karakorum in Mongolia, was one of the most admired cities in the world. On the whole, however, herding does not favor the development of cities or the kind of culture that cities nourish, such as monumental buildings, large-scale institutions for education and the arts, and industrial technology.

Second, since herders breed from animals that naturally share their grassland habitats, their herds consist of such creatures as cattle, sheep, horses, goats—milk-yielding stock. To get the full benefit from their animals, herding peoples have to eat dairy products. To modern, milk-fed Americans, this may sound perfectly normal. But it required a modification of human evolution. Most people, in most parts of the world, do not naturally produce lactase, the substance that enables them to digest milk, after infancy. They respond to dairy products with distaste or even intolerance. Whereas the Masai of Kenya in East Africa get 80 percent of their energy intake from milk, their Kikuyu neighbors, who are tillers, detest the stuff. People from the steppes of Eurasia invented an amazing variety of products, including butter, yoghurt, and cheese to make milk digestible.

Third, the herders' diet, relying heavily on meat, milk, and blood, lacks variety compared to the diets of people in more ecologically diverse environments. This does not mean that the herders' diet is nutritionally deficient. If you eat organ meats (especially liver, kidneys, heart, lungs, and glands), drink animal blood, and prepare dairy products in a variety of ways to harness beneficial bacteria, you can get everything the human body needs, including adequate vitamin C. But this does not mean that herding peoples, although they often express contempt for farmers, despise the crops farmers grow. On the contrary, herders highly prize cultivated plants and import them at great cost or take them as tribute or booty. The same goes for the products of the sedentary industries that only farming folk have land or leisure for, or that are possible only in tree-rich environments, such as wood products, silk, linen, and cotton.

Violence between herders and farmers was common until about 300 years ago or so, when the war technology of sedentary societies left herding societies unable to compete. Conflict arose not from herders' hatred of farmers' culture but from a desire to share its benefits. On the other hand, farmers have not normally had to depend on herding cultures for meat or dairy products. Typically, they can farm

**Masai.** Humans need vitamin C, but the meat and dairy products from herds do not supply much of it. So people in herding cultures eat half-digested plants from animals' stomachs and organ meats, such as the liver, in which vitamin C tends to get concentrated. Fresh blood—drawn here from the veins of a calf by Masai women in Kenya—is also a useful source of the vitamin. Drinking blood confers an added advantage: nomads can draw it from their animals "on the hoof," without slaughtering them or halting the migrations of their flocks.




MAP 2.3

## Herders' Environments

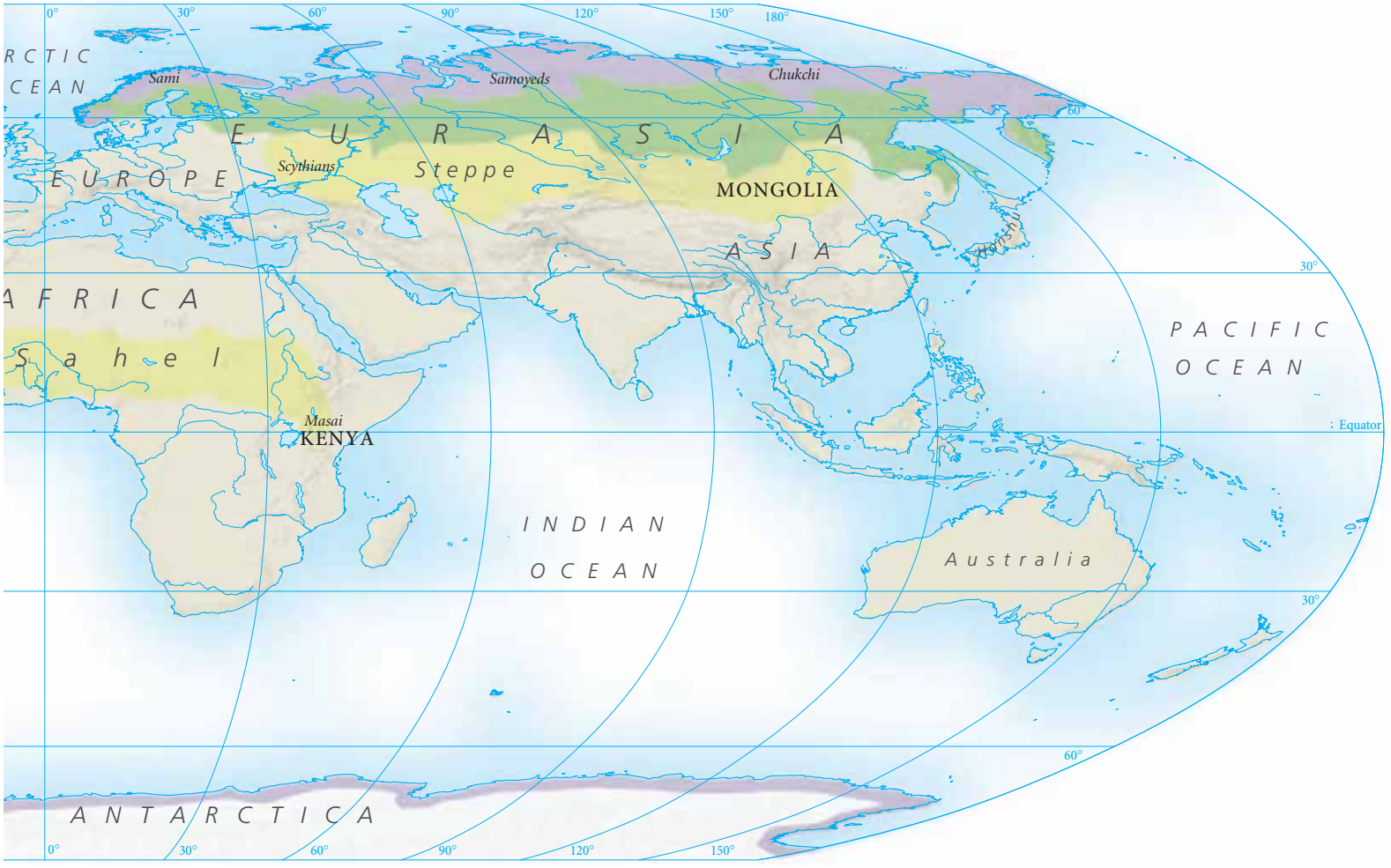
- tundra
- evergreen forests
- grasslands
- *Sami* hunters and herders described on pages 38–39
- KENYA modern country

their own animals, feeding them on the waste or surplus of their crops or by grazing them between their tillage. Or they can graze sheep or goats upland, at higher altitudes above their fields. Therefore, in herder–settler warfare, the herders have typically been aggressive and the settlers defensive.

## Tillers' Environments

In the tundra, northern Eurasian evergreen forests, and great grasslands, tilling isn't an option. Husbandry is restricted to herding. But numerous other environments are suited to farming. The first essential prerequisite for farming was soil loose enough for a dibble—a pointed stick for poking holes in the ground—to work. At first, this was the only technology available. Where the sod had to be cut or turned—where, for instance, the soil was heavy clay or a dense or sticky mixture—agriculture had to wait for the slightly more advanced technology of the spade and the plow.

Equally necessary prerequisites for agriculture were sufficient water, by rain or flood or irrigation, to grow the crop; enough sun to ripen it; and some way to nourish the soil. This last was generally the hardest to ensure, because farming can exhaust even the richest soils fairly rapidly. Flooding and layering with silt or dredging and dressing new topsoil is needed to replace nutrients. Alternatively, farmers can add fertilizer: ash from burned wood, leaf mold from forest clearings, guano




from bird colonies if there are any nearby, mined potassium, manure from domesticated animals, or night soil—if all else fails, for human excretion is poor fertilizer.

We can divide environments suited to early agriculture into three broad types: swampy wetlands, uplands, and alluvial plains, where flooding rivers or lakes renew the topsoil. (Cleared woodlands and irrigated drylands are also suitable for agriculture, but as far as we know, farming never originated in these environments. Rather, outsiders brought it to these areas from some place else.) Each of the three types developed with peculiar characteristics and specialized crops. It is worth looking at each in turn (see Map 2.4).

**Swampland** Swamp is no longer much in demand for farming. Nowadays, in the Western world, if we want to turn bog into farmland we drain it. But it had advantages early on. Swamp soil is rich, moist, and easy to work with simple technology. At least one staple grows well in waterlogged land—*rice*. We still do not know where or when rice was first cultivated, or even whether any of these wetland varieties preceded the dryland rice that has gradually become more popular around the world. Most evidence, however, suggests that people were producing rice at sites on the lower Ganges River in India and in parts of Southeast Asia some 8,000 years ago, and in paddies in the Yangtze River valley in China not long afterward.

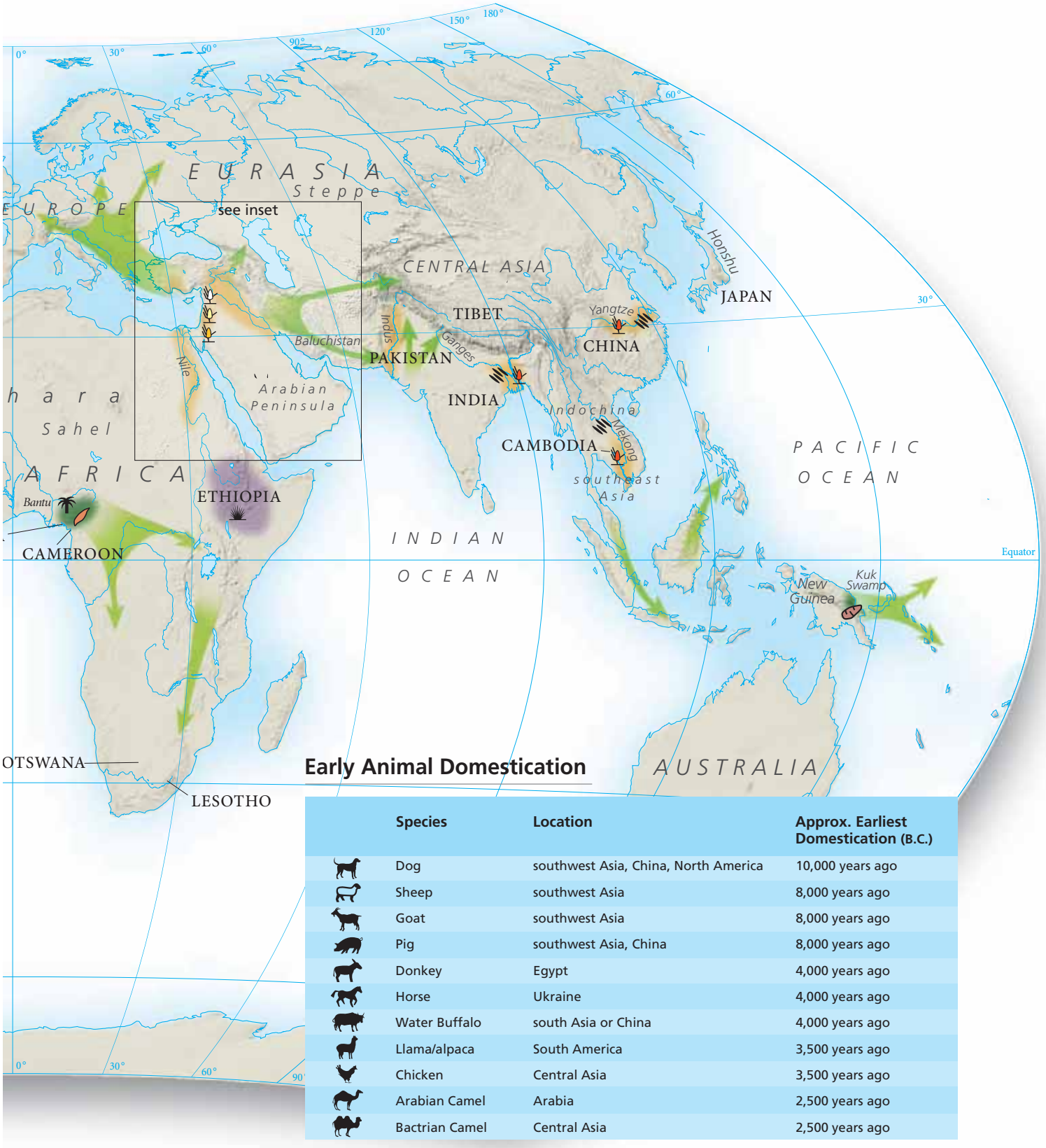
MAP 2.4

# Early Crop Sites and the Spread of Agriculture

swamplands
uplands
floodplains
*Bantu* native people
MEXICO modern country
place described on pages 44–48
spread of agriculture


## Early Crop Sites

| | Crop | Environment | Earliest Sites | Approx. Earliest Domestication |
|---|---|---|---|---|
| | quinoa | uplands | high Andes, Peru | 12,000–7,000 years ago |
| | potato | uplands | high Andes, Peru | 12,000–7,000 years ago |
| | sweet potato | central coast | Peru | 10,000 years ago |
| | wheat | floodplains | Jericho on river Jordan | 10,000 years ago |
| | rye | | Jordan, Syria | 10,000 years ago |
| | barley | uplands | Jordan, Syria | 10,000 years ago |
| | taro | swamp | New Guinea | 9,000 years ago |
| | beans | uplands | Oaxaca, Mexico | 9,000 years ago |
| | squash | uplands | Oaxaca, Mexico | 9,000 years ago |
| | rice | swamp | Ganges River valley, India, southeast Asia, Yangtze River valley, China | 8,000 years ago |
| | millet | floodplains | Ganges River valley, India, southeast Asia, Yangtze River valley, China | 7,000 years ago |
| | maize | uplands | Oaxaca, Mexico | 6,000 years ago |
| | yams | swamp | Cameroon, West Africa | 5,000 years ago |
| | oil palm dates | swamp | Cameroon, West Africa | 5,000 years ago |
| | teff | uplands | Ethiopia, East Africa | 5,000 years ago |
| | bitter manioc, (cassava, yucca) | swamp | Amazon, South America | 1,500 years ago |

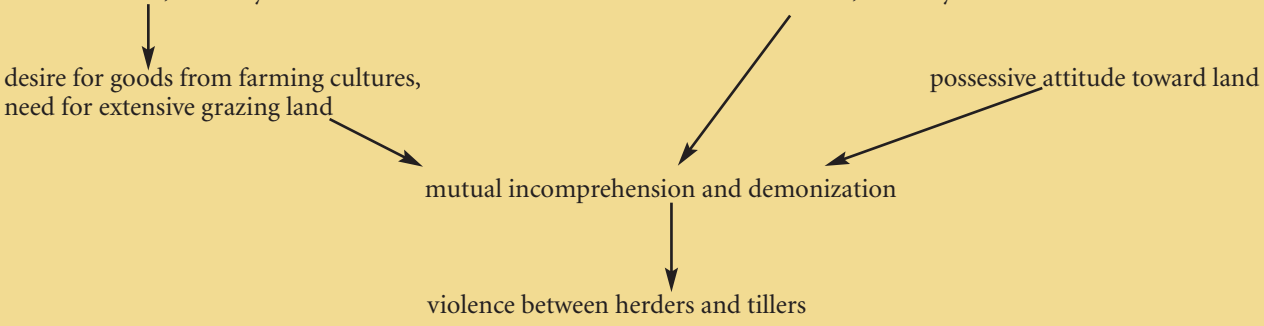



## Early Animal Domestication

| | Species | Location | Approx. Earliest Domestication (B.C.) |
|---|---|---|---|
| | Dog | southwest Asia, China, North America | 10,000 years ago |
| | Sheep | southwest Asia | 8,000 years ago |
| | Goat | southwest Asia | 8,000 years ago |
| | Pig | southwest Asia, China | 8,000 years ago |
| | Donkey | Egypt | 4,000 years ago |
| | Horse | Ukraine | 4,000 years ago |
| | Water Buffalo | south Asia or China | 4,000 years ago |
| | Llama/alpaca | South America | 3,500 years ago |
| | Chicken | Central Asia | 3,500 years ago |
| | Arabian Camel | Arabia | 2,500 years ago |
| | Bactrian Camel | Central Asia | 2,500 years ago |

# Making Connections | HERDERS AND TILLERS COMPARED

| HERDERS | TILLERS |
|---|---|
| **Environment**<br>tundra, evergreen forests of northern Eurasia, grasslands, uplands | **Environment**<br>swampy wetlands, alluvial plains, temporal forests, irrigated deserts, some uplands |
| **Way of life**<br>mobile | **Way of life**<br>settled |
| **Diet**<br>reliance on meat, milk, and blood, sometimes supplemented by cultivated plants from tillers | **Diet**<br>reliance on cultivated plants, supplemented by meat and dairy from their own animals |
| **Culture**<br>does not favor development of cities, large-scale institutions, industry | **Culture**<br>tends to become urban, with large-scale institutions, industry |




Where rice is unavailable, swampland cultivators can adapt the land for other crops by dredging earth—which they can do by hand in suitable conditions—and by building up mounds. Not only can they plant the mounds, but they can also farm water-dwelling creatures and plants in the ditches between mounds. In the western highlands of New Guinea, the first agriculture we know of started fully 9,000 years ago in the boggy valley bottoms. Drains, ditches, and mounds still exist in the Kuk swamp there. More extensive earthworks were in place by 6000 B.C.E. The crops have vanished—biodegraded into nothingness—but the first farmers probably planted *taro*, the most easily cultivated, indigenous native root. Modern varieties of taro exhibit signs of long domestication. A diverse group of plants—native bananas, yams and other tubers, the sago palm, and nuts from the palmlike *pandanus* tree—was probably added early. At some point, pigs arrived on the island. However, a fierce and, on present evidence, unresolvable scholarly controversy rages over when that was.

Having a variety of crops made New Guinea's agriculture exceptionally sustainable. Variety may also help explain why farming has remained a small-scale enterprise there that numerous, politically independent villages, and not a large, centralized state, conduct. New Guinea never generated the big states and cities that grew up where the range of available crops was narrower and agriculture more fragile. It may sound paradoxical that the most advantageous crop range produces the most modest results, but it makes sense. One of the pressures that drives farming peoples to expand their territory is fear that a crop will fail. The

more territory you control, the more surplus you can warehouse, the more manpower you command, and the more productive are your fields. Moreover, if you farm an environment with a narrow range of food sources, you can diversify only by conquering other people's habitats. The history of New Guinea has been as violent as that of other parts of the world, but its wars have always been local and the resulting territorial adjustments small. Empire-building was unknown on the island until European colonizers got there in the late nineteenth century.

We know of no other swamps that people adapted so early, but many later civilizations arose from similar sorts of ooze. We do not know much about the origins of **Bantu** agriculture in West Africa, but it is more likely to have begun in the swamp than in the forest. Swampland is suited to the native *yams* on which Bantu farming first relied. Waterlogged land is also the favorite habitat of the other mainstay of Bantu tradition, the *oil palm*. The earliest archaeological evidence of farming based on yams and oil palms dates from about 5,000 years ago in swampy valley bottoms of Cameroon, above the forest level.

Swampland also contributed to the agriculture that began along the Amazon River in South America 4,000 or 5,000 years ago. At first, the crops were probably richly diverse, supplemented by farming turtles and snails or similar mollusks. Later, however, from about 500 C.E., farmers increasingly focused on *bitter manioc*, also known as cassava or yucca, which has the great advantage of being poisonous to predators. Human consumers can process the poison out. Olmec civilization, which, as we shall see in Chapter 3, was enormously influential in the history of **Mesoamerica**, was founded in swamps thick with mangrove trees about 3,000 years ago.

**Uplands** Like swamplands, regions of high altitude are not places that people today consider good for farming. Farmers have usually left these regions to the herdsmen and native upland creatures, such as sheep, goats, yaks, and llamas. There are three reasons for doing so: First, as altitude increases, cold and the scorching effects of solar radiation in the thin atmosphere diminish the variety of viable plants. Second, slopes are subject to erosion (although this has a secondary benefit because relatively rich soils collect in valley bottoms). Finally, slopes in general are hard to work once you have come to rely on plows, but this does not stop people who do not use plows from farming them. Nonetheless, in highlands suitable for plant foods plant husbandry or mixed farming did develop.

*The Andes* Highlands usually contain many different microclimates at various altitudes and in valleys where sun and rain can vary tremendously within a short space. Some of the world's earliest farming, therefore, happened at surprisingly high altitudes. Evidence of mixed farming survives from between about 12,000 and 7,000 years ago near Lake Titicaca, elevation 13,000 feet, in the Andes of South America. Here, in the cave of Pachamachay, bones of domesticated llamas cover those of hunted camelios—the llamalike but smaller *vicuña* and *guanaco*. The domesticated animals fed on *quinoa*, an extremely hardy grainlike food that resembles some kinds of

**The valley of Cuzco,** Peru, the homeland of the Inca (Chapter 15). Potatoes—which were first cultivated in the Andes at least 7,000 years ago and spread from there to the rest of the world—remain a staple in this region. They are the only food that—if eaten in sufficient quantities—contains all the nutrients necessary to sustain life. Suitable varieties of potatoes flourish at over 13,000 feet above sea level. In mountain climates, they can be freeze-dried for year-round nutrition.

grass. It grows at high altitudes thanks to a bitter, soapy coating that cuts out solar radiation. The llamas ingested the leafy part and deposited the seeds in their manure. Their corrals therefore became nurseries for a food fit for humans to grow and eat.

The earliest known experiments in domesticating the *potato* probably occurred at about the same time in the same area. Potatoes were ideal for mountain agriculture. Not only were some naturally occurring varieties of potato hardy enough to grow at altitudes of up to 14,000 feet, but they also provided total nutrition. Eaten in sufficient quantities, potatoes provide everything the human body needs to survive. Moreover, the high-altitude varieties have a hidden advantage. Whereas wild kinds of lowland potatoes are poisonous and need careful processing to become edible, the concentration of poison in potatoes diminishes the higher you climb. There is an obvious evolutionary reason for this. The poison is there to deter predators, which are most numerous at low altitudes.

The potato gave Andean mountain dwellers the same capacity to support large populations as peoples of the valleys and plains, where a parallel story began in the central coastal region of what is now Peru. There, around 10,000 years ago, farmers grew *sweet potato* tubers similar to modern varieties. If agriculture did indeed produce sweet potatoes, they would have to be counted as the New World's earliest farmed crop. Once both regions had the capacity to feed dense populations, Andean history became a story of highland–lowland warfare, punctuated by the rise and fall of mountain-based empires.


**FIGURE 2.1 TEOSINITE AND MAIZE.** The form of teosinte from which early farmers in Mesoamerica developed maize no longer exists. But the diagram illustrates the stages through which Mesoamericans may have bred teosinte into maize, until they developed the characteristic thick, densely packed cobs familiar today. Unlike teosinte, maize cannot germinate without human help.
*Permission of the University of Michigan Museum of Anthropology.*

*Mesoamerica* The Mesoamerican highlands, which stretch from central Mexico to Central America and are less high and less steep than those of the Andes, produced their own kind of highland-adapted food: a trinity of *maize*, *beans*, and *squash*. This combination grows well together and when eaten together provides almost complete nutrition. The earliest surviving specimens of cultivated maize are 6,000 years old. People in Mesoamerica developed maize from a wild grass known as teosinte, of which a type still grows in the state of Oaxaca in central Mexico, along with the wild ancestors of modern domesticated beans (see Figure 2.1). By working out how long it would take wild species to mutate, botanists estimate that people domesticated beans about 9,000 years ago. The earliest domesticated squashes date from about the same period and are found at the same site as teosinte and wild beans, at Guilá Naquitz, in Oaxaca. The fact that their wild ancestors have disappeared suggests that farming here might have started with squashes when gatherers of wild beans and grains needed to provide food during droughts. Squash grows well during dry spells severe enough to wither teosinte and blight beans, so it would have provided a food reserve that people did not need to store.

*The Old World* The Old World had no potatoes, quinoa, or even maize for highland farmers to work with. The hardiest staples available in most of Eurasia and Africa were *rye* and *barley*. Surprisingly, however, people in lowlands first domesticated both of them in what are now Jordan and Syria, probably about 10,000 years ago. Rye germinates at just a couple of degrees above freezing, but its drawbacks made it more popular as a winter crop in wheat-growing lowlands than as a mountain staple. Its yield is lower, and it is less nutritious than other grains. Rye is also extremely vulnerable to fungus infection. Barley did not fulfill its potential to be an Old World equivalent of quinoa or potatoes until the sixth century C.E., when it became the staple food of a farming society in Tibet (Chapter 10).

**Teff**—the staple grain of early Ethiopian civilization—remains unique to the region, where it is still harvested regularly. But, as the picture shows, it more closely resembles wild grasses than modern high-yielding food grains. The starchy ears are tiny and require much labor to mill. So, like many traditional staples, teff faces the threat of extinction today from the competition of commercial hybrids or genetically modified varieties, promoted by powerful corporations.

The only other Old World grain with similar potential was Ethiopia's indigenous grass called *teff*. Although its tiny grains make teff laborious to cultivate and process, it was suited to the region's fertile soil and temperate climate above 7,200 feet. Farmers in Ethiopia cultivated teff at least 5,000 years ago, but they never had to rely on it absolutely. Some varieties of *millet*—the name of a huge range of grasses whose seeds humans can digest—had superior yields. Over time, millet displaced teff, which never became a major staple outside Ethiopia.

**Alluvial Plains** Although swamps and rain-fed highlands have produced spectacularly successful agriculture, farmers get the best help from nature in **alluvial plains**, flat lands where mud carried by overflowing rivers or lakes renews the soil. If people can channel the floods to keep crops from being swept away on these plains, alluvium, made up of sediment and other organic matter, restores nutrients and compensates for lack of rain. As we shall see in the next chapter, alluvial soils in arid climates sustained some of the world's most productive economies until late in the second millennium B.C.E. *Wheat* and barley grew in the black earth that lines Egypt's Nile, the floodplains of the lower Tigris and Euphrates rivers in what is now Iraq, and the Indus River in what is now Pakistan. People first farmed millet on alluvial soils in a somewhat cooler, moister climate in China, in the crook of the Yellow River and the Guanzhong Basin around 7,000 years ago. And in the warm, moist climate of Indochina in what is now Cambodia, three crops of rice a year could grow on soil that the annual counter flow of the Mekong River created. The Mekong becomes so torrential that the delta—where the river enters the sea—cannot funnel its flow, and water is forced back upriver.

**Jericho Skull.** No one knows why people in Jericho, in the eighth millennium B.C.E., kept skulls, painted them with plaster, and inserted cowrie shells into the eye sockets. But these decorated skulls have, in a sense, helped the dead to survive. Some of the skulls even show traces of painted hair and mustaches.
*Ashmolean Museum, Oxford, England, UK*

Smaller patches of alluvium, deposited by floods, nourished the world's earliest known fully farming economies. Among the first of these farming economies was Jericho on the river Jordan. Today, the Jordan valley looks inhospitable: desert crusted with salt and sodium. Ten thousand years ago, however, Jericho overlooked an alluvial fan that trickling streams washed down from the Judaean hills, filling the river as it crept south from the Sea of Galilee. The Jordan was thick with silt. The banks it deposited formed the biblical "jungle

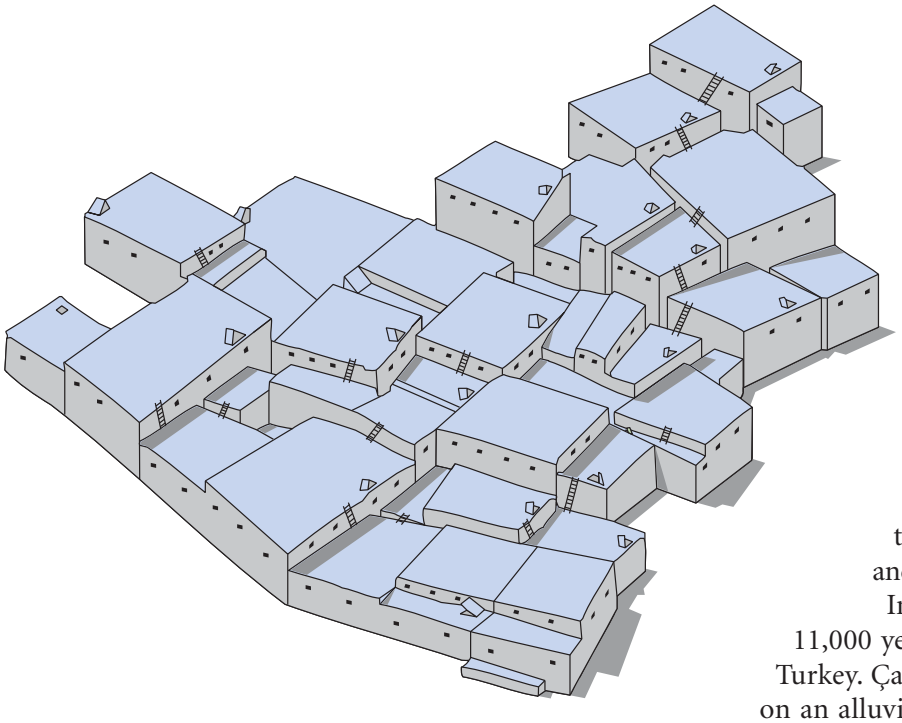


**FIGURE 2.2 ÇATALHÜYÜK** The houses of Çatalhüyük were linked not by streets as we know them, but by rooftop walkways, from which people presumably used ladders to reach different levels. The diagram reconstructs part of Çatalhüyük on the basis of archaeological findings. Wall paintings there show that other settlements in the region were constructed on similar principles.
*Schematic reconstruction of houses and shrines from Level VI at Catalhoyuk by James Mellaart. Reprinted by permission of the Catalhoyuk Research Project.*

of Jericho," from where lions padded to raid the sheepfolds. Here stood rich wheat fields, creating the landscape said in the Bible to resemble "the garden of the Lord." Desert people, such as the Israelites led by Joshua, were excluded and were tempted to conquer it.

In Jericho, the ritual focus of life was a cult of skulls, which were cut from bodies exhumed after burial, coated with plaster to resemble flesh, and given eyes of cowrie shells from the Red Sea. This cult was part of a way of life Jericho shared with similar settlements dotted around the region. At Jerf al Ahmar, 300 miles to the northeast, lies a farming settlement of the same era with a building used both for storing grain and for ritually decapitating corpses.

In much the same period, between about 9,000 and 11,000 years ago, farming towns also appeared in Anatolia in Turkey. Çatalhüyük, the most spectacular of these towns, stood on an alluvial plain that the river Çarsamba flooded. Nourished by wheat and beans, the people filled an urban area of 32 acres. Walkways across flat roofs, not streets as we define them, linked a honeycomb of dwellings. The houses, built of mud bricks, were identical (see Figure 2.2). The wall panels, doorways, hearths, ovens, and even the bricks were a standard shape and size. You can still see where the occupants swept their rubbish—chips of bone and shiny, black flakes of volcanic glass called obsidian—into their hearths.

Çatalhüyük was not an isolated phenomenon. A wall painting there depicts what may be another, similar urban settlement. Even earlier sites, smaller than Çatalhüyük but on the same order, communicated with the Jordan valley—villages like Çayonu, inhabited by people who piled up skulls and performed sacrifices on polished stone slabs. By exchanging craft products—weapons, metalwork, and pots—for primary materials such as cowrie shells from the Red Sea, timber from the Taurus Mountains in Anatolia, and copper from beyond the Tigris, the inhabitants of Çatalhüyük became rich by the standards of the time. Archaeologists have unearthed such treasures as fine blades and mirrors made from local obsidian and products of the copper-smelting technology that these people gradually developed.

Yet the inhabitants of Çatalhüyük never got safely beyond the mercy of nature. They worshiped images of its strength: bulls with monstrous horns and protruding tongues, crouching leopards who guard goddesses leaning on grain bins, fuming volcanoes, giant boars with laughing jaws and bristling backs. This is surely farmer's art, animated by fear of the wild and loathing of the savage. Most people died in their late twenties or early thirties. Their corpses were ritually fed to vultures and jackals—as surviving paintings show—before their bones were buried in communal graves.

Çatalhüyük lasted for nearly 2,000 years, remarkable longevity by the standards of later cities. It became doomed as the waters that supplied it dried up. Even during its greatest prosperity, its space was limited and its resource base restricted. But, along with Jericho and other settlements of the era, it pointed to the future, showing how farming, despite all its short-term disadvantages and the sacrifices it demanded, could sustain life through hard times.

# A CLOSER LOOK

## The Fertility Goddess of Çatalhüyük

In recent times, the so-called fertility goddess or Earth Mother of Çatalhüyük has become a cult object for feminists, who make pilgrimages to the site. But what her image was for and what it represents are unknown.

Her seated position and uptilted head suggest authority, as do the predatory felines that guard the throne, as if in obedience to someone able to command nature.

The folds of fat around her joints suggest a degree of obesity amounting to clinical pathology or physical deformity. Most human societies, for most of history, have admired body fat on both men and women.

Her bulbous breasts and exaggerated sex organs suggest the importance of fertility to the society in which this image was crafted.

From this image, what can we infer about the status of women in early agricultural societies?

## THE SPREAD OF AGRICULTURE

The development of food production in diverse environments with different foods and different techniques points to an important conclusion: It was not a unique occurrence—a one-of-a-kind accident or a stroke of genius. Rather, farming was an ordinary and fairly frequent process that could therefore be open to a variety of explanations.

Where we can be sure agriculture developed independently, we can see that early food producers focused on what they could grow or raise most easily in their particular environment. Examples include livestock herds in central Eurasia; wheat and barley in the Middle East; sweet potatoes, quinoa, and potatoes in the Andean region; the squash–maize–beans trinity in Mesoamerica; millet in China; and rice in Southeast Asia. In New Guinea agriculture was based on taro, in Ethiopia on teff, and in West Africa on yams and oil palms. Nevertheless, connections between neighboring regions were unquestionably important in spreading husbandry. Some crops were undoubtedly transferred from the places they originated to other regions (see Map 2.4).

### Europe

It seems likely (though the evidence is slight and subject to reinterpretation) that migrants from Asia colonized Europe. They brought their farming materials and knowledge with them, as well as their **Indo-European languages**, from which most of Europe's present languages descend. Colonization was a gradual process, beginning about 6,000 years ago. Early farmers may have cleared land, but probably did not undertake large-scale deforestation. Later, well-documented cases from other forest environments suggest that early agriculturists in Europe found trees useful and even revered them. So large-scale deforestation more likely occurred naturally, perhaps through tree diseases. Between 4,500 and 5,000 years ago, for instance, in northern Europe, the broadleaved forest receded, creating areas that were well suited to farming. When the woodland grew back after a few hundred years, farmers unquestionably cut it away.

### Asia

Similar migrations probably spread farming to parts of Central Asia south of the steppeland. The farming that developed in alluvial environments in Anatolia and the Jordan valley colonized or converted every viable part of the region by 8,000 or 9,000 years ago. At altitudes above 1,800 feet, inhabitants of sites east of the Zagros Mountains (in what is now Iran) replaced their wild grains with cultivated varieties. Then, too, by about 6,000 years ago, comprehensive irrigation systems for farming crisscrossed the oases in southern Turkmenistan, which had a moister climate than it has now.

In the Indian subcontinent, the sudden emergence of well-built villages in the same period was probably the result of outside influence. No intermediate phase between foraging and farming occurred; there was no period when foragers led settled lives. We can trace the spread of farming from southwest Asia by way of Baluchistan (southern Pakistan). Here, remnants of domestic barley and wheat in mud bricks and the bones of domestic goats confirm the presence of agriculture about 9,000 years ago. This is also the site of the world's earliest surviving cotton thread, strung through a copper bead about 7,500 years ago.

**Chronology: The Spread of Agriculture**

| | |
|---|---|
| 9,000 years ago | Evidence of agriculture in Indian subcontinent; farming spreads by diffusion in the Egyptian Sahara and Nile valley |
| 8,000–9,000 years ago | Farming spreads from Jordan valley and Anatolia to central Asia, south of the steppe |
| 6,000 years ago | Migrants from Asia bring farming materials and knowledge with them to Europe |
| 4,500–5,000 years ago | Bantu expansion spreads farming from West Africa southward |
| 3,000 years ago | Maize moves northward from Mexico to southwestern United States |

(All dates are approximate)

## The Americas

In much of North America, the spread of maize northward from its birthplace in central Mexico marked the transmission of agriculture. This process took thousands of years and demanded the development of new varieties as the crop crossed climate zones on its northward route. The best estimate puts maize farming in the southwestern United States about 3,000 years ago. Meanwhile, some North American peoples began to farm sunflowers and sumpweed for their edible seeds and roots. In South America, the idea of agriculture spread from, or across, the high Andes, through the upper Amazon Basin.

## Africa

How agriculture spread in Africa is less clear than in other regions. People began to cultivate similar plant foods in the Egyptian Sahara and in the Nile valley about 9,000 years ago. It therefore appears that one region might have influenced the other. A little later, wheat cultivation along the Nile followed developments of a similar kind in the Jordan valley. Between 4,500 and 5,000 years ago, agriculture spread southward from West Africa along with Bantu languages. We can trace the path from what are now Cameroon and Nigeria in West Africa, southward and then eastward across the expanding Sahara to the Nile valley, before turning south again (see Map 2.5).


MAP 2.5

**The Spread of Bantu Languages**

## The Pacific Islands

Scholars debate when agriculture originated in the Pacific Islands. In particular, we do not know how or when the sweet potato—which, together with the pig, is the basis of food production in most of the region—got there. The most widely respected theory sees agriculture as the result of diffusion from New Guinea. It was a slow process requiring many adaptations as it spread across the ocean with seaborne migrants.

## SO WHY DID FARMING START?

Knowing or guessing about how food production started does not tell us why it started. Why, despite the short-term difficulties, did some peoples originate farming and others adopt it? Though scholars ferociously advocate rival explanations, we do not have to choose among them. Different explanations, or different combinations of the same explanations, may have applied in different places. Nor do we have to go through all the theories. We can group them under seven manageable headings.

*"Knowing or guessing about how food production started does not tell us why it started. Why, despite the short-term difficulties, did some peoples originate farming and others adopt it?"*

## Population Pressure

The first group of theories explains agriculture as a response to stress from population growth and overexploitation of wild foods. Examples include hunting game to extinction and overgathering plants, grubs, and mollusks. Logically, population should not grow if resources are getting scarce. But anthropological studies of contemporary cultures making the transition to agriculture in Botswana and Lesotho in southern Africa support the theory. Apparently, once farming starts, people cannot abandon it without catastrophe. A ratchet effect makes it impossible, while population rises, to go back to less intensive ways of getting food. As an explanation, however, for why agriculture arose in the first place, population pressure does not match the facts of chronology. Populations certainly grew in the most dedicated farming cultures, but, in most places, growth was probably more a consequence of agriculture than a cause.

## The Outcome of Abundance

A group of theories has arisen in direct opposition to stress theory. These claim that husbandry was a result of abundance. Farming, it is said, was a by-product of the leisure of fishermen in Southeast Asia who devoted their spare time to experimenting with plants. Or it was invented by hill dwellers in northern Iraq, whose habitat was peculiarly rich in easily domesticated grasses and grazing herds. Or it was the natural result of concentrations of pockets of abundance in Central Asia in the post–Ice-Age era of global warming. As temperatures rose, oases opened up where different species congregated peacefully. Humans discovered they could domesticate animals that would otherwise be rivals, enemies, or prey. Abundance theory is a convincing description for why agriculture developed in some key areas, but it does not explain why, in good times, people would want to change how they got their food and take on extra work.

## The Power of Politics

Stress theory and abundance theory may apply to why agriculture arose in different areas, but they cannot be true simultaneously. Therefore, beyond the food supply, it is worth considering possible political, social, or religious influences on food strategies. After all, food is for more than nourishment. It also confers power and prestige. It can symbolize identity and generate rituals. In hierarchically organized societies, elites nearly always demand more food than they can eat, not just to ensure their security but also to show off their wealth by squandering their waste.

In a society where leaders buy allegiance with food, competitive feasting can generate huge increases in demand, even if population is static and supplies are secure. Societies bound by feasting will always favor intensive agriculture and massive storage. Even in societies with looser forms of leadership or with collective decision making, feasting can be a powerful incentive to boost food production and storage, by force if necessary. Feasting can celebrate collective identity or cement relations with other communities. Then, too, people could process most of the early domesticated plants into intoxicating drinks. If farming began as a way to generate surpluses for feasts, alcohol must have had a special role.

**Cult agriculture.** Chimú goldsmiths (Chapter 14) produced this ceremonial dish, which depicts the succession of the seasons, presided over by the central figure of the maize god, and offerings of the characteristic starches of the Peruvian lowlands—maize, cassava, sweet potatoes. By the time this object was made, however, around 1200 C.E., maize varieties had been adapted for varied environments, including uplands and temperate climates.

## Cult Agriculture

Religion may well have been the inspiration for farming. Planting may have originated as a fertility rite, or irrigation as libation (a liquid offering to the spirits or gods), or enclosure as an act of reverence for a sacred plant. To plow or dibble and sow and irrigate can carry profound meaning. They can be understood as rites of birth and nurture of the god on whom you are going to feed. In exchange for labor—a kind of sacrifice—the god provides nourishment. Most cultures have considered the power to make food grow to be a divine gift or curse or a secret that a hero stole from the gods. People have domesticated animals for use in sacrifice and prophecy as well as for food. Many societies cultivate plants that play a part at the altar rather than at the table. Examples include incense, ecstatic or hallucinatory drugs, the sacrificial corn of some high Andean communities, and wheat, which, in orthodox Christian traditions, is the only grain permitted for the Eucharist. And if religion inspired agriculture, alcohol as a drink that can induce ecstasy might have had a special appeal. In short, where crops are gods, farming is worship.

## Climatic Instability

Global warming, as we saw in Chapter 1, presented some foragers with thousands of years of abundance. But warming is unpredictable. Sometimes it intensifies, causing droughts; sometimes it goes into reverse, causing little ice ages. Its effects are uneven. In the agrarian heartland of the Middle East, for example, warming squeezed the environment of nut-bearing trees but favored some grasses. The forest receded dramatically as the climate got drier and hotter. Between about 13,000 and 11,000 years ago a spell of cooling, when temperatures dropped a degree or so, seems to have affected much of the northern hemisphere. The new conditions encouraged people to rely more and more on grains for food and perhaps try to find ways to increase the amount of edible wheat. Gatherers who knew the habits of their plants tended them ever more carefully. It was, perhaps, a conservative, even a conservationist strategy: a way to keep old food stocks and lifestyles going under the impact of climate change.

## Agriculture by Accident

In the nineteenth century, the most popular theory of how farming started attributed it to accident. One can hardly open a nineteenth-century book on the subject without encountering the myth of the primitive forager, usually a woman, discovering agriculture by observing how seeds, dropped by accident, germinated on fertilized soil. The father of the theory of evolution, Charles Darwin (1809–1882; see Chapter 25), thought something similar himself:

> The savage inhabitants of each land, having found out by many and hard trials what plants were useful . . . would after a time take the first step in cultivation by planting them near their usual abodes. . . . The next step in cultivation (and this would require but little forethought) would be to sow the seeds of useful plants; and as the soil near the hovels of the natives would often be in some degree manured, improved varieties would sooner or later arise. Or a wild and unusually good variety of a native plant might attract the attention of some wise old savage; and he would transplant it or sow its seed. . . . Transplanting any superior variety, or sowing its seeds, hardly implies more forethought than might be expected at an early and rude period of civilisation.

Darwin's reconstruction is plausible: He makes accident interact with human action. But this model leaves unsolved problems. Historians are never satisfied to fall back on what would or might have happened (though this may be necessary to help understand remote or poorly documented periods). We want to know—and it is the historian's job to try to tell us—what really did happen. Assuming that anything a "savage" does requires "little forethought" does not fit with what we now know of human nature. Cleverness occurs at every period of history and in every type of society—in New Guinea as well as in New York, in antiquity as well as in modernity.

*"Cleverness occurs at every period of history and in every type of society—in New Guinea as well as in New York, in antiquity as well as in modernity."*

## Production as an Outgrowth of Procurement

Still, the accident theory may be right in one respect. Early practitioners may not have consciously thought of food production as a different strategy from foraging. It makes sense, for instance, to see herding as a natural development of hunting techniques, such as improving a species by culling weak or old animals, managing grazing by setting fires, driving herds down lanes to a place of

**Einkorn** is one of the few wild grasses that yield kernels that human stomachs can digest. It was a principal food source for the early sedentary foraging cultures of the Middle East, and one of the first species farmers adopted. But its grains are hard to separate from their tough husks, which helps explain why farmers strove to produce new varieties of grain by selection and hybridization.

slaughter, or corralling them for the kill. Similarly, farming and gathering might have been parts of a single continuous attempt to manage food sources. It is hard to tell where one leaves off and the other begins. "Even the simplest hunter–gatherer society," as archaeologist Brian Fagan has said, "knows full well that seeds germinate when planted." The Papago Native Americans of the Sonora Desert of Arizona drift in and out of an agrarian way of life as the weather permits, using patches of surface water to grow fast-maturing varieties of beans.

The archaeological evidence has begun to yield clues to how gatherer communities of southwest Asia transformed themselves into farming communities after the Ice Age. Grasses on the whole are naturally too indigestible to be human food. But the region produced wild barley and two kinds of wheat—einkorn and emmer. We know people ate them because archaeologists have found actual remains that grinders processed from 14,000 to 15,000 years ago. Kernels of these grains are hard to free from their tough, inedible covering, so people who ate large amounts of them may have had an incentive to try to breed varieties that were easier to process. At first, the gatherers beat sheaves of wheat with sticks where they grew and collected edible seeds in baskets as they fell. Increasingly, as time went on, they cut stalks with flint sickles, which meant that fewer seeds fell when the wheat was harvested. This new method suggests that people were selecting preferred seeds for replanting. Modern experiments show that this process could produce a self-propagating species within 20 years. Alternatively, the new method itself might have encouraged changes in the species because heavier, larger seeds would be more likely to fall to the ground at the point of harvesting. Eventually, new varieties would emerge, but the process would be much slower.

Even earlier, humans used a similar process with snails and other mollusks. Mollusks are an efficient food, self-packaged in a shell for carrying and cooking. Compared with the large four-legged beasts that are usually claimed as the first domesticated animal food sources, mollusks are readily managed. People can gather marine varieties, such as mussels and clams, in a natural rock pool. On land a snail-rich spot can be enclosed with a ditch. Moreover, snails are grazers and do not need to be fed with foods that humans would otherwise eat themselves. They can be herded without the use of fire, any special equipment, personal danger, or the need to train leashed animals or dogs to help. By culling small or undesirable types by hand, the early snail farmers could soon enjoy the benefits of selective breeding. Shell mounds from the late Ice Age or soon thereafter contain varieties of snails that are bigger on average than today's, so it looks as if the snail eaters were already selecting for size. Sometimes large-scale consumption of mollusks preceded that of foods that the more elaborate technologies of the hunt obtained. At Frankthi Cave in southern Greece, a huge dump of snail shells nearly 13,000 years old was topped first by red deer bones with some snail shells, and then, nearly 4,000 years later, by tuna bones.

**Snails** and other shell-dwelling mollusks are nature's "fast foods"—easily gathered and conveniently packaged. Discarded shells—heaps that are found all over the world, make a convenient record for archaeologists to study. In Frankthi cave in Greece, shown here, snail eaters piled huge residues nearly 13,000 years ago. Many ancient mollusks were bigger than modern species, which suggests that people were already selecting and encouraging large varieties.

## A Conservative Revolution?

The archaeologist Martin Jones has suggested a speculative but attractive way of making sense of the competing theories about how agriculture started. In warming environments, where climate change threatened settled foragers' stands of crops, they would be bound to take increasing care of those crops to preserve their existing way of life. They would weed them, tend them, water them, winnow them to encourage the most high-yielding specimens, channel water to them, and even end up transplanting them to more favorable spots. They would adopt similar practices to conserve the creatures they hunted, gradually managing their grazing grounds ever more zealously, until eventually the humans and the species they ate became locked in mutual dependence—each unable to survive without the other. A conservative trait—a strategy of survival and resistance against change—ended by transforming the environment and committing people to a new way of life.

*"So gathering, hunting, herding, and tillage, which our conventional chronologies usually place one after the other, were in fact complementary techniques to obtain food. They developed together, over thousands of years, in a period of relatively intense climatic change."*

## In Perspective
## Seeking Stability

So gathering, hunting, herding, and tillage, which our conventional chronologies usually place one after the other, were in fact complementary techniques to obtain food. They developed together, over thousands of years, in a period of relatively intense climatic change. The warming, drying effects of the post–Ice-Age world multiplied the opportunities and incentives for people to experiment with food strategies in changing environments. Foragers turned to farming and herding by slow stages and one case at a time, as relationships between people and other species changed and accumulated little by little. The naturalist David Rindos described early farming as a case of human–plant symbiosis, in which species developed together in mutual dependence, and—in part at least—evolved together: an unconscious relationship. Eventually, foodstuffs developed that needed human involvement to survive and reproduce. For instance, emerging kinds of edible grasses, maize, for example, would not survive because their seeds would not fall to the ground unless a person took the seeds out of their husks.

The continuities in the worlds of the food procurers and early food producers are in many ways more impressive than the differences. The settled way of life, the art, the religious cults, even the kinds of foods

## Chronology

| | |
|---|---|
| 15,000 B.C.E. | End of Ice Age |
| 13,000–14,000 B.C.E. | First permanent settlements in Middle East |
| 11,000 B.C.E. | Appearance of Jomon culture, Japan |
| 10,000–5000 B.C.E. | Mixed farming and potato cultivation develop (South America) |
| 9000–7000 B.C.E. | Farming towns appear in Anatolia and Egypt |
| 8000 B.C.E. | Rye and barley cultivation in Jordan and Syria; farming spreads from Jordan and Anatolia to Central Asia |
| 7000 B.C.E. | "Trinity" of maize, beans, and squash develops in Andes; farming spreads in Egyptian Sahara and Nile valley; evidence of agriculture in Indian subcontinent; earliest evidence of agriculture in New Guinea |
| 6000 B.C.E. | Rice cultivation in India, Southeast Asia, and China |
| 4000 B.C.E. | Scythians domesticate the horse and invent wheel and axle; Indo-European languages spread as migrants from Asia colonize Europe; millet farmed in Yellow River valley, China |
| 5000–2000 B.C.E. | River valley civilizations flourish |
| 3000 B.C.E. | Teff cultivated in Ethiopia; Bantu languages and agriculture begin to spread southward from West Africa; earliest specimens of cultivated maize (Mexico) |
| 1000 B.C.E. | Maize cultivation moves northward from Mexico to southwestern United States |

(All dates are approximate)

(though obtained by different means) are often of the same order. The similarities suggest a new way to look at the transition to agriculture. We can see it as an attempt to stabilize a world convulsed by climatic instability—a way to cope with environmental change that was happening too fast and to preserve ancient traditions. In other words, the peoples who switched to herding or farming and those who clung to hunting and gathering shared a common, conservative mentality. Both wanted to keep what they had.

Perhaps, then, we should stop thinking of the beginnings of food production as a revolution, the overthrow of an existing state of affairs and its replacement by an entirely different one. Rather, we should think of it as a **climacteric**—a long period of critical change in a world poised between different possible outcomes. Indeed, the concept of a climacteric can be a useful way to understand change. It is worth keeping it in mind throughout the rest of this book as we confront other so-called revolutions that were really uncertain, slow, and sometimes unconscious transitions. Yet if early farmers' motivations were indeed conservative, in most cases they failed to maintain the status quo. On the contrary, they inaugurated the spectacular changes and challenges that are the subject of the next chapter.

## PROBLEMS AND PARALLELS

1. How was husbandry, with its emphasis on "unnatural selection," the first human challenge to evolution?
2. Why would some societies (such as the aborigines of Australia), with the ability to engage in agriculture, continue to live a hunter–gatherer lifestyle? What are the disadvantages of farming compared to foraging?
3. What was life like in preagricultural settlements? How did agriculture affect the pace of change in human society? Why were agricultural settlements less stable than foraging communities?
4. What are the relative benefits of farming and herding? Why was violence between farmers and herders common until recently?
5. What were the prerequisites for early agriculture? Why were alluvial plains the most hospitable environment for early agricultural communities?
6. Why did farming start at different places and at different times around the world? What are some of the rival theories advocated by scholars?
7. Why is the beginning of food production more of a climacteric than a revolution?

## READ ON ▶ ▶ ▶

The lines of the argument are laid down in F. Fernández-Armesto, *Near a Thousand Tables* (2002). The method of classifying events in environmental categories comes from F. Fernández-Armesto, *Civilizations* (2001). Indispensable for the study of the origins of the agriculture are J. R. Harlan, *Crops and Man* (1992); B. D. Smith, *The Emergence of Agriculture* (1998); D. Rindos, *The Origins of Agriculture* (1987); and D. R. Harris, ed., *The Origins and Spread of Agriculture and Pastoralism in Eurasia* (1996). K. F. Kiple and K. C. Ornelas, eds., *The Cambridge World History of Food* (2000) is an enormous compendium.

I. G. Simmons, *Changing the Face of the Earth: Culture, Environment, History* (1989) is a superb introduction to global environmental history, as is B. De Vries and J. Goudsblom, eds., *Mappae Mundi: Humans and Their Habitats in a Long-term Socio-ecological Perspective* (2004).

The quotation from Darwin comes from his work of 1868, *The Variation of Animals and Plants under Domestication.*

On feasts, M. Dietler and B. Hayden, *Feasts: Archaeological and Ethnographic Perspective on Food, Politics, and Power* (2001) is an important collection of essays. *Feast: Why Humans Share Food* (2007) by Martin Jones is entertaining as well as instructive.

O. Bar-Yosef and A. Gopher, eds. (1991), *The Natufian Culture in the Levant* is outstanding. On Çatalhüyük, up-to-date information is in M. Özdogan and N. Basgelen, eds. (1999), *The Neolithic in Turkey: The Cradle of Civilization*, and I. Hodder, *Towards a Reflexive Method in Archaeology* (2000); but the classic J. Mellaart, *Çatal Hüyük* (1967) is more accessible. On Jericho, the classic work is by Kenyon, *Digging Up Jericho; the Results of Jericho Excavations* (1957).

# THE BIG PICTURE

## The World in 5000 B.C.E.

The Ice Age was a dynamic time. But to us, who live amid convulsive change, it seems like an age of remarkable stability, continuity, and equilibrium. The retreat of the ice 20,000 years ago ended all that. Colonization quickened. Cultures diverged as communities tried different strategies for survival. From this point onward, societies could be classified in three types: hunters, who foraged for food, and herders and tillers, who produced it for themselves.

Hunters were the most successful survivors because they maintained their way of life relatively unchanged. Tillers (and to a lesser extent herders) had to embrace dynamic change: political change because they needed strong leaders to organize production and distribution of food; social and economic change because they needed large workforces and growing populations; changes in economic specialization and styles of living because ever larger populations had to be concentrated in relatively small spaces; changes in health and nutrition because of the need to survive on limited diets in a new disease environment; changes in warfare because they had to defend their flocks and fields or enlarge them at others' expense.

Yet more and more societies followed the tillers' example or adopted it independently, abandoning hunting or restricting it to elites. Peoples who remained loyal to hunting began to retreat into ever more marginal environments, to tundras, forests, and arid regions. The reasons for this withdrawal are hard to understand. To some extent, it was a simple matter of diminishing resources. As farming expanded, less game and land were available for hunting cultures. At another level, it was an effect of relative power. Though farming disrupted almost every society that adopted it, and often led to failure and collapse, it fed more people and generated more resources for war.

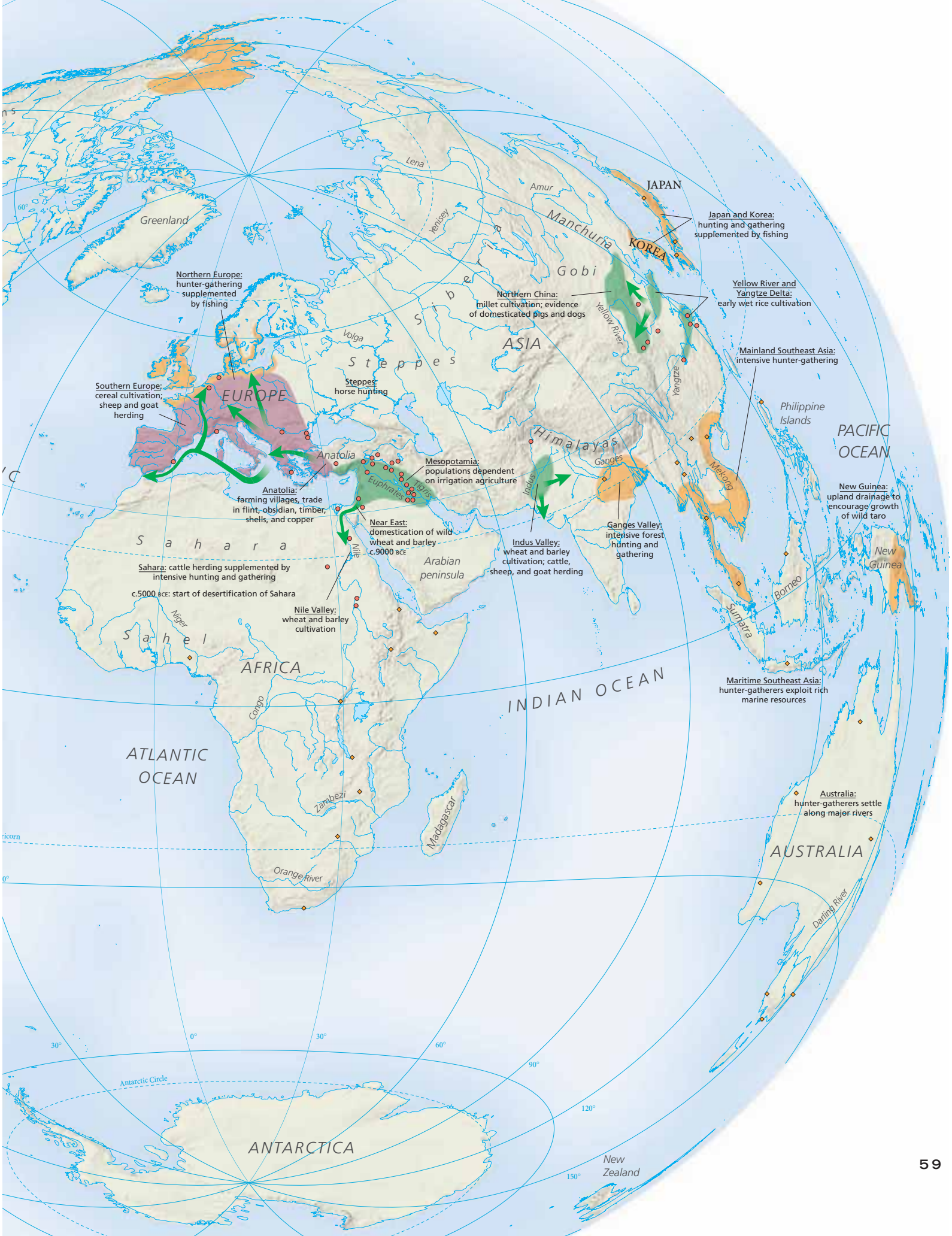
## QUESTIONS

**1.** How does this map show that gathering, hunting, herding, and farming were complementary techniques to obtain food? Does this perspective provide a new way to look at the transition to agriculture? If so, how?

**2.** If food production inaugurates change, which societies were the most poised for change in 5000 B.C.E.?

myhistorylab

To view an interactive version of this map, as well as a video of the author describing key themes related to this Part, go to www.myhistorylab.com


Northern Europe: hunter-gathering supplemented by fishing
Southern Europe: cereal cultivation; sheep and goat herding
Steppes: horse hunting
Anatolia: farming villages, trade in flint, obsidian, timber, shells, and copper
Mesopotamia: populations dependent on irrigation agriculture
Near East: domestication of wild wheat and barley c.9000 BCE
Sahara: cattle herding supplemented by intensive hunting and gathering
c.5000 BCE: start of desertification of Sahara
Nile Valley: wheat and barley cultivation
Northern China: millet cultivation; evidence of domesticated pigs and dogs
Japan and Korea: hunting and gathering supplemented by fishing
Yellow River and Yangtze Delta: early wet rice cultivation
Mainland Southeast Asia: intensive hunter-gathering
Indus Valley: wheat and barley cultivation; cattle, sheep, and goat herding
Ganges Valley: intensive forest hunting and gathering
New Guinea: upland drainage to encourage growth of wild taro
Maritime Southeast Asia: hunter-gatherers exploit rich marine resources
Australia: hunter-gatherers settle along major rivers
EUROPE
ASIA
AFRICA
AUSTRALIA
ANTARCTICA
JAPAN
KOREA
Greenland
Manchuria
Gobi
Steppes
Lena
Amur
Yenisey
Volga
Yellow River
Yangtze
Mekong
Ganges
Indus
Himalayas
Anatolia
Euphrates
Tigris
Nile
Niger
Congo
Zambezi
Orange River
Madagascar
Arabian peninsula
Sahara
Sahel
Philippine Islands
PACIFIC OCEAN
INDIAN OCEAN
ATLANTIC OCEAN
New Guinea
Borneo
Sumatra
Darling River
New Zealand
Antarctic Circle