

The World Transformed: From Hunter-Gatherers to Early Farmers

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Rock paintings at Tassili n'Ajjer in Algeria were made by cattle pastoralists who were able to occupy this region of the central Sahara during the fifth millennium BCE, when winter rains allowed grasslands to flourish.

In this chapter we cover the global transformation that followed the end of the last Ice Age, at around 9600 BCE (11,600 years ago). This involved massive environmental change. The warmer climate caused the ice sheets to retreat and the sea level to rise, drowning formerly extensive coastal lowlands. At the same time, plant and animal species were able to expand into new environments. Human societies responded to this warmer climate in several ways, one of the most significant being the development and spread of agriculture.

The domestication of plants and animals resulted in a growth in world population to far higher levels than were sustainable by hunting and gathering alone. Food production and demographic increase were accompanied by other changes, notably larger and more permanent settlements, more complex social organization, growing social inequality, and new technologies. But change was not restricted to farming cultures, and many hunter-gatherer societies also developed larger settlements, greater symbolic complexity, and more intensive subsistence practices as the postglacial period progressed.

- The beginning of the postglacial epoch saw rising sea levels caused by the retreat of the glaciers, which submerged land masses, such as the Bering land bridge between North America and Eurasia, Doggerland in Europe, and Sundaland in Southeast Asia.
- The warming climate allowed new forms of social and economic activity, including more intensive forms of hunting and gathering, and eventually agriculture, which arose independently in at least seven regions of the world.
- The reasons for the adoption of agriculture were diverse, including social competition and longer-term pressures toward food production imposed by demographic growth. Agriculture enabled much greater populations to be supported but involved more work and had many health disadvantages for individuals.
- Social complexity often accompanied the development of agriculture, but there are many examples of socially complex hunter-gather communities.

ENVIRONMENTS AND LANDSCAPES: 13,000–9600 BCE

At the end of the last Ice Age, around 11,600 years ago (c. 9600 BCE), temperatures began to increase. This warming process was not constant, but included intervals of temperature reversal and cooling. By around 13,000 BCE, summer temperatures had reached almost their present levels, but then temperatures went into dramatic reverse, and cold conditions returned for a further 1,000 years during the Younger Dryas phase (c. 10,800–9600 BCE). This was probably caused by the melting of the northern ice sheets, which released immense quantities of cold meltwater into the North Atlantic and weakened or stopped the warm conveyor belt North Atlantic current known as the Gulf Stream, which brings water north from the tropics. We will see in following chapters how human populations across the world reacted to this period of cold climate. At around 9600 BCE, warm conditions re-established themselves, with temperatures rising by 7°C (12.6°F) in only fifty years, ushering in what we call the postglacial epoch or the Holocene.



5.1 Rising sea levels at the end of the last Ice Age

drowned significant areas of low-lying land (shown here in a darker shade), especially in East and Southeast Asia and northwest Europe. One outcome was the formation of new islands: the Japanese archipelago; New Guinea; Borneo, Sumatra and Indonesia; Britain and Ireland. At the same time, the loss of productive lowlands must have had major regional impacts on human and animal populations.

The Early Postglacial Environment

The first 2,000 years of the postglacial period were a time of especially rapid change. Though summer temperatures had reached modern levels very early in this epoch (by c. 9000 BCE), the ice sheets took many centuries to melt, and sea levels were still more than 50 meters (165 feet) below those of the present. The melting of the ice sheets led to a rise in sea level, which drowned low-lying areas at a speed that must at times have been perceptible to human communities on a year-by-year basis [5.1].

In high northern latitudes, the melting of the ice sheets had a reverse effect. The removal of the weight of the ice caused land areas to rebound in a process known as **isostatic uplift**, which far outstripped the rise in sea level. In previously glaciated areas, early postglacial shorelines and coastal settlement sites of the period are now to be found well above sea level and far inland, whereas throughout most of the world, where there were no glaciers, the rising sea level drowned out coastal areas. As a result, in most regions, save where isostatic uplift has preserved early shorelines, the history of human coastal exploitation can be traced back only to some 5,000 years ago.

One notable effect of early sea-level rise was the creation of islands. The Japanese islands were separated from the Asian mainland, Tasmania from Australia, and Britain from continental Europe. East Asia and North America became divided by the flooding of the Bering Strait around 8500 BCE. In terms of geographical extent, however, the most dramatic of all late Pleistocene and early postglacial coastal losses occurred in Southeast Asia. Here the Pleistocene landmass known as Sundaland lost more than half of its land area to rising sea levels between 15,000 and 5000 BCE, resulting in the creation of the Southeast Asian islands [5.2].

By the time that sea-level rise began to slow appreciably (around 5000 BCE), the shapes of continents and islands were very much the same as in the present day. Although some former mainland communities now

isostatic uplift the rising of landmasses once the weight of the ice sheets has been removed

5.2 Islands of Indonesia

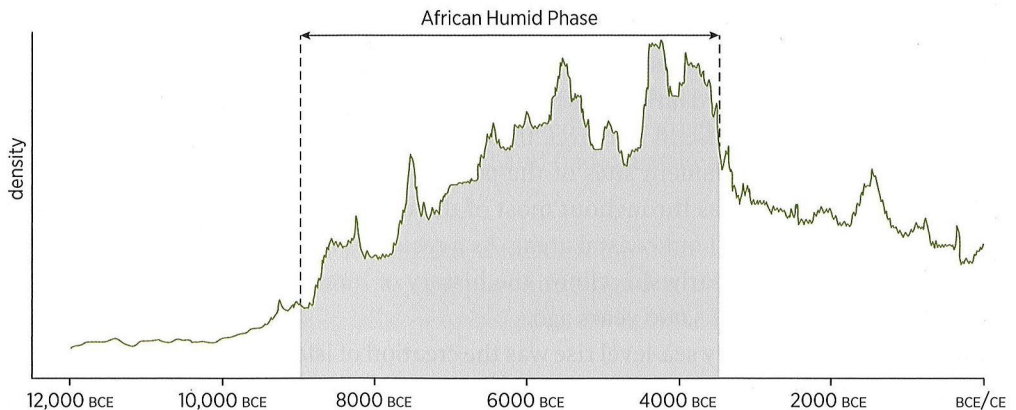
created by rising sea levels during the postglacial period.



5.3 Rock art in the Sahara. During the early postglacial period, North Africa experienced a wetter climate than today and much of what is now the Sahara Desert became dry grassland, punctuated in the south by extensive lakes. Rock art of the period depicts crocodile, elephant, and other animals now restricted to the sub-Saharan region. These are joined by images of herds of domestic cattle from the fifth millennium BCE (see pp. 94–95).



5.4 Postglacial climatic change. Evidence for the changing intensity of human occupation in the Sahara, reflecting variations in rainfall. The wetter Saharan climate of the early postglacial was reflected in growing density of settlement in the African Humid Phase c. 9000–3000 BCE, which ended with the reversion to arid conditions that have continued up to the present day.



found themselves living on islands, that only rarely resulted in cultural isolation. The human response to changes in sea level and island formation was usually more innovative, resulting in new strategies of marine exploitation and highly developed navigational skills. It was these that enabled Polynesian seafarers to discover and settle far-flung and often tiny islands of the Pacific during the first and early second millennia CE, as discussed in Chapter 11.

Tropical areas were also affected by postglacial warming. During the earlier postglacial period, the Inter-Tropical Convergence Zone, which carries rains through tropical Africa and via the monsoon systems across the Indian Ocean, moved farther north to pass over the Sahara. The southern Sahara became a region of lakes within an extensive savanna grassland, rather than the desert familiar to us today. By 9000 BCE, pottery-using fishers and hunters had settled this region. Only from 3000 BCE did climate patterns change and the Sahara begin to take on the desert-like character it has today [5.3, 5.4].

HUNTER-GATHERER TRAJECTORIES

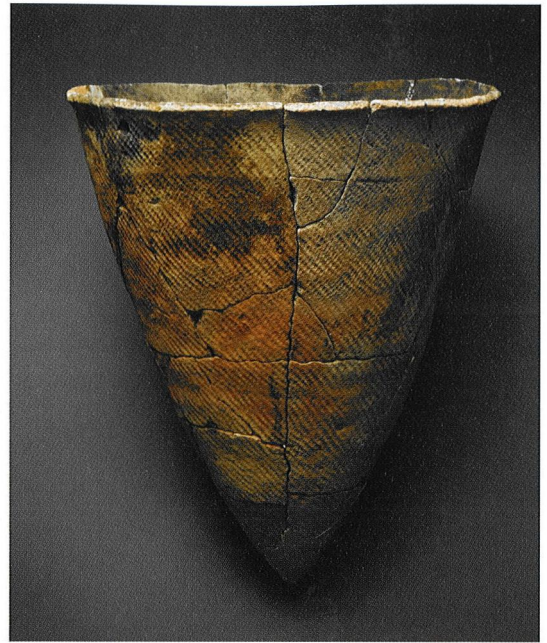
During the last Ice Age, human populations had been concentrated in tropical and sub-tropical zones, and those living in more marginal areas were severely constrained by the harsh glacial environment. The postglacial world, by contrast, offered enormous opportunities, especially to communities occupying or migrating into the temperate zones of North America, Europe, and Asia.

The technology and material culture of early postglacial groups were directly developed from that of their late Paleolithic forebears. **Microliths** were used to make composite tools, with flint or chert cutting edges inserted into wooden or bone hafts. In Europe, microliths are a distinguishing feature of the Mesolithic, the period between the end of the Paleolithic (the end of the last Ice Age) and the beginning of the Neolithic (characterized by the adoption of farming), although they had been used much earlier in Africa, where quartz and other fine-grained rocks formed the raw material.

Stone was far from being the only material worked and used by hunter-gatherers, although it is prominent in the archaeological record because it has survived so well. Where waterlogging or aridity allow the preservation of organic remains, wooden tools and implements and basketry containers are also found. Some hunter-gatherer communities also produced pottery vessels. The earliest known pottery vessels were made by hunter-gatherers of East Asia around 16,000 years ago [5.5]. Analysis of organic residues within the pots has shown that these vessels were used for processing marine resources. In an independent development, pottery was also invented by hunter-gatherer communities of the southern Sahara in the tenth millennium BCE, long before farming, where they may have been used for processing both freshwater resources and wild seeds.

Like their Paleolithic predecessors, early postglacial communities exploited resources by moving around their landscapes, generally in small groups, occasionally coming together in larger seasonal gatherings at places of abundant productivity. The geographical and seasonal distribution of resources dictated the size and spread of these human communities and set a limit to their numbers.

Generally, early postglacial communities gathered plant foods using stone reaping knives, or dug up tubers with digging sticks, and hunted with spears and bows. Yet already during the final stages of the last Ice Age, certain groups of hunters and gatherers had begun to exploit their environment in a new way, moving beyond collecting to the intentional management of some plant species. Among these were the Jōmon of Japan, who developed successful methods of exploiting wild plants and marine resources, which they maintained until past 1000 BCE, long after farming had become established in mainland China. In southwest Asia, Natufian hunter-gatherers (c. 12,500 to 10,200 years ago) used a strategy that exploited a wide range of resources and supported communities that, similar to the Jōmon, developed complex symbolism and ceremonial sites. The Natufians paid special attention to the wild cereals that grew in the hilly flanks of the Fertile Crescent, which were easy to harvest when they became ripe. They began to manipulate the wild wheat and barley, favoring those with larger seed heads, and those with seeds that remained attached to the seed head rather than shattering and scattering in the natural way. These were the first steps towards domestication



5.5 Pottery. Pottery vessels are fragile and heavy to transport, and in most regions appear only with sedentary farmers. The oldest, however, were produced by hunter-gatherer societies in East Asia, as illustrated by this example from the Initial Jōmon period from Shimoda shironaya in Aomori Prefecture, Japan.

microlith a small, standardized stone blade, originally set into a composite tool or weapon

and cultivation in southwest Asia, and similar developments occurred independently in other parts of the world, including China, where the main cereal species were rice and millet. Spreading from its origins in a number of separate regions, the shift from food collection to food production dramatically increased the human-carrying capacity of the planet. In the process, the landscape was transformed, as modest clearings gave way to fields, and forests were felled to provide farmland for ever-increasing human numbers.

The cultural and social complexity of hunter-gatherers should not be underestimated. The Jōmon of Japan, who carefully managed their food resources but never domesticated them, developed long-lived settlements comprising significant numbers of houses. Excavations at Sannai-Maruyama have uncovered remains of more than 650 houses, a huge post-built structure, a large cemetery, and some 1,800 clay figurines, although these remains span a period of 1,500 years (3500–2000 BCE) and only a few of the houses would have been in occupation at any one time. Other hunter-gatherers in productive environments, such as the societies of the northwest coast of North America, moved only once or twice during the year and had villages of substantial timber houses. Communities supported by hunting and gathering were also capable of major cooperative undertakings, such as the construction of the massive Poverty Point and Watson Brake mounds in Southeast North America. Poverty Point, involving the movement of 750,000 cubic metres of earth, is one of the largest prehistoric monuments in the world. Complex hunter-gatherers were therefore an important feature of the human past in both Eurasia and the Americas. Ultimately, however, agriculture became established in almost every region where conditions of climate and soils allowed, whether through indigenous domestication of local species, through the adoption of domesticated animals and plants from neighboring farming communities, or through the expansion of the farmers themselves.

TRANSITIONS TO AGRICULTURE

What Is Agriculture?

Agriculture is the system in which selected species of plants and animals are cultivated and reared by humans. It has two basic features. First is the selection of some plants and animals over others by humans. This leads to the second feature, which is the isolation of those selected species from their wild relatives. That ongoing process causes changes (intended and unintended) in the morphology of the selected plants and animals, and they often end up relying on humans for reproductive success. Agriculture also involves dramatic changes in human behavior and society, where humans become equally dependent on their domesticated plants and animals, most especially to feed and maintain the new population numbers that agriculture can provide. When describing early food production, a number of terms are used that have different, if overlapping, meanings.

- **Domestication** is a process that involves genetic changes in plants and animals as they become dependent on humans for reproductive success. Domestication may often be unintentional, resulting from continuing interaction between humans and wild species.
- **Cultivation** is a cultural phenomenon that involves intentionally preparing fields, and sowing, harvesting, and storing seeds or other plant parts. Cultivation required significant and deliberate changes in human technology, subsistence, and perspectives.

- **Herding**, similarly to cultivation, requires intentional changes in the relationship between humans and animals. It can take varying forms: herding close to a permanent settlement, as part of a mixed economy combining livestock and cultivation, or transhumant herding, where animals are moved between pastures on a seasonal basis (for example from summer uplands to sheltered lowlands for the winter). There are also **pastoral** communities where the emphasis is on livestock herding and plant cultivation plays only a minor role.

- **Agriculture** is a commitment to this relationship between humans and plants and animals. It ultimately involves changes in the human use of the earth and in the structure and organization of human society, including the extensive clearance of forest, the cultivation of hard-shelled cereals or root crops that can be stored for long periods of time, and the invention and adoption of new technologies for farming and/or herding (plows, field systems, irrigation).

pastoralist an individual or society depending primarily on the herding of domestic animals, often associated with a mobile or nomadic lifestyle

sedentism a residence pattern of permanent, year-round settlement

The adoption of agriculture required solutions to new problems, such as assigning greater investments of time and energy to clearing forests and constructing and managing storage facilities to keep the annual harvest. These solutions usually involved forms of **sedentism**: permanent, year-round settlement. The relationship between agriculture and sedentism may be too simplistic, however, as certain non-farming communities in favorable locations, such as the Jōmon mentioned above, already had relatively permanent settlements.

Hunter-gatherers often develop close relationships with key plant species that lead to practices verging on domestication. Aboriginal communities in Australia, for example, often replant parts of the yams that they dig up, and the Owens Valley Paiute of eastern California diverted streams so as to irrigate natural fields of water-meadow root crops. Hunter-gatherers were not simply passive bystanders in the history of plant and animal exploitation, but modified those species on which they relied, both intentionally and unintentionally. Furthermore, close relationships between humans and animals did not begin abruptly with the development of agriculture in the early postglacial period, but have a much longer history, stretching back into the Paleolithic. The first species to be domesticated was the dog. Remains of domestic dog that are more than 12,000 years old have been found at archaeological sites in Europe and East Asia. This animal, however, was a hunting aid rather than a food animal, and the development of fully fledged farming communities, where it occurred, marked a significant break with what had gone before.

Domestication

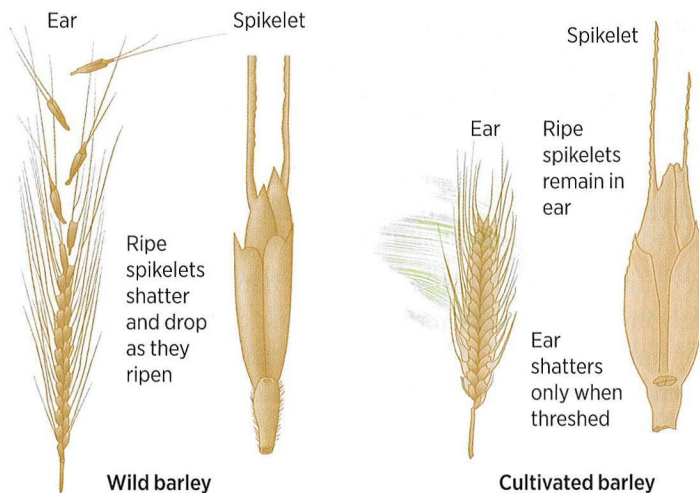
Domesticated animals and plants are predominantly subject to selection by humans. Farmers may, for example, prefer smaller and more docile individuals in a herd, or may breed new forms that have specially valued characteristics, such as thick wool or short horns.

In cereals such as wheat, rice, and millet, the first stages in domestication involved changes in the shape and size of the grains. For wheat and barley in Southwest Asia, grain size began to increase in the ninth millennium BCE. This stage could be described as semi-domestication, where human selection changes the plant's form, though the plant itself is not dependent on humans for reproduction.

Full domestication of plants involved morphological changes that meant the plants could no longer survive in the wild without human intervention. The most important change to cereals was in how the plants' seeds dispersed, or shattered [5.6, p. 102]. Grains that shattered

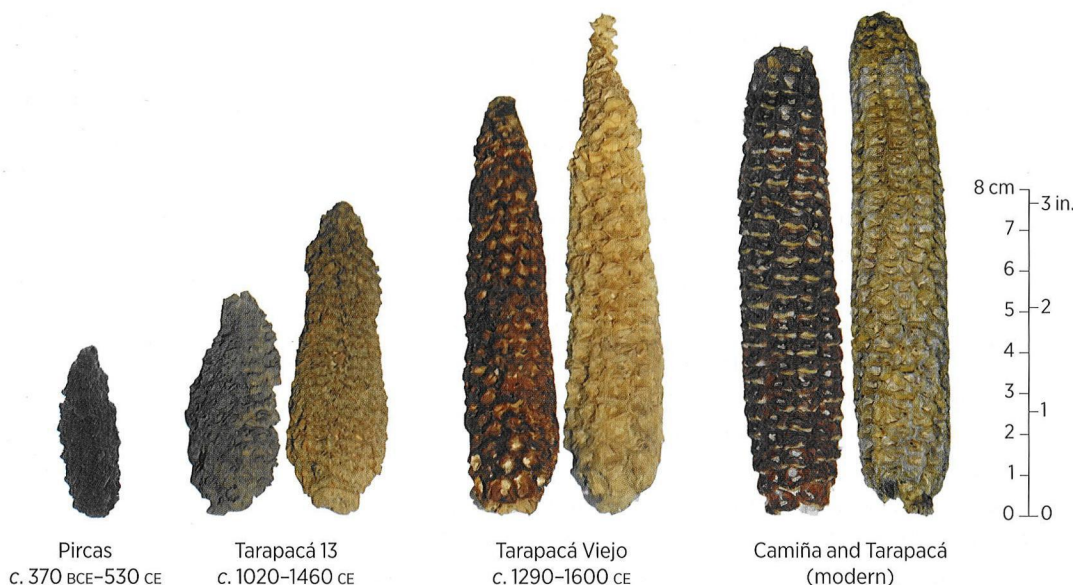
5.6 Wild and cultivated barley

The differences are slight, and the difficulty of identification is compounded by the fact that the archaeobotanist sees only fragments, never the complete ear, and the carbonized fragments have been distorted by being burned. The domesticated grains are a little fatter, and the rachis of the wild form is usually complete, while the tough rachis of the domesticated species of wild barley has to be broken by threshing.



5.7 Preserved maize cobs from prehistoric sites in the Atacama Desert of northern Chile

Early domesticated varieties were still small in size but had the advantage of kernels that remained attached to the cob when harvested. Over subsequent millennia, farmers developed larger maize cobs with more rows that steadily increased in size, first in the Americas before European contact, then later both in the Americas and beyond, eventually giving rise to modern varieties (far right, from Camiña and Tarapacá).



from the plants too soon (at the point of each plant called the **rachis**) would not be gathered by humans and sown the following season. Seeds of plants that tended to keep hold of their grains for longer were more likely to be gathered and planted by people, and this trait was therefore selected for in future generations. The eventual result of these changes was the emergence of distinct domesticated species. In Southwest Asia this process took a further 1,000 years to appear. It can have been only at that stage that sickles came systematically into use for harvesting the cereal heads. Full domestication is therefore the end result of a prolonged period of human–plant interaction and adaptation. In the Americas, the impact of selective breeding on grain size can be charted through time in preserved maize cobs from prehistoric sites in the Atacama Desert of northern Chile [5.7].

The success of the new food-producing economy, based on effective combinations, or packages, of domestic plants and animals, led to its relatively rapid expansion at the expense of hunting and gathering. As a consequence, plant and animal species were carried by humans to areas far beyond the geographical range of their wild ancestors.

rachis the tiny stalk that connects the cereal grain to the ear in plants, such as maize, wheat, and other cereals

Aside from the domesticated species themselves, cultivation, herding, and agriculture leave a range of other archaeological traces. We see combinations of technologies of cultivation (grindstones, sickles, storage facilities, and plows), and technologies of the landscape (field systems, forest clearances, terracing, and irrigation).

The Geography of Domestication

Only certain species of plants and animals are capable of successful domestication and of being combined into a full farming economy. Such animal domesticates include a few large terrestrial herbivores, notably sheep, goat, cattle, pig, horse, camel, water buffalo, and llama, and a few smaller herbivore and bird species, including chicken, turkey, rabbit, and guinea pig. These represent only a tiny percentage of the total available species, and it has been argued that of the 148 available big terrestrial herbivorous mammals, only fourteen have been successfully domesticated. Others do not breed readily in captivity or are very difficult to herd and manage.

Domesticated plant species are more numerous. Especially important among these plants are the large-seeded grasses: wheat and barley in Southwest Asia (Chapter 7); millet and rice in East Asia (Chapter 9); maize in Mesoamerica (Chapter 16); and pearl millet in Africa (Chapter 13). Along with root crops, such as manioc, yams, and potatoes, these constitute the staples that have proved an excellent source of carbohydrate and are grown in many parts of the world today. Successful farming economies, however, needed to combine these carbohydrate-yielding staples with sources of protein from pulses (beans, peas, and lentils) or animal products.

Research in recent decades has confirmed that agriculture arose independently during the postglacial epoch in at least seven different regions of the world—Southwest Asia, East Asia, the New Guinea highlands, sub-Saharan Africa, Andean South America, Central Mexico, and the eastern United States—at different times. Why should this have occurred?

Why Agriculture?

Early writers assumed that agriculture brought such clear advantages that the only obstacle to its development had been lack of knowledge: the earliest human societies did not have sufficient understanding of the plants and animals around them to undertake their domestication. It was envisaged that once invented, agriculture spread rapidly among prehistoric human communities, its progress stalling only where hostile environmental conditions intervened. This theory condemned hunter-gatherers to a marginal existence.

The assumption that hunter-gatherers were constantly threatened by starvation was emphatically refuted by a number of ethnographic studies. In one famous example, the anthropologist Richard Lee showed that among the Kalahari San of southwest Africa, population levels were kept well within the capacity of the available food supply. For the most part, the San had copious wild resources on which to rely and enjoyed far more leisure time than peasant agriculturalists or, indeed, than working adults in industrialized societies. The Danish economist Ester Boserup demonstrated the increasing amounts of labor that farmers needed to invest in order to increase the productivity of their fields. More intensive agriculture can feed more people, but at a cost of much greater labor input per person, since if a plot of land is planted more frequently, with shorter and shorter fallow intervals between, it is necessary to devote an increasing amount of agricultural labor to weeding, fertilizing, and irrigating the crop. This contested the widely held view put forward by Thomas Malthus,



5.8 Dental cavities in an adult found at Çatalhöyük, c. 7100 BCE. The increased consumption of carbohydrates from a cereal diet led to more cavities in teeth.

the English economist and demographer, in the eighteenth century, by showing that the threat of starvation does not necessarily cause people to limit their population growth; they can choose to increase the amount of food that is produced by increasing their labor.

The development of agriculturally based societies also had an adverse impact on human health. The reliance on a narrow range of cultivated plants in particular led to an increased incidence of dental decay [5.8] and nutritional deficiencies, and a decrease in average stature.

Such studies presented agriculture as an undesirable strategy that demanded greater labor input, so scholars began to look at factors that might have *forced* communities to adopt it. The two most frequently cited have been demographic increase and environmental change, or a combination of the two. Alternatively, it may have been that competition within societies played a significant role in the development of agriculture. Ethnography shows that social status and power are frequently achieved through establishing relations of indebtedness or dependency via principles of reciprocity. One of the most common ways that ambitious individuals seek to gain power and status is by throwing feasts, which create indebtedness among those who attend but cannot reciprocate. Feasting is a conspicuous public display of wealth and status, and generates a powerful incentive for ambitious individuals to increase their food resources. Many of the first **cultigens** may have been chosen for their value as luxury foods, and some, such as the chili peppers that are among the earliest domesticates in highland Mesoamerica, can hardly have played a role in fending off starvation, for they are flavorings or additives. Cultivation may, therefore, have been adopted in part in order to provide the specially valued kinds of food and drink deployed in competitive strategies.

Agriculture was possible only during the postglacial period. Ice Age climates were both too cold and too climatically unstable (with short-term oscillations) for the development of agricultural economies, even in warmer regions, such as Central Africa. Postglacial climates, by contrast, were sufficiently stable to allow the evolution of agriculture in vast areas that benefited from relatively warm, wet climates, or access to irrigation. Whatever the mechanism, more food allowed for population growth, which must quickly have passed the threshold of what could be supported by hunting and gathering.

The reasons for the adoption of agriculture were likely diverse, and probably included both strategies of social competition and longer-term pressures toward food production imposed by demographic growth that occurred in the postglacial world. Once the severe environmental constraints of the last Ice Age had relaxed, the intensification of relationships between human communities and their plant and animal food sources might be regarded as both inevitable and unsurprising.

Not all communities adopted agriculture, though, even when successful domestic species were easily within reach. We return again to the Jōmon hunter-gatherer populations in Japan, who maintained a sophisticated non-agricultural lifestyle long after farming had become established in Korea and China. That does not mean that they did not manipulate and manage their environment and food resources. On the contrary, there is clear evidence that they did. One striking illustration is the intentional transport of wild boar to such islands as Hachijō and Hokkaido, where they were not native. These interventions did not amount to domestication, however, and the agricultural transition came only in the fourth century BCE, at the end of the Jōmon period, when wet rice cultivation was introduced from the adjacent mainland.

cultigen a plant or crop cultivated by humans, as opposed to wild species

EXPANSION OF DOMESTICATION

Archaeology has shown that agriculture was developed independently in a few geographically dispersed centers of origin throughout the world [5.9]. While there are important regional variations, the dominant pattern during the postglacial is of the spread of domestication and the reduction of hunting and gathering, so much so that within the last few centuries hunting and gathering has mostly been restricted to marginal areas where farming is impossible, such as arid deserts or the frozen Arctic. The expansion of domesticates was particularly rapid across Eurasia, where east-west similarities in climate and day length imposed few constraints on the successful transfer of cultivated plants to new areas. Farming spread much more slowly north and south through the Americas and sub-Saharan Africa, where tropical forests and greater climatic variations intervened.

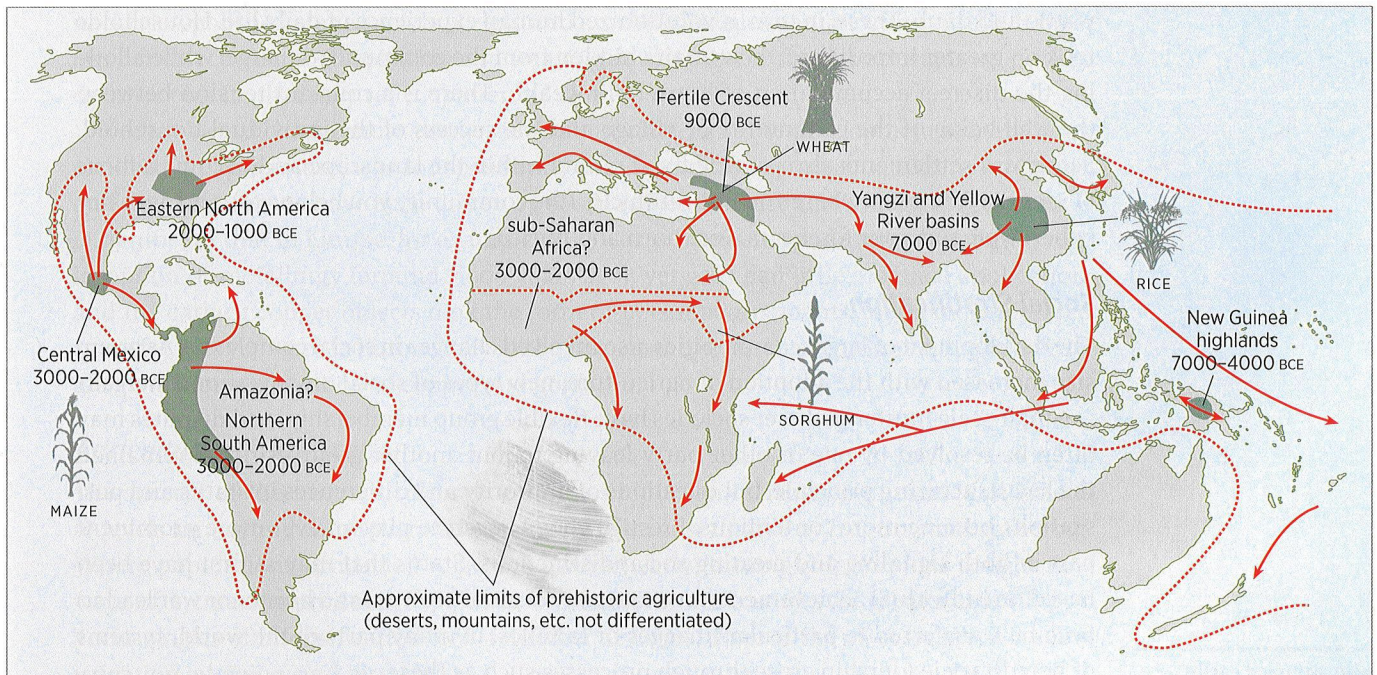
The two major causes of farming spread were its adoption by hunter-gatherers from their neighbors and the displacement of hunter-gatherers by expanding farmers. It is generally difficult to distinguish between these alternatives from archaeological evidence alone. Farming holds a demographic advantage over hunting and gathering, since it is able to support many more people per unit area, and where farmers and hunter-gatherers came into conflict over land, it was the former who usually prevailed.

Attempts have been made to associate the distributions of language families with demographic expansions that might be the consequence of farming. It is argued that the geographical patterning of related groups of languages, or language families, around the world might reflect the expansion of the initially small farming communities that spoke the ancestral forms of those languages. This approach has been applied with varying degrees of success in different regions of the world.

Such broad-scale models of farming spread have become popular in recent years, but evidence exists in many areas that farming may have been preceded or accompanied by

5.9 The origins and spread of agriculture.

Agriculture was developed independently in several regions of the world at different times during the postglacial period. From these core areas, the productive new economy spread eventually to adjacent regions, allowing the development of more populous societies and leading ultimately to the demise of hunting and gathering in most of the world.



small-scale local adjustments through which postglacial communities responded to their changing environments. The pattern of subsistence change, therefore, may have been much more mosaic-like in character than is sometimes supposed. Nonetheless, a growing body of DNA analysis indicates that in many parts of the world, farming was introduced by colonist farmers and involved substantial movements of population. Genetic studies also confirm the rapid increase of human populations following the introduction of agriculture. Analysis of skeletal evidence at a global scale supports that, revealing what has been termed a Neolithic Demographic Transition, with much higher percentages of juvenile individuals represented among the dead than in previous hunter-gatherer populations. This indicates an increase in fertility and birth rate among early farming populations.

THE CONSEQUENCES OF AGRICULTURE

The consequences of agriculture were more than simply increased populations. Farming communities often involved different ways of living, which manifested in various ways, including settlement, material culture, and social stratification. It is important to mention here again that settled life and social stratification were not exclusive to farming communities but became more common with the development of farming.

Settlement

Most farming communities are distinguished by being sedentary, their members living in permanent farmsteads or villages that are occupied year-round. This required a shift from traveling between food sources to collecting food and bringing it back to a central place. The ability to store food is an important part of this change, and storage pits and ceramic containers are prominent features of both farming societies and sedentary hunter-gatherers.

The permanence of farming settlements encouraged greater investment in individual houses, which might be substantial structures built of timber, stone, mud brick, **pisé**, or wattle and daub. These, in turn, revolutionized human experience of daily life. Households took on greater importance, their affairs hidden from the community at large, while allowing the discreet accumulation of household wealth. There is a constant tension between the well-being of the community or village and the success of the individual household. Sedentary settlements also provide fixed points within the landscape and become a focus of identity (the place where you live), ethnicity (the community you belong to), and ancestry (where you and your forebears were born and buried).

Social Stratification

The development of larger communities also involved changes in social complexity. As group size increased with the adoption of agriculture, new types of social organization emerged.

Small-scale hunter-gatherer societies have flexible group membership, and disputes may often be resolved by one or other party leaving to join another group. Kinship remained the key structuring principle, but questions of authority and differences in status and possessions became more contentious. Prestige goods began to play an ever more prominent part in both signaling and creating social distinctions. Status that may at first have been based on individual achievement (for example, personal prowess as a hunter or war leader) became transferred to particular lineages or families. In many parts of the world, systems of hereditary leadership arose through processes such as these.

pisé rammed earth

But social complexity is not restricted to hereditary leadership. Rather, it takes many forms and is not the exclusive preserve of farmers, and evidence shows that cultural and ritual changes sometimes preceded the adoption of agriculture. A key site is Göbekli Tepe in southeast Turkey (see Chapter 6), where carved and decorated T-shaped pillars were set up in so-called shrines in the tenth millennium BCE by people who had begun cultivating cereals, though at this early stage they were more wild than domesticated in form. It has been argued that the new ideologies or religious beliefs represented here may have facilitated the gradual transition to an agricultural lifestyle. Recent discoveries in Southwest Asia more generally suggest that, in a reversal of the usual sequence, it was hunter-gatherers that came together in the first big, permanent communities to form extensive settlements, which only later needed to be fed by farming.

It is nonetheless clear that the higher population densities that agriculture could support, and the greater potential for generating a storable surplus, led in many regions to increasing inequalities in social status. These differences become manifest in the archaeological record through the evidence from graves and houses. Powerful and prosperous families may build grander houses than their neighbours, while differences in wealth and status can be expressed by the size and elaboration of a grave or burial monument, and by the objects that are placed with the dead. Underlying these more unequal societies are higher densities of populations and levels of food production, all stemming ultimately from the adoption of agriculture in different regions of the world.

Material Culture

Changes in material culture were an integral part of the transformation of human societies that involved the adoption of agriculture. Sedentism in itself allowed the accumulation of material goods, and the increasing adoption of containers made of pottery—heavy and fragile to transport—was a part of this trend. Yet many of the most conspicuous items of material culture were designed to be worn or carried on or around the body: beads and necklaces, polished stone axes, bracelets, and amulets. Textiles, too, are attested, albeit most often indirectly through spinning and weaving equipment, or from the designs on pottery or other objects that may reflect patterned cloth.

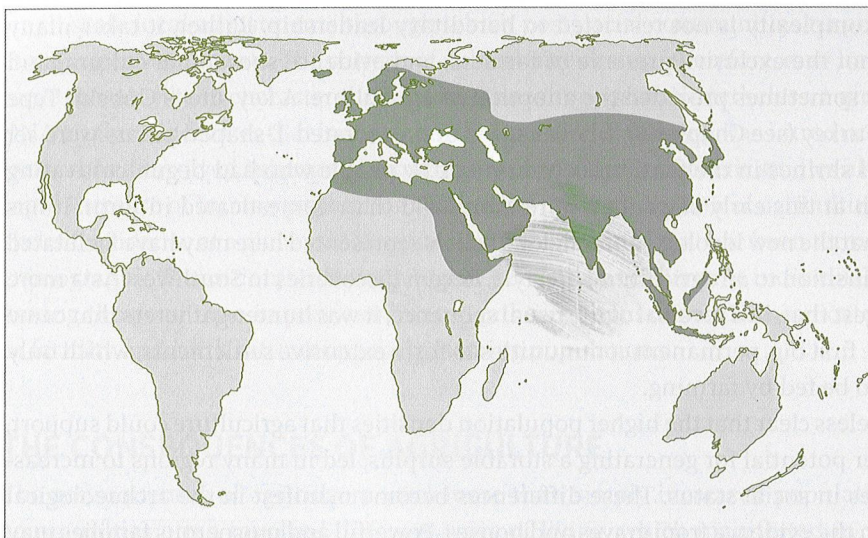
Technological change must also be viewed in social terms. The development of metallurgy, similarly to agriculture, was independently discovered in a number of different regions, and it too appears to have been driven by social rather than economic or technical need. It is significant that in Europe, for example, gold was worked alongside copper from the very inception of metallurgy (around 7,000 years ago), yet gold had little practical application, and the earliest copper objects took the form of personal ornaments. Metal tools replaced stone for everyday use in Europe only in the late second or first millennium BCE, 4,000 years after the first exploitation of copper and gold.

Agricultural Intensification

The success of the new agricultural economies led to an increase in human populations to levels far beyond those that had previously been sustainable by hunting and gathering. Where populations continued to grow, however, early farming communities sought new ways of increasing productivity, almost inevitably at the cost of ever greater labor input. Technologies of intensification took a number of forms, three of the most significant being irrigation, plowing, and terracing.

5.10 Plow agriculture.

The development of the plow from the fifth millennium BCE was restricted to areas of Africa and Eurasia where domestic cattle provided a suitable source of traction (indicated by the darker shading). Elsewhere—in southern Africa beyond the tsetse fly belt, and in the Americas where there were no suitable traction animals—cultivation continued to rely on human labor and the hoe.



5.11 Agricultural terraces

cut into the steep sides of the mountains of Banau province in northern Luzon, the Philippines, increase the area of land available for cultivating rice.

Irrigation is a means of overcoming seasonal deficiencies in rainfall. It takes two primary forms: a) the storage of rainwater or floodwater in tanks and basins, and its release to the fields by a system of canals (for example, the traditional receding flood agriculture of the Nile Valley in Egypt); or b) the distribution of river water to the fields via canals (such as the irrigation agriculture of early Mesopotamia or coastal Peru). The cost implications of irrigation agriculture lie in the heavy labor input needed for the construction of channels, banks, sluices, and reservoirs, and the need for constant cleaning and repair.



Plowing generally requires animal traction (although humanly pulled plows have sometimes been used). As a result, plow agriculture developed only in areas where suitable animals were available, and traditional systems can accordingly be divided into two types: hoe agriculture and plow agriculture. The latter covers the greater part of Eurasia and North and northeast Africa; the former, whereby people work the fields by hand, unaided by animal traction, is characteristic of southern Africa and the Americas before European colonization [5.10].

Terracing is designed to increase the area of cultivable land in rough or mountainous terrain by the construction of tiers of dry-stone walling to support fertile but often narrow and restricted fields; terraces also stabilize slopes and limit erosion. Agricultural terraces are sometimes combined with irrigation canals, and spectacular landscapes of terraced fields are found in Andean South America and the Philippines (Luzon) [5.11]; they were also a regular feature of Greek and Roman farming in the Mediterranean region. Much earlier agricultural terraces, however, have been discovered at Dhra', in Jordan, where terrace walls were built to conserve soil and control water around 6000 BCE.

SUMMARY AND CONCLUSIONS

As the ice sheets melted, temperatures and sea level rose, and human communities took advantage of the new opportunities, growing rapidly in numbers where conditions allowed that. In several regions, population increase and the availability of suitable local plants and animals led to new patterns of exploitation, which resulted in the development of agriculture. In several other regions, hunter-gatherers, too, developed larger settlements and social complexity.

The greater productivity made possible by food production, however, ensured the further growth of farming communities and the extension of farming (and in many cases colonist farmers) to wider and wider areas. It came to dominate the world far beyond the confines of the original habitats of the domesticated plants and animals. In favored regions, notably lowland river valleys, the potential for high agricultural yields was linked to the development of the first state societies.

FURTHER READING

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