altering them to suit at least some of them, at least for a while. The greatest such alteration, centered initially in Southwest Asia, was the development of grain farming. With farming, radically new possibilities for human life opened up and an agrarian era of deliberate, laborious food production dawned. Neither human history nor the earth would ever be the same.

II

SHIFTING TO FOOD PRODUCTION, 11,000–3,000 YEARS AGO

A few hundred domesticated species of plants and animals established a new intimacy with humankind when small groups of people, located in at least seven different parts of the earth, began to produce most (and eventually almost all) of the food they consumed by resorting to agriculture and herding. An enormous increase in the number of people and in the number of domesticated plants and animals followed, because mutual dependence allowed domesticated plants, animals, and humans to capture far more energy from the face of the earth than they had done before. Humans and some, but not all, of their domesticated animals also had to work harder, and by changing the environment more radically than before, created greater risks for themselves from famine, disease, and warfare.

Humans managed all these new relationships. Their acts and choices altered the traits and behavior of the plants and animals that submitted to domestication so radically that archeologists can usually distinguish bones and seeds of domesticated species from those of their wild relatives. Humans also altered their own behavior radically when tending gardens, fields, and herds became a daily routine; and, for all we know, some of our hereditary traits deriving from the long era of hunting and gathering may have been altered through selection for those who best endured laborious routines of farming.

Recent improvements in radiocarbon analysis allow reliable dating of even a single grain of wheat; and statistical analysis of pollen deposited in ancient bogs and lake bottoms can reconstruct ancient plant assemblages with great precision. Such methods, and careful archeological digging, have gone far to clarify the beginnings of agriculture in Southwest Asia,

Central America, and the eastern woodlands of the United States, but comparable precision for China, Southeast Asia, South America, and sub-Saharan Africa is only beginning to emerge. Table 2.1 summarizes recent results:

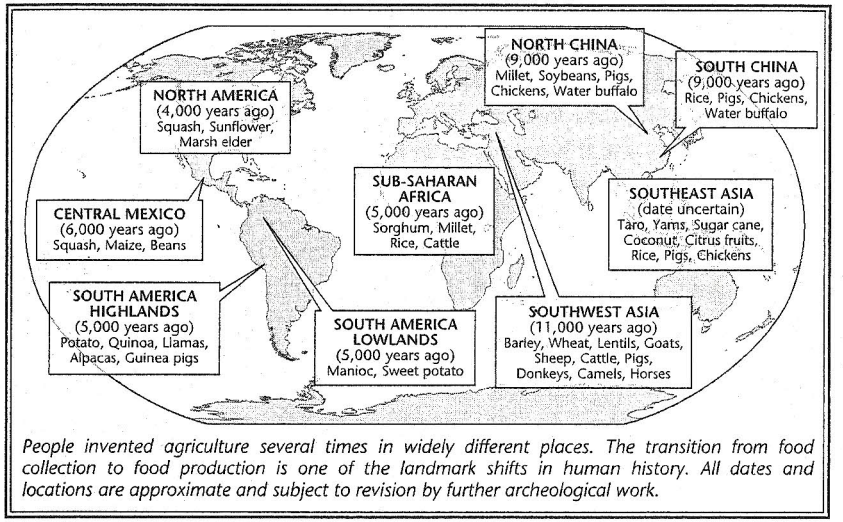
Table 2.1
Domestications of Plants and Animals

Date	Place	Main Crops	Main Animals
Uncertain	Southeast Asia	taro, yams, sugar cane, coconut, citrus fruits, rice	pigs, chickens
11,000–4,000 years ago	Southwest Asia	barley, wheat, lentils	goats, sheep, cattle, pigs, donkeys, camels, horses
9,000–6,300 years ago	China	South China: rice North China: millet, soybeans	pigs, chickens, water buffalo
6,000–4,000 years ago	central Mexico	squash, maize, beans	none
5,000–4,000 years ago	South America	lowlands: manioc, sweet potato highlands: potato, quinoa	lowlands: none highlands: llamas, alpacas, guinea pigs
5,000–3,000 years ago	sub-Saharan Africa	sorghum, millet, rice	cattle

Why and how farming started has been much debated ever since studies of contemporary hunters and gatherers in the 1960s showed that they spent only a few hours each day getting food, and enjoyed a far better diet than hardworking peasant farmers who depended on a single staple for nearly all their nourishment. Who, then, would ever wish to become a farmer?

What seems to have happened is that in unusually rich and diversified landscapes, communities of hunters and gatherers found it convenient to settle down for all or most of the year, whereupon already familiar methods for encouraging the growth of useful plants acquired wider scope than before. Hunters and gatherers had long been accustomed to using many different plants for different purposes. Plant fibers supplied clothing, nets, bow strings, and the like. Herbal medicines, poisons, and mood-altering drugs were highly valued; so was the nourishment that some plants

Map 2.1 Multiple Separate Inventions of Agriculture



People invented agriculture several times in widely different places. The transition from food collection to food production is one of the landmark shifts in human history. All dates and locations are approximate and subject to revision by further archeological work.

provided. Whenever communities settled down, it was convenient to have especially useful plants growing close by. Wherever soil and climate allowed selected seeds and cuttings to flourish in new locations, such gardens could then be expanded until they provided most and eventually almost all of the food and other vegetable products people required.

Understanding how plants reproduced was surely age old. But as long as wandering human bands consumed food as it became available and shared it among all their members, the extra effort needed to cultivate gardens was unattractive and, above all, storing seed for next year's harvest was impractical. Only when familial units became independent consumers of food could farming take off. Very likely, sedentary living brought on this change. It is easy to imagine that whenever individual women began to create gardens of useful plants around their dwellings, they developed a sense of personal and familial ownership on the strength of the sweat they expended and the proximity of the garden to their home. Only when this principle replaced the sharing ethos of wandering bands could gardening and farming develop.

But gardening did not expand solely because of deliberate human choices. Other factors almost surely played a critical role. More particularly, a settled way of life in unusually rich environments allowed families to support more than a single small child, whereas among roving bands of hunters and gatherers population growth was restrained by the fact that mothers could usually carry only one infant when moving from