

I.a.2 Hillel, Dan. “The Agricultural Transformation,” in Out of the Earth

“In toil shalt thou eat of the earth all the days of thy life.”

Genesis 3:17

The Biblical story describing the banishment of Adam and Eve from the Garden of Eden may be taken to symbolize humanity’s transformation from the carefree “child of nature” hunting-gathering-wandering phase of existence to a life of toil and responsibility as permanently bound tillers of the soil. The actual initiation of settlement appears to have begun in the Late Paleolithic (sometimes called Mesolithic) period that preceded the advent of farming by several thousand years. On finding a particularly favorable location, a clan of humans would naturally tend to prolong its stay there so as to take advantage of its favorable conditions. Those conditions might include an assured supply of water, a relative abundance of game or of edible plant resources, access to useful raw materials such as flint or wood, a benign climate or shelter against inclement weather, as well as safety or protection against potential enemies.

The process of intensification of land use can be seen as an adaptation to increasing population pressure. Several millennia of occupation by hunter-gathers, even at a very low density and slow rate of population growth, could have filled up the terrain and decimated the natural forageable resources to the population between migration and some form of intensification aimed at inducing the same area to yield a greater supply. Free hunting would be supplanted by manipulative hunting, based on the use of fire to modify the vegetation, or of various stratagems to lure and trap a greater number of animals. The next step would be the selective eradication of undesirable species and the encouragement of desirable ones, leading eventually to herding and domestication. Similarly, selective manipulation of plant communities would involve suppressing some species and promoting the growth of others. The entire series of activities would quite logically lead to plant domestication and propagation, and to purposeful land and soil management aimed at creating favorable conditions for crop production--that is to say, these activities would culminate in the development of agriculture and the agricultural way of life.

The Agricultural Transformation is very likely the most momentous turn in the progress of humankind, and many believe it to be the real beginning of civilization. Often called the Neolithic Revolution, this transformation apparently first took place in the Near East between 10,000 and 8,000 years ago, and was based on the successful domestication of suitable species of plants and animals. The ability to raise crops and livestock, while resulting in a greater and more secure supply of food, definitely required attachment to controllable sections of land, and hence brought about the growth of permanent settlements and of larger coordinated communities. The economic physical security so gained accelerated the process of population growth and necessitated further expansion and intensification of production. A self-reinforcing and self-perpetuating pattern thus developed, so the transition from the nomadic hunter-gatherer mode to the settled farming mode of life became in effect irreversible.

Compared to the long period of two or more million years during which our ancestors were hunters and gatherers, the brief interval of two thousand or so years required to accomplish the Agricultural Transformation over most of the region known as the Near East seems almost instantaneous. But why did humans suddenly give up their long natural existence as hunters and band both physically and culturally together in larger and larger groups, thus presaging the closely packed and often unhealthful cities that ultimately became the characteristic mode of life in much of the modern world? How did the sedentary life become so universally appealing that it was so quickly adopted by people in practically all regions of the world? And why did this momentous transformation first take place in the Near East of all regions? What was the natural setting in which the fateful change was initiated? These are questions to which we still have only partial answers.

Clearly, the old stereotypic portrayal of the Late-Paleolithic pre-agricultural people as ignorant savages is erroneous. We have much evidence, both historical and derived from present day hunter-gatherers, to prove that their understanding of the environment within which they lived was sophisticated indeed. No doubt they

knew a great deal about the life cycles of plants and animals, for instance, as their livelihood depended on that knowledge. In a real sense, therefore, they were professional botanists and zoologists.

Contemporary or recent hunter-gathers, such as the Bushmen of Southern Africa, the Panare of Amazonian Venezuela, the Kinka of the Sudanese Sudd, the aborigines of Australia, still maintain and utilize the rich lore amassed by countless generations of their forebears. They know not only how to distinguish nutritious plants from those that are non-nutritious or poisonous, and how to detoxify harmful vegetable products, but also how to use plant-derived drugs, narcotics, arrow poisons, gums and resins, glues, dyes and paints, as well as fibers for spinning ropes and for weaving mats, baskets and cloth. Thus the reason they did not, for so long, choose to take up agriculture is either that they had no need to do so or that local conditions were not conducive. As long as the population remained low enough so that the carrying capacity of the habitat was not exceeded, humans could continue to subsist as gatherers and hunters and were under no compulsion to change their traditional mode of life.

Some anthropologists and prehistorians have argued that hunting and gathering was an easier and healthier lifestyle than permanent farming, so the transition to the later may actually have been disadvantageous, rather than immediately advantageous as it has often been portrayed. Reliance on farming imposed a monotonous diet of grain and a few other edible crops, instead of the rich and varied nutrition which could be obtained by hunting and gathering. Furthermore, life in larger groups residing in dense settlements increased the incidence and spread of contagious diseases, and may thus have shortened the average longevity. The contrary and still the more prevalent view is that the advent of agriculture ensured a supply of food, and freed humans from the need to roam endlessly over the countryside in search of edible wild plants and animal prey. Moreover, since the early farmers domesticated animals as well as plants, their diet may have been no worse, and in some cases, better, than that of hunter-gatherers. Finally, stable communities provided more secure conditions for rearing children.

Notwithstanding the arguable disadvantages of the original Agricultural Transformation, the fact remains that this change did occur, that it was rather rapid, and that it was essentially irreversible. Hence, ipso facto, it must have been advantageous overall, though it certainly created its own problems. There must have been something in the condition of humans that impelled that transformation once it became possible. That something may well have been an antecedent increase in human population density following the use of tools, weapons, and techniques that had increased the efficiency of hunting and gathering to the point where human groups were depleting the supply of game animals and edible wild plants within the areas available to them.

The advent of farming itself could not have been a sudden discovery or invention by some individual genius. Rather, it must have been the culmination of a long series of observations and trials by numerous generations of humans transmitting and augmenting their experience and methods, until the knowledge, technology and circumstances were ripe for the seminal transformation.

At different stages, separate and very likely independent developments took place in other centers, each with its own selection of crops. Among these centers are Sub-Saharan Africa, East Asia (China), Southeast Asia and Oceania, and the Americas.

The process of plant domestication and the evolution of crop plants from their wild progenitors is a fascinating topic of study, made progressively more difficult by the globally accelerating destruction of natural habitats and of native plant communities. By domesticating plants and developing crops, humans created biological artifacts that could no longer thrive autonomously without constant care. Reciprocally, humans had become so dependent on their crops that, in effect, their crops had domesticated them.

The domestication of animals occurred as a consequence of hunting, not necessarily in conjunction with the domestication of plants. Consequently, the herding of animals and the husbandry of crops were in some places complementary, and in other places divergent, activities. The benefits of animal domestication were obvious--

secure supplies of meat, milk, fur, leather, wool, and even bones and horns for tool-making. Animal manure could serve to fertilize crops. Larger animals could also assist in the performance of laborious tasks and in transportation. However, the cost in terms of human labor was high. Human herders needed not only to feed and breed their animals and to confine them to prevent their escape, but also to protect them against predators, diseases, and climatic vagaries. This required a level of planning, commitment, and consistence never before undertaken by humans. Consequently, both the domesticated animals and their keepers developed a mutual dependency.

Pastoralists were able to exploit niches marginal to the agricultural zone, like patches of scrub and grass at the edges of fields and paths, as well as semiarid hill lands peripheral to the river valleys that became the centers of cultivation. Such extensive utilization of patchy and seasonal pastures required moving the animals periodically from one place to another, a mode called transhumance. The roving pattern could become especially extensive in drought-prone regions, where the sparse growth of forage, and the paucity of water, require graziers to roam almost constantly in search of sustenance for their flocks, thus assuming a nomadic life.

As agriculturists, human beings began to affect their environment to a greater degree than ever before. They cleared away the natural ecosystems of increasingly large areas, until they eventually altered entire regions. Their success as measured in terms of population growth, was considerable, but this success sometimes resulted in the practically irreparable degradation of the once-bountiful environment in which agricultural development began.

The Agricultural Transformation radically changed almost every aspect of human life. Food production and storage stimulated specialization of activities, and greatly enhanced the division of labor which had already started in hunting-gathering societies. The larger permanent communities based on agriculture required new forms of organization, both social and economic. Domestication undoubtedly affected family structure and the roles and status of men, women, and children. With permanent facilities such as dwellings, storage bins, heavy tools, and agricultural fields came the concept of property. Specifically, private ownership of land may well have originated with the advent of agriculture. So also might have the private ownership of springs and other water resources. The inevitably uneven allocation of such property resulted in self-perpetuating class differences. Religious myths and rituals, as well as moral and behavioral standards, developed in accordance with the new economic and social constellation and the new relationship between human society and the environment.

The evolution of agriculture has left a strong imprint on the land in many regions. The vegetation, animal populations were changed. The processes of tillage and fallowing, of terracing, of irrigation and drainage have had considerable consequences for some processes as the erosion of slopes and the aggradation of valleys, as well as the formation of deltas in seas and lakes where silt from the land surface naturally comes to rest. Soil lost from deforested and subsequently cultivated slopes is unlikely to be regenerated unless the land is allowed to revert to its forest cover for many scores, perhaps even many hundreds, of years.

Pastoralism, as well as cultivated farming, can cause a great deal of environmental damage. During dry seasons, when large numbers of animals are kept on pastures least able to sustain them, the land is denuded of its vegetation and made most vulnerable to the erosive onslaught of winds and of violent rainstorms that may occur at the end of the dry period. If overgrazing continues over a long period of time the environmental damage can be profound. In antiquity, shepherds in the fringelands of the Mediterranean region were notorious as plunderers of land. Though they must have tried, as do present-day pastoralists, to maintain a rough equilibrium between stocking rates (the number of animals grazed on a unit area of pasture) and the average carrying capacity of the range, that equilibrium could only be maintained as long as the range remained more or less stable. However, such a system would naturally break down during periods of drought, when the pressure on the shriveled vegetation would soon become excessive. To survive during such periods, the pastoralists would have had no recourse but to invade the land of the neighboring farmers. The ancient enmity between these groups has long been legendary and implacable, as it still is today in some semiarid regions.

Two or three millennia after the initial Agricultural Transformation, there began a further process of fundamental change; namely, the process of urbanization. It was made possible by the very success of agriculture, as the people involved directly in farming produced surpluses beyond their subsistence needs. These surpluses could then support the artisans, traders, priests, administrators, and kings who resided in the cities. The development was but a qualitative change in the structure of society and its relationship to the environment. Today most of us belong to urbanized societies and live in cities quite detached from the land and its natural ecosystems.

The artificial environment of our cities owes many of its features to the early cities developed five thousand years ago in lowland Mesopotamia, and then elsewhere in the Near East. Among numerous innovations attributable to these early cities are writing, formal codes of law, political and ecclesiastical hierarchies, craft specialization,, monumental art, mass production industries, metallurgy, mathematics, scientific and engineering principles, architecture, large-scale trade, and organized warfare in the form both of massive defensive fortifications and long distance offensive campaigns. The scale and intensity of land and water management in the agricultural hinterlands serving the cities has to change accordingly.

A land of wheat and barley, vines, fig trees and pomegranates,
A land of oil olives and honey:
A land wherein thou shalt eat bread without scarceness. Deuteronomy. 8: 8-9.

“EARLY FARMING IN THE NEAR EAST”

The process of developing a dependable food-producing system was a complex sequence of steps, starting with an initially extensive gathering economy that tended to become increasingly intensive, and culminating in a complete revolution in human society and its management of the environment. An essential step in that process was the selection of favorable wild plants in their natural habitats and their domestication and transformation into artificially propagated crops, to be grown at will in areas that might be far removed from their place of origin.

The end of the Pleistocene and the beginning of the Holocene era (some 10-12 thousand years ago) was a time of great climatic transition. The last ice age ended and a warming trend prevailed. Areas that had been cold and inhospitable in centuries past burst forth with a profusion of plants and animals that responded to the longer and warmer growing seasons. Having survived the vicissitudes of the ice age no doubt thanks to their growing ingenuity and acquired skills, humans now found themselves in a more auspicious ecological situation, in which they could not only survive but even prosper and multiply.