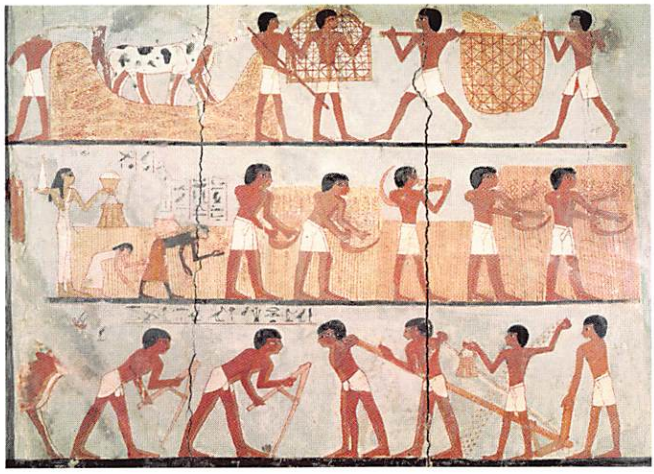
Part Two
The Agricultural Revolution



11. A wall painting from an Egyptian grave, dated to about 3,500 years ago, depicting typical agricultural scenes.

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History's Biggest Fraud

FOR 2.5 MILLION YEARS HUMANS FED themselves by gathering plants and hunting animals that lived and bred without their intervention. *Homo erectus*, *Homo ergaster* and the Neanderthals plucked wild figs and hunted wild sheep without deciding where fig trees would take root, in which meadow a herd of sheep should graze, or which billy goat would inseminate which nanny goat. *Homo sapiens* spread from East Africa to the Middle East, to Europe and Asia, and finally to Australia and America – but everywhere they went, Sapiens too continued to live by gathering wild plants and hunting wild animals. Why do anything else when your lifestyle feeds you amply and supports a rich world of social structures, religious beliefs and political dynamics?

All this changed about 10,000 years ago, when Sapiens began to devote almost all their time and effort to manipulating the lives of a few animal and plant species. From sunrise to sunset humans sowed seeds, watered plants, plucked weeds from the ground and led sheep to prime pastures. This work, they thought, would provide them with more fruit, grain and meat. It was a revolution in the way humans lived – the Agricultural Revolution.

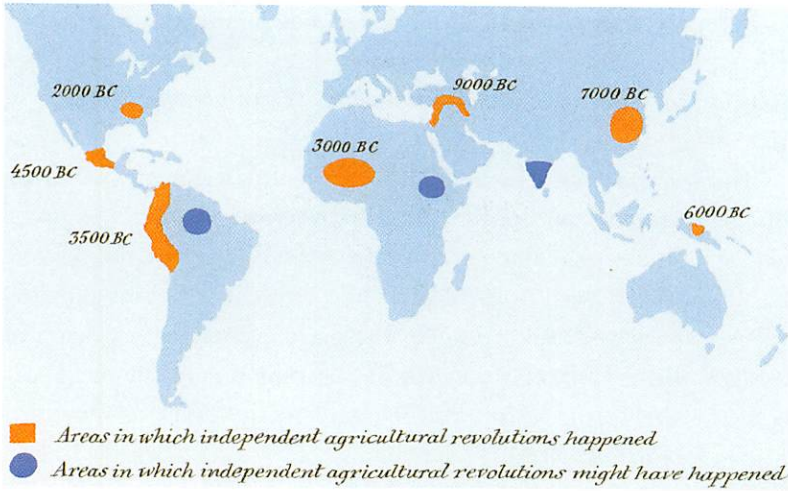
The transition to agriculture began around 9500–8500 BC in the hill country of south-eastern Turkey, western Iran, and the Levant. It began slowly and in a restricted geographical area. Wheat and goats were domesticated by approximately 9000 BC; peas and lentils around 8000 BC; olive trees by 5000 BC; horses by 4000 BC; and grapevines in 3500 BC. Some animals and plants, such as camels and cashew nuts, were domesticated even later, but by 3500 BC the main

wave of domestication was over. Even today, with all our advanced technologies, more than 90 per cent of the calories that feed humanity come from the handful of plants that our ancestors domesticated between 9500 and 3500 BC – wheat, rice, maize (called 'corn' in the US), potatoes, millet and barley. No noteworthy plant or animal has been domesticated in the last 2,000 years. If our minds are those of hunter-gatherers, our cuisine is that of ancient farmers.

Scholars once believed that agriculture spread from a single Middle Eastern point of origin to the four corners of the world. Today, scholars agree that agriculture sprang up in other parts of the world not by the action of Middle Eastern farmers exporting their revolution but entirely independently. People in Central America domesticated maize and beans without knowing anything about wheat and pea cultivation in the Middle East. South Americans learned how to raise potatoes and llamas, unaware of what was going on in either Mexico or the Levant. China's first revolutionaries domesticated rice, millet and pigs. North America's first gardeners were those who got tired of combing the undergrowth for edible gourds and decided to cultivate pumpkins. New Guineans tamed sugar cane and bananas, while the first West African farmers made African millet, African rice, sorghum and wheat conform to their needs. From these initial focal points, agriculture spread far and wide. By the first century AD the vast majority of people throughout most of the world were agriculturists.

Why did agricultural revolutions erupt in the Middle East, China and Central America but not in Australia, Alaska or South Africa? The reason is simple: most species of plants and animals can't be domesticated. Sapiens could dig up delicious truffles and hunt down woolly mammoths, but domesticating either species was out of the question. The fungi were far too elusive, the giant beasts too ferocious. Of the thousands of species that our ancestors hunted and gathered, only a few were suitable candidates for farming and herding. Those few species lived in particular places, and those are the places where agricultural revolutions occurred.

Scholars once proclaimed that the agricultural revolution was a great leap forward for humanity. They told a tale of progress fuelled by human brain power. Evolution gradually produced ever more



Map 2. Locations and dates of agricultural revolutions. The data is contentious, and the map is constantly being redrawn to incorporate the latest archaeological discoveries.[1]

intelligent people. Eventually, people were so smart that they were able to decipher nature's secrets, enabling them to tame sheep and cultivate wheat. As soon as this happened, they cheerfully abandoned the gruelling, dangerous, and often spartan life of hunter-gatherers, settling down to enjoy the pleasant, satiated life of farmers.

That tale is a fantasy. There is no evidence that people became more intelligent with time. Foragers knew the secrets of nature long before the Agricultural Revolution, since their survival depended on an intimate knowledge of the animals they hunted and the plants they gathered. Rather than heralding a new era of easy living, the Agricultural Revolution left farmers with lives generally more difficult and less satisfying than those of foragers. Hunter-gatherers spent their time in more stimulating and varied ways, and were less in danger of starvation and disease. The Agricultural Revolution certainly enlarged the sum total of food at the disposal of humankind, but the extra food did not translate into a better diet or more leisure. Rather, it translated into population explosions and pampered elites. The average farmer worked harder than the average forager, and got a worse diet in return. The Agricultural Revolution was history's biggest fraud.[2]

Who was responsible? Neither kings, nor priests, nor merchants. The culprits were a handful of plant species, including wheat, rice and potatoes. These plants domesticated *Homo sapiens*, rather than vice versa.

Think for a moment about the Agricultural Revolution from the viewpoint of wheat. Ten thousand years ago wheat was just a wild grass, one of many, confined to a small range in the Middle East. Suddenly, within just a few short millennia, it was growing all over the world. According to the basic evolutionary criteria of survival and reproduction, wheat has become one of the most successful plants in the history of the earth. In areas such as the Great Plains of North America, where not a single wheat stalk grew 10,000 years ago, you can today walk for hundreds upon hundreds of miles without encountering any other plant. Worldwide, wheat covers about 870,000 square miles of the globe's surface, almost ten times the size of Britain. How did this grass turn from insignificant to ubiquitous?

Wheat did it by manipulating *Homo sapiens* to its advantage. This ape had been living a fairly comfortable life hunting and gathering until about 10,000 years ago, but then began to invest more and more effort in cultivating wheat. Within a couple of millennia, humans in many parts of the world were doing little from dawn to dusk other than taking care of wheat plants. It wasn't easy. Wheat demanded a lot of them. Wheat didn't like rocks and pebbles, so Sapiens broke their backs clearing fields. Wheat didn't like sharing its space, water and nutrients with other plants, so men and women laboured long days weeding under the scorching sun. Wheat got sick, so Sapiens had to keep a watch out for worms and blight. Wheat was attacked by rabbits and locust swarms, so the farmers built fences and stood guard over the fields. Wheat was thirsty, so humans dug irrigation canals or lugged heavy buckets from the well to water it. Sapiens even collected animal faeces to nourish the ground in which wheat grew.

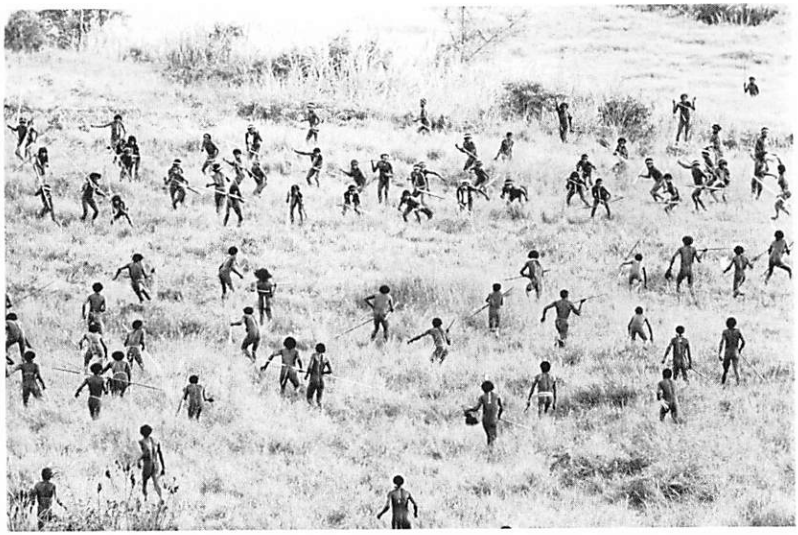
The body of *Homo sapiens* had not evolved for such tasks. It was adapted to climbing apple trees and running after gazelles, not to clearing rocks and carrying water buckets. Human spines, knees, necks and arches paid the price. Studies of ancient skeletons indicate

that the transition to agriculture brought about a plethora of ailments, such as slipped discs, arthritis and hernias. Moreover, the new agricultural tasks demanded so much time that people were forced to settle permanently next to their wheat fields. This completely changed their way of life. We did not domesticate wheat. It domesticated us. The word 'domesticate' comes from the Latin *domus*, which means 'house'. Who's the one living in a house? Not the wheat. It's the Sapiens.

How did wheat convince *Homo sapiens* to exchange a rather good life for a more miserable existence? What did it offer in return? It did not offer a better diet. Remember, humans are omnivorous apes who thrive on a wide variety of foods. Grains made up only a small fraction of the human diet before the Agricultural Revolution. A diet based on cereals is poor in minerals and vitamins, hard to digest, and really bad for your teeth and gums.

Wheat did not give people economic security. The life of a peasant is less secure than that of a hunter-gatherer. Foragers relied on dozens of species to survive, and could therefore weather difficult years even without stocks of preserved food. If the availability of one species was reduced, they could gather and hunt more of other species. Farming societies have, until very recently, relied for the great bulk of their calorie intake on a small variety of domesticated plants. In many areas, they relied on just a single staple, such as wheat, potatoes or rice. If the rains failed or clouds of locusts arrived or if a fungus infected that staple species, peasants died by the thousands and millions.

Nor could wheat offer security against human violence. The early farmers were at least as violent as their forager ancestors, if not more so. Farmers had more possessions and needed land for planting. The loss of pasture land to raiding neighbours could mean the difference between subsistence and starvation, so there was much less room for compromise. When a foraging band was hard-pressed by a stronger rival, it could usually move on. It was difficult and dangerous, but it was feasible. When a strong enemy threatened an agricultural village, retreat meant giving up fields, houses and granaries. In many cases, this doomed the refugees to starvation. Farmers, therefore, tended to stay put and fight to the bitter end.



12. Tribal warfare in New Guinea between two farming communities (1960). Such scenes were probably widespread in the thousands of years following the Agricultural Revolution.

Many anthropological and archaeological studies indicate that in simple agricultural societies with no political frameworks beyond village and tribe, human violence was responsible for about 15 per cent of deaths, including 25 per cent of male deaths. In contemporary New Guinea, violence accounts for 30 per cent of male deaths in one agricultural tribal society, the Dani, and 35 per cent in another, the Enga. In Ecuador, perhaps 50 per cent of adult Waoranis meet a violent death at the hands of another human![3] In time, human violence was brought under control through the development of larger social frameworks – cities, kingdoms and states. But it took thousands of years to build such huge and effective political structures.

Village life certainly brought the first farmers some immediate benefits, such as better protection against wild animals, rain and cold. Yet for the average person, the disadvantages probably outweighed the advantages. This is hard for people in today's prosperous societies to appreciate. Since we enjoy affluence and security, and since our affluence and security are built on foundations laid by the Agricultural Revolution, we assume that the Agricultural Revolution was a

wonderful improvement. Yet it is wrong to judge thousands of years of history from the perspective of today. A much more representative viewpoint is that of a three-year-old girl dying from malnutrition in first-century China because her father's crops have failed. Would she say 'I am dying from malnutrition, but in 2,000 years, people will have plenty to eat and live in big air-conditioned houses, so my suffering is a worthwhile sacrifice'?

What then did wheat offer agriculturists, including that malnourished Chinese girl? It offered nothing for people as individuals. Yet it did bestow something on *Homo sapiens* as a species. Cultivating wheat provided much more food per unit of territory, and thereby enabled *Homo sapiens* to multiply exponentially. Around 13,000 BC, when people fed themselves by gathering wild plants and hunting wild animals, the area around the oasis of Jericho, in Palestine, could support at most one roaming band of about a hundred relatively healthy and well-nourished people. Around 8500 BC, when wild plants gave way to wheat fields, the oasis supported a large but cramped village of 1,000 people, who suffered far more from disease and malnourishment.

The currency of evolution is neither hunger nor pain, but rather copies of DNA helixes. Just as the economic success of a company is measured only by the number of dollars in its bank account, not by the happiness of its employees, so the evolutionary success of a species is measured by the number of copies of its DNA. If no more DNA copies remain, the species is extinct, just as a company without money is bankrupt. If a species boasts many DNA copies, it is a success, and the species flourishes. From such a perspective, 1,000 copies are always better than a hundred copies. This is the essence of the Agricultural Revolution: the ability to keep more people alive under worse conditions.

Yet why should individuals care about this evolutionary calculus? Why would any sane person lower his or her standard of living just to multiply the number of copies of the *Homo sapiens* genome? Nobody agreed to this deal: the Agricultural Revolution was a trap.

The Luxury Trap

The rise of farming was a very gradual affair spread over centuries and millennia. A band of *Homo sapiens* gathering mushrooms and nuts and hunting deer and rabbit did not all of a sudden settle in a permanent village, ploughing fields, sowing wheat and carrying water from the river. The change proceeded by stages, each of which involved just a small alteration in daily life.

Homo sapiens reached the Middle East around 70,000 years ago. For the next 50,000 years our ancestors flourished there without agriculture. The natural resources of the area were enough to support its human population. In times of plenty people had a few more children, and in times of need a few less. Humans, like many mammals, have hormonal and genetic mechanisms that help control procreation. In good times females reach puberty earlier, and their chances of getting pregnant are a bit higher. In bad times puberty is late and fertility decreases.

To these natural population controls were added cultural mechanisms. Babies and small children, who move slowly and demand much attention, were a burden on nomadic foragers. People tried to space their children three to four years apart. Women did so by nursing their children around the clock and until a late age (around-the-clock suckling significantly decreases the chances of getting pregnant). Other methods included full or partial sexual abstinence (backed perhaps by cultural taboos), abortions and occasionally infanticide.[4]

During these long millennia people occasionally ate wheat grain, but this was a marginal part of their diet. About 18,000 years ago, the last ice age gave way to a period of global warming. As temperatures rose, so did rainfall. The new climate was ideal for Middle Eastern wheat and other cereals, which multiplied and spread. People began eating more wheat, and in exchange they inadvertently spread its growth. Since it was impossible to eat wild grains without first winnowing, grinding and cooking them, people who gathered these grains carried them back to their temporary campsites for processing. Wheat grains are small and numerous, so some

of them inevitably fell on the way to the campsite and were lost. Over time, more and more wheat grew along favourite human trails and near campsites.

When humans burned down forests and thickets, this also helped wheat. Fire cleared away trees and shrubs, allowing wheat and other grasses to monopolise the sunlight, water and nutrients. Where wheat became particularly abundant, and game and other food sources were also plentiful, human bands could gradually give up their nomadic lifestyle and settle down in seasonal and even permanent camps.

At first they might have camped for four weeks during the harvest. A generation later, as wheat plants multiplied and spread, the harvest camp might have lasted for five weeks, then six, and finally it became a permanent village. Evidence of such settlements has been discovered throughout the Middle East, particularly in the Levant, where the Natufian culture flourished from 12,500 BC to 9500 BC. The Natufians were hunter-gatherers who subsisted on dozens of wild species, but they lived in permanent villages and devoted much of their time to the intensive gathering and processing of wild cereals. They built stone houses and granaries. They stored grain for times of need. They invented new tools such as stone scythes for harvesting wild wheat, and stone pestles and mortars to grind it.

In the years following 9500 BC, the descendants of the Natufians continued to gather and process cereals, but they also began to cultivate them in more and more elaborate ways. When gathering wild grains, they took care to lay aside part of the harvest to sow the fields next season. They discovered that they could achieve much better results by sowing the grains deep in the ground rather than haphazardly scattering them on the surface. So they began to hoe and plough. Gradually they also started to weed the fields, to guard them against parasites, and to water and fertilise them. As more effort was directed towards cereal cultivation, there was less time to gather and hunt wild species. The foragers became farmers.

No single step separated the woman gathering wild wheat from the woman farming domesticated wheat, so it's hard to say exactly when the decisive transition to agriculture took place. But, by 8500 BC, the Middle East was peppered with permanent villages

such as Jericho, whose inhabitants spent most of their time cultivating a few domesticated species.

With the move to permanent villages and the increase in food supply, the population began to grow. Giving up the nomadic lifestyle enabled women to have a child every year. Babies were weaned at an earlier age – they could be fed on porridge and gruel. The extra hands were sorely needed in the fields. But the extra mouths quickly wiped out the food surpluses, so even more fields had to be planted. As people began living in disease-ridden settlements, as children fed more on cereals and less on mother's milk, and as each child competed for his or her porridge with more and more siblings, child mortality soared. In most agricultural societies at least one out of every three children died before reaching twenty.[5] Yet the increase in births still outpaced the increase in deaths; humans kept having larger numbers of children.

With time, the 'wheat bargain' became more and more burdensome. Children died in droves, and adults ate bread by the sweat of their brows. The average person in Jericho of 8500 BC lived a harder life than the average person in Jericho of 9500 BC or 13,000 BC. But nobody realised what was happening. Every generation continued to live like the previous generation, making only small improvements here and there in the way things were done. Paradoxically, a series of 'improvements', each of which was meant to make life easier, added up to a millstone around the necks of these farmers.

Why did people make such a fateful miscalculation? For the same reason that people throughout history have miscalculated. People were unable to fathom the full consequences of their decisions. Whenever they decided to do a bit of extra work – say, to hoe the fields instead of scattering seeds on the surface – people thought, 'Yes, we will have to work harder. But the harvest will be so bountiful! We won't have to worry any more about lean years. Our children will never go to sleep hungry.' It made sense. If you worked harder, you would have a better life. That was the plan.

The first part of the plan went smoothly. People indeed worked harder. But people did not foresee that the number of children would increase, meaning that the extra wheat would have to be shared between more children. Neither did the early farmers understand

that feeding children with more porridge and less breast milk would weaken their immune system, and that permanent settlements would be hotbeds for infectious diseases. They did not foresee that by increasing their dependence on a single source of food, they were actually exposing themselves even more to the depredations of drought. Nor did the farmers foresee that in good years their bulging granaries would tempt thieves and enemies, compelling them to start building walls and doing guard duty.

Then why didn't humans abandon farming when the plan backfired? Partly because it took generations for the small changes to accumulate and transform society and, by then, nobody remembered that they had ever lived differently. And partly because population growth burned humanity's boats. If the adoption of ploughing increased a village's population from a hundred to 110, which ten people would have volunteered to starve so that the others could go back to the good old times? There was no going back. The trap snapped shut.

The pursuit of an easier life resulted in much hardship, and not for the last time. It happens to us today. How many young college graduates have taken demanding jobs in high-powered firms, vowing that they will work hard to earn money that will enable them to retire and pursue their real interests when they are thirty-five? But by the time they reach that age, they have large mortgages, children to school, houses in the suburbs that necessitate at least two cars per family, and a sense that life is not worth living without really good wine and expensive holidays abroad. What are they supposed to do, go back to digging up roots? No, they double their efforts and keep slaving away.

One of history's few iron laws is that luxuries tend to become necessities and to spawn new obligations. Once people get used to a certain luxury, they take it for granted. Then they begin to count on it. Finally they reach a point where they can't live without it. Let's take another familiar example from our own time. Over the last few decades, we have invented countless time-saving devices that are supposed to make life more relaxed – washing machines, vacuum cleaners, dishwashers, telephones, mobile phones, computers, email. Previously it took a lot of work to write a letter, address

and stamp an envelope, and take it to the mailbox. It took days or weeks, maybe even months, to get a reply. Nowadays I can dash off an email, send it halfway around the globe, and (if my addressee is online) receive a reply a minute later. I've saved all that trouble and time, but do I live a more relaxed life?

Sadly not. Back in the snail-mail era, people usually only wrote letters when they had something important to relate. Rather than writing the first thing that came into their heads, they considered carefully what they wanted to say and how to phrase it. They expected to receive a similarly considered answer. Most people wrote and received no more than a handful of letters a month and seldom felt compelled to reply immediately. Today I receive dozens of emails each day, all from people who expect a prompt reply. We thought we were saving time; instead we revved up the treadmill of life to ten times its former speed and made our days more anxious and agitated.

Here and there a Luddite holdout refuses to open an email account, just as thousands of years ago some human bands refused to take up farming and so escaped the luxury trap. But the Agricultural Revolution didn't need every band in a given region to join up. It only took one. Once one band settled down and started tilling, whether in the Middle East or Central America, agriculture was irresistible. Since farming created the conditions for swift demographic growth, farmers could usually overcome foragers by sheer weight of numbers. The foragers could either run away, abandoning their hunting grounds to field and pasture, or take up the ploughshare themselves. Either way, the old life was doomed.

The story of the luxury trap carries with it an important lesson. Humanity's search for an easier life released immense forces of change that transformed the world in ways nobody envisioned or wanted. Nobody plotted the Agricultural Revolution or sought human dependence on cereal cultivation. A series of trivial decisions aimed mostly at filling a few stomachs and gaining a little security had the cumulative effect of forcing ancient foragers to spend their days carrying water buckets under a scorching sun.

Divine Intervention

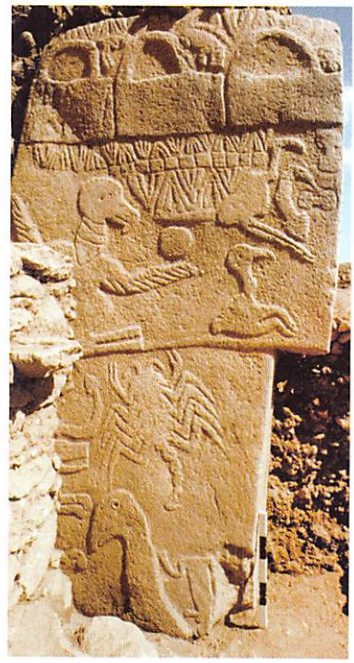
The above scenario explains the Agricultural Revolution as a miscalculation. It's very plausible. History is full of far more idiotic miscalculations. But there's another possibility. Maybe it wasn't the search for an easier life that brought about the transformation. Maybe Sapiens had other aspirations, and were consciously willing to make their lives harder in order to achieve them.

Scientists usually seek to attribute historical developments to cold economic and demographic factors. It sits better with their rational and mathematical methods. In the case of modern history, scholars cannot avoid taking into account non-material factors such as ideology and culture. The written evidence forces their hand. We have enough documents, letters and memoirs to prove that World War Two was not caused by food shortages or demographic pressures. But we have no documents from the Natufian culture, so when dealing with ancient periods the materialist school reigns supreme. It is difficult to prove that preliterate people were motivated by faith rather than economic necessity.

Yet, in some rare cases, we are lucky enough to find telltale clues. In 1995 archaeologists began to excavate a site in south-east Turkey called Göbekli Tepe. In the oldest stratum they discovered no signs of a settlement, houses or daily activities. They did, however, find monumental pillared structures decorated with spectacular engravings. Each stone pillar weighed up to seven tons and reached a height of sixteen feet. In a nearby quarry they found a half-chiselled pillar weighing fifty tons. Altogether, they uncovered more than ten monumental structures, the largest of them nearly 100 feet across.

Archaeologists are familiar with such monumental structures from sites around the world – the best-known example is Stonehenge in Britain. Yet as they studied Göbekli Tepe, they discovered an amazing fact. Stonehenge dates to 2500 BC, and was built by a developed agricultural society. The structures at Göbekli Tepe are dated to about 9500 BC, and all available evidence indicates that they were built by hunter-gatherers. The archaeological community initially found it difficult to credit these findings, but one test

13. Opposite: The remains of a monumental structure from Göbekli Tepe. Right: One of the decorated stone pillars (about sixteen feet high).



after another confirmed both the early date of the structures and the pre-agricultural society of their builders. The capabilities of ancient foragers, and the complexity of their cultures, seem to be far more impressive than was previously suspected.

Why would a foraging society build such structures? They had no obvious utilitarian purpose. They were neither mammoth slaughterhouses nor places to shelter from rain or hide from lions. That leaves us with the theory that they were built for some mysterious cultural purpose that archaeologists have a hard time deciphering. Whatever it was, the foragers thought it worth a huge amount of effort and time. The only way to build Göbekli Tepe was for thousands of foragers belonging to different bands and tribes to cooperate over an extended period of time. Only a sophisticated religious or ideological system could sustain such efforts.

Göbekli Tepe held another sensational secret. For many years, geneticists have been tracing the origins of domesticated wheat. Recent discoveries indicate that at least one domesticated variant, einkorn wheat, originated in the Karaçadag Hills – less than twenty miles from Göbekli Tepe.[6]

This can hardly be a coincidence. It's likely that the cultural centre of Göbekli Tepe was somehow connected to the initial domestication of wheat by humankind and of humankind by wheat. In order to feed the people who built and used the monumental structures, particularly large quantities of food were required. It may well be that foragers switched from gathering wild wheat to intense wheat cultivation, not to increase their normal food supply, but rather to support the building and running of a temple. In the conventional picture, pioneers first built a village, and when it prospered, they set up a temple in the middle. But Göbekli Tepe suggests that the temple may have been built first, and that a village later grew up around it.

Victims of the Revolution

The Faustian bargain between humans and grains was not the only deal our species made. Another deal was struck concerning the fate of animals such as sheep, goats, pigs and chickens. Nomadic bands that stalked wild sheep gradually altered the constitutions of the

herds on which they preyed. This process probably began with selective hunting. Humans learned that it was to their advantage to hunt only adult rams and old or sick sheep. They spared fertile females and young lambs in order to safeguard the long-term vitality of the local herd. The second step might have been to actively defend the herd against predators, driving away lions, wolves and rival human bands. The band might next have corralled the herd into a narrow gorge in order to better control and defend it. Finally, people began to make a more careful selection among the sheep in order to tailor them to human needs. The most aggressive rams, those that showed the greatest resistance to human control, were slaughtered first. So were the skinniest and most inquisitive females. (Shepherds are not fond of sheep whose curiosity takes them far from the herd.) With each passing generation, the sheep became fatter, more submissive and less curious. *Voilà*! Mary had a little lamb and everywhere that Mary went the lamb was sure to go.

Alternatively, hunters may have caught and 'adopted' a lamb, fattening it during the months of plenty and slaughtering it in the leaner season. At some stage they began keeping a greater number of such lambs. Some of these reached puberty and began to procreate. The most aggressive and unruly lambs were first to the slaughter. The most submissive, most appealing lambs were allowed to live longer and procreate. The result was a herd of domesticated and submissive sheep.

Such domesticated animals – sheep, chickens, donkeys and others – supplied food (meat, milk, eggs), raw materials (skins, wool), and muscle power. Transportation, ploughing, grinding and other tasks, hitherto performed by human sinew, were increasingly carried out by animals. In most farming societies people focused on plant cultivation; raising animals was a secondary activity. But a new kind of society also appeared in some places, based primarily on the exploitation of animals: tribes of pastoralist herders.

As humans spread around the world, so did their domesticated animals. Ten thousand years ago, not more than a few million sheep, cattle, goats, boars and chickens lived in restricted Afro-Asian niches. Today the world contains about a billion sheep, a billion pigs, more than a billion cattle, and more than 25 billion chickens. And they are all over the globe. The domesticated chicken is the most

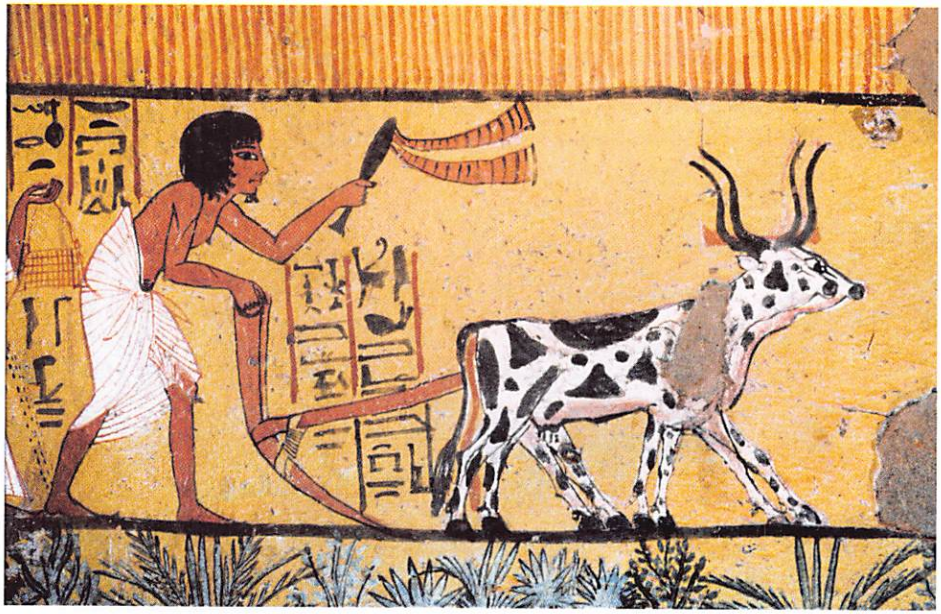
widespread fowl ever. Following *Homo sapiens*, domesticated cattle, pigs and sheep are the second, third and fourth most widespread large mammals in the world. From a narrow evolutionary perspective, which measures success by the number of DNA copies, the Agricultural Revolution was a wonderful boon for chickens, cattle, pigs and sheep.

Unfortunately, the evolutionary perspective is an incomplete measure of success. It judges everything by the criteria of survival and reproduction, with no regard for individual suffering and happiness. Domesticated chickens and cattle may well be an evolutionary success story, but they are also among the most miserable creatures that ever lived. The domestication of animals was founded on a series of brutal practices that only became crueller with the passing of the centuries.

The natural lifespan of wild chickens is about seven to twelve years, and of cattle about twenty to twenty-five years. In the wild, most chickens and cattle died long before that, but they still had a fair chance of living for a respectable number of years. In contrast, the vast majority of domesticated chickens and cattle are slaughtered at the age of between a few weeks and a few months, because this has always been the optimal slaughtering age from an economic perspective. (Why keep feeding a cock for three years if it has already reached its maximum weight after three months?)

Egg-laying hens, dairy cows and draught animals are sometimes allowed to live for many years. But the price is subjugation to a way of life completely alien to their urges and desires. It's reasonable to assume, for example, that bulls prefer to spend their days wandering over open prairies in the company of other bulls and cows rather than pulling carts and ploughshares under the yoke of a whip-wielding ape.

In order for humans to turn bulls, horses, donkeys and camels into obedient draught animals, their natural instincts and social ties had to be broken, their aggression and sexuality contained, and their freedom of movement curtailed. Farmers developed techniques such as locking animals inside pens and cages, bridling them in harnesses and leashes, training them with whips and cattle prods, and mutilating them. The process of taming almost always involves the castration of



14. A painting from an Egyptian grave, *c.*1200 BC: A pair of oxen ploughing a field. In the wild, cattle roamed as they pleased in herds with a complex social structure. The castrated and domesticated ox wasted away his life under the lash and in a narrow pen, labouring alone or in pairs in a way that suited neither its body nor its social and emotional needs. When an ox could no longer pull the plough, it was slaughtered. (Note the hunched position of the Egyptian farmer who, much like the ox, spent his life in hard labour oppressive to his body, his mind and his social relationships.)

males. This restrains male aggression and enables humans selectively to control the herd's procreation.

In many New Guinean societies, the wealth of a person has traditionally been determined by the number of pigs he or she owns. To ensure that the pigs can't run away, farmers in northern New Guinea slice off a chunk of each pig's nose. This causes severe pain whenever the pig tries to sniff. Since the pigs cannot find food or even find their way around without sniffing, this mutilation makes them completely dependent on their human owners. In another area of New Guinea, it has been customary to gouge out pigs' eyes, so that they cannot even see where they're going.[7]

The dairy industry has its own ways of forcing animals to do its will. Cows, goats and sheep produce milk only after giving birth to calves, kids and lambs, and only as long as the youngsters are suckling. To continue a supply of animal milk, a farmer needs to have calves, kids or lambs for suckling, but must prevent them from monopolising the milk. One common method throughout history was to simply slaughter the calves and kids shortly after birth, milk the mother for all she was worth, and then get her pregnant again. This is still a very widespread technique. In many modern dairy farms a milk cow usually lives for about five years before being slaughtered. During these five years she is almost constantly pregnant, and is fertilised within 60 to 120 days after giving birth in order to preserve maximum milk production. Her calves are separated from her shortly after birth. The females are reared to become the next generation of dairy cows, whereas the males are handed over to the care of the meat industry.[8]

Another method is to keep the calves and kids near their mothers, but prevent them by various stratagems from suckling too much milk. The simplest way to do that is to allow the kid or calf to start suckling, but drive it away once the milk starts flowing. This method usually encounters resistance from both kid and mother. Some shepherd tribes used to kill the offspring, eat its flesh, and then stuff the skin. The stuffed offspring was then presented to the mother so that its presence would encourage her milk production. The Nuer tribe in the Sudan went so far as to smear stuffed animals with their mother's urine, to give the counterfeit calves a familiar, live scent. Another Nuer technique was to tie a ring of thorns around a calf's mouth, so that it pricks the mother and causes her to resist suckling.[9] Tuareg camel breeders in the Sahara used to puncture or cut off parts of the nose and upper lip of young camels in order to make suckling painful, thereby discouraging them from consuming too much milk.[10]

Not all agricultural societies were this cruel to their farm animals. The lives of some domesticated animals could be quite good. Sheep raised for wool, pet dogs and cats, war horses and race horses often enjoyed comfortable conditions. The Roman emperor Caligula allegedly planned to appoint his favourite horse, Incitatus, to the

15. A modern calf in an industrial meat farm. Immediately after birth the calf is separated from its mother and locked inside a tiny cage not much bigger than the calf's own body. There the calf spends its entire life – about four months on average. It never leaves its cage, nor is it allowed to play with other calves or even walk – all so that its muscles will not grow strong. Soft muscles mean a soft and juicy steak. The first time the calf has a chance to walk, stretch its muscles and touch other calves is on its way to the slaughterhouse. In evolutionary terms, cattle represent one of the most successful animal species ever to exist. At the same time, they are some of the most miserable animals on the planet.

consulship. Shepherds and farmers throughout history showed affection for their animals and have taken great care of them, just as many slaveholders felt affection and concern for their slaves. It was no accident that kings and prophets styled themselves as shepherds and likened the way they and the gods cared for their people to a shepherd's care for his flock.

Yet from the viewpoint of the herd, rather than that of the shepherd, it's hard to avoid the impression that for the vast majority of domesticated animals, the Agricultural Revolution was a terrible

catastrophe. Their evolutionary 'success' is meaningless. A rare wild rhinoceros on the brink of extinction is probably more satisfied than a calf who spends its short life inside a tiny box, fattened to produce juicy steaks. The contented rhinoceros is no less content for being among the last of its kind. The numerical success of the calf's species is little consolation for the suffering the individual endures.

This discrepancy between evolutionary success and individual suffering is perhaps the most important lesson we can draw from the Agricultural Revolution. When we study the narrative of plants such as wheat and maize, maybe the purely evolutionary perspective makes sense. Yet in the case of animals such as cattle, sheep and Sapiens, each with a complex world of sensations and emotions, we have to consider how evolutionary success translates into individual experience. In the following chapters we will see time and again how a dramatic increase in the collective power and ostensible success of our species went hand in hand with much individual suffering.