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THE LONG STRUGGLE

Agriculture did not solve the problem of producing enough food to meet the needs of the world's population. It had been adopted by human societies around the globe mainly because rising population meant that more intensive ways of obtaining food were necessary. Yet, until about the last two centuries in every part of the world nearly everyone lived on the edge of starvation. Throughout this period and all the changes of political systems, the rise and fall of empires, the emergence of new states and their decline, the underlying economic and social conditions remained broadly unchanged for thousands of years. Although areas less environmentally sensitive than Mesopotamia, in the Indus valley and the tropical jungles of Mesoamerica a complete collapse of society did not take place, there was still a high price to pay in terms of individual suffering, reduced human potential and at times wholesale loss of life. About 95 per cent of the people in the world were peasants; directly dependent on the land and living a life characterised by high infant mortality, low life expectancy, chronic under-nourishment and with the ever present threat of famine and the outbreak of virulent epidemics. The food they ate was almost entirely vegetable in origin (especially in Asia, Africa and the Americas) and the dietary staples were the three major crops of the world - rice in Asia, maize in the Americas and wheat (supplemented by oats and rye) in Europe. Because of the overwhelming dependence of these societies on agriculture there were limits on the extent of other activities and the numbers of soldiers, priests and craftsmen that could be supported by the peasantry.

The human condition around the world varied from place to place and period to period depending not just on the factors affecting agricultural output but also on those affecting the level of population. Although the number of people in the world was far lower than at present, there was the persistent threat of overpopulation and starvation because of the inefficiency of the agricultural system. Agriculture allowed far more people to be supported than in gathering and hunting societies but reliance on a small number of crops grown in a specialised environment increased vulnerability to crop failure. Continuous cultivation of the same area lowered soil fertility and a vicious circle was established between the need to use as much land as possible to grow crops for direct human consumption, the limited amount of land available for animals and the lack of animal manures to maintain soil fertility. The limitations on agricultural output were exacerbated by problems in distributing food. The total amount that could be stored was limited and the losses were high because of inadequate facilities. A primitive transportation system meant that anything more than local distribution of food, except by water, was extremely difficult. The market for food was therefore limited and very often crop failure in one area could not be alleviated by moving in supplies from elsewhere because they were not available or, even if they were, they could not be transported. These problems were further accentuated by the religious and secular elite who enforced collection of food through taxes, tithes and other forms of direct appropriation, often leaving the peasantry with insufficient food for survival. Armies moving through the countryside looting the food they needed and destroying crops and animals made the situation worse.

Only very slowly did changes in agricultural systems leading to higher productivity, better storage and distribution facilities begin to alleviate these problems. For most societies until the nineteenth century population size and the amount of food available were often out of balance, both in the short term and the long term. In the short term, annual fluctuations in supply as a result of bad harvest or an outbreak of warfare could bring disaster. In the long term, population could increase to a level where it was almost impossible for a large part of the population to obtain an adequate diet. Adjusting either side of the equation was problematic - it was difficult to increase food production at a rapid rate and, although many of these early agricultural societies around the world used fairly crude methods for restricting the growth in numbers (the practice of infanticide or a tradition of late marriage for example), food supply and population size were only rarely in balance. Over the very long term it is clear that slow improvements to the agricultural system meant that more people could be fed. But overall population growth rates remained very low. Until about three hundred years ago the world's population never increased by more than about 0.1 per cent a year - a twentieth of the current rate. Within this gradual
upward trend there was no steady growth in population or in food production. Instead there were bouts of rapid growth in numbers followed by sudden halts and declines caused by population levels outstripping food supplies or by the consequences of war and disease. More often than not, increasing population put ever greater pressure on a limited agricultural system, producing more poverty and malnutrition. The conflict was normally only resolved in a drastic fashion through mass starvation and death until the population was more in balance with the output from farming.

There are no reliable population statistics until the last two hundred years. Nevertheless, working from partial censuses, contemporary estimates and returns produced for other purposes such as taxation, demographers have been able to make estimates which, although not accurate in detail, give a broad picture of the number of people in the world, their distribution and the main periods of growth and decline. About the time agriculture was adopted in the three core areas the world’s population was about 4 million (the same as one large city today). The spread of agriculture enabled more people to be fed and human numbers rose steadily, doubling every thousand years to reach about 50 million by 1000 BC (roughly equivalent to the current population of England and Wales). That figure doubled in only five hundred years to reach 100 million about 500 BC and numbers then grew to reach 200 million at the peak of the Han and Roman empires about 200 AD. With the decline of those empires a widespread increase in instability, warfare and destruction meant that there was little further growth anywhere in the world until about the year 1000. Then, in both China and Europe, numbers rose to reach a temporary peak of about 350 million people in the world by 1100. For a century population increased only slowly to some 400 million as the limits of food supply were reached. After 1300 starvation and plague sharply reduced numbers so that by 1400, when some recovery had taken place, there were still only about 350 million people in the world. Numbers rose sharply in the next two centuries to reach about 550 million by 1600. Then the next century a deteriorating climate affected food production and restricted the growth in numbers so that the world’s population in 1700 was just over 600 million. The eighteenth century saw the most rapid growth in history to that date, bringing the total to 900 million by 1800. The world’s population first reached the one billion mark about 1825.

The distribution of people in the world also changed markedly over this long period. Before the spread of agriculture the world’s population was fairly evenly distributed across the globe but the rise of settled
communities reduced the share of Africa, the Americas and Oceania from about 40 per cent to less than 15 per cent of the total as the great empires of the Near East, Mediterranean, India and China became the main centres of human society. Within this general picture there have nearly always been more Chinese or Indians than Europeans. That pattern was established very early once the temporary importance, around 3000 BC, of the societies in the Near East, stemming from their early adoption of agriculture, had diminished. By the time of the Roman and Han empires there were about 35 million Europeans but 50 million Chinese and about the same number again of Indians. At the same time the total population of the Americas was about 5 million, that of Oceania about 1 million and Africa had about 20 million inhabitants, over half of whom lived in North Africa near the Mediterranean. These broad relationships still applied a millennium later between Europe (60 million), China (85 million), India (90 million), Africa (46 million), the Americas (14 million) and Oceania (2 million).

The examples of China and Europe show that although very different agricultural systems evolved both were restricted by environmental limitations and neither was able to sustain a long-term balance between population and food supplies. In China the development of agriculture and the emergence of a settled society took place in the north, where it was based on the dry farming of millet. Until the end of the Han empire in 220 AD the centre of the Chinese state remained in the north. It was in this period that one of the most distinctive features of Chinese society developed – the almost complete dichotomy between the ruling elite and the bulk of the population who were peasants living in small villages. Throughout Chinese history there have been periods of political unity followed by disunity but the way of life of the overwhelming majority of the people continued basically unchanged in the village world. The main task of the elite was to ensure that enough food was obtained from the peasants to maintain themselves and the army that was largely stationed in the north to provide protection against attacks from the nomads of central Asia. The collapse of the Han empire under the pressure of barbarian attacks pushed the centre of gravity of the Chinese state slightly south towards the Yangtse river, into an area which became one of the main grain producing areas. The later reunification of China, under the Sui dynasty after 589, made it necessary to transport the food surplus northwards to the military centre of the empire. The huge Grand Canal, which extended for almost 1,200 miles, was built in the early seventh century to move food supplies from the Yangtse valley to the north for the army and for the capital Peking, which alone required 400,000 tons of grain a year. By the eleventh century an army of 300,000 near Peking and over 750,000 on the frontier was being fed in this way. Not surprisingly it placed an enormous burden on the peasantry.

One of the most important changes in Chinese society took place with a wave of emigration to the south of the country after the fourth century, encouraged by a revolution in agricultural production. Rice had been domesticated and cultivated widely across south-east Asia about 3500 BC but it was grown as a dry crop like other grains such as millet or wheat. About 500 BC a new technique of wet-rice production in paddy fields developed in south-east Asia and spread slowly to reach China, Korea, Japan, India and Java in the next millennium. The inherently poor nutrient content of tropical soils was circumvented by
growing the rice partially covered in water in special fields fed by complex water management techniques to produce large quantities of slowly moving water. This provided extra nutrients in two ways – it encouraged the growth of algae which were able to fix nitrogen from the atmosphere and secondly it allowed large amounts of organic matter – vegetable waste and both human and animal manures – to rot down in the water. The continual trampling involved in working in the fields made the soil impervious and therefore able to retain the nutrients. This system produced huge increases in crop yields but required enormous amounts of labour not only for cultivating the crop but, more importantly, for constructing and maintaining the fields and the water control systems. In the centuries after about 400 AD there was a steady wave of people moving south to open up and settle new lands using paddy field systems. The main rice growing provinces of the Yangtze delta, the Hsiang valley, Szechwan and Kwantung were colonised, and steady if unspectacular improvements in techniques further increased production. The most important of these was the introduction, in the eleventh century, of new varieties of quicker growing rice from Indo-China that enabled two crops a year to be grown in the most favoured areas in the south and both a rice and a wheat crop further north.

The Chinese developed the most sophisticated agriculture in the world (based on techniques such as crop rotation that were still largely unused in Europe), producing very high yields from intensively farmed land. By about 1200 China was the largest, most literate and most advanced country in the world. The expansion of settlement into the new rice growing areas in the south allowed population to grow from about 50 million under the Han (a level that was maintained for several hundred years afterwards) to reach about 115 million in the early thirteenth century. However there were a number of structural problems that ensured that the balance between food supply and population was never satisfactory. Improvements in techniques or farming of new land brought only temporary increases in per capita food supply which were soon counterbalanced by increases in population.

The Chinese were unable to make the necessary structural changes in the agricultural system that might have increased food supply on a large scale. Yields were about as high as was possible before the introduction of modern artificial fertilisers. The most fertile areas were already densely populated and inputs could not be increased because there was not enough land to keep more animals which might have provided the extra manure. Social mores emphasised equal land division within the family, which meant a multitude of very small farms, each of which could only produce a very small surplus, if any. Output could only be increased by small improvements in productivity and by cultivating new land, although this was often of marginal quality and therefore produced lower yields. The Chinese agricultural system was certainly impressive in its total output and its very intensive production methods. However, the high level of population and the difficulty of making any significant qualitative changes meant that the mass of the population were dependent on a system that could produce only a low level of food for each individual. Disasters like the Mongol invasion which resulted in the deaths of about 35 million Chinese (most in the north of the country) or the massive epidemics in 1586–89 and 1639–44, which killed about a fifth of the people on each occasion, reduced the pressure of population for a while. But after about 1600 there is no evidence of any significant increases in yields and, although the area under cultivation rose, the amount of food available per person was about the same in 1850 as it had been three hundred years earlier. The result of this high intensity system (dependent on a large amount of labour to produce high levels of food from the land used) was that the overwhelming majority of the population lived permanently on the verge of starvation.

Chinese agriculture was able to maintain a large number of people on the brink of starvation. Medieval European agriculture was a low productivity system that kept a smaller number in the same condition. Europe too found it difficult to expand output on a sustainable basis. The overriding problem here was that soil fertility was steadily reduced through continual cropping, leaching out of nutrients in rain and low level soil erosion, and there was a lack of replacement nutrients. Fertility in the arable fields could only be maintained through use of animal manures, but the number of animals that could be fed throughout the year was very small because of the lack of fodder crops. Many animals had to be slaughtered in the autumn because of a shortage of winter feed. Keeping animals on pasture was difficult in the long term when the manure was removed to fertilise arable fields, because yields of hay and grass for the animals would then fall. A vicious circle was therefore established. As the number of animals that could be fed declined so did the manure available for arable fields and with it crop yields. Most manure was also stored in the open for long periods which severely lowered its nutrient value. Crops were reduced by the use of only a two-field rotation system under which fields alternated between being planted in the autumn with winter grain and
being left fallow for a year. This resulted in an inadequate amount of
time to restore nutrients and remove any diseases or pests in the soil that
might reduce yields. A shortage of marls (or liming materials) also
meant that it was difficult to reduce the acidity of soils and this kept
yields low. The consequence was that in medieval Europe the agri-
cultural system was only able to sustain a low level of productivity. In
the short term it was sometimes possible to increase production. Extra
inputs could be introduced by keeping more animals in new fields or
new arable fields could be brought into use but these improvements
could not be sustained in the long term because of the draining of
nutrients from the pastures and fields. There was therefore a tendency
for the fertility of the soil to fall back to a level where the risk of crop
failure was high.

Changes to the European agricultural system came gradually. About
800, in north-eastern France a new three-field rotation was adopted.
Under this system one field was planted in the autumn with winter
wheat or rye and a second the following spring with oats, barley or
perhaps peas whilst a third was left fallow. This not only increased
fallow periods and the variety of crops grown but also helped to some
extent to raise fertility levels and distributed work more evenly
throughout the year. The three-field system spread across Europe — but
only slowly. Its use was not widespread in England until after 1250 and
even later in other areas. However the output of food was still con-
strained by the amount of inputs available. An important contribution
to raising output was the invention of the heavy plough which was
probably developed in the sixth century and its use spread across
Europe during the next four hundred years. The earliest ploughs were
simply an enlarged digging stick dragged by a single animal or a pair of
oxen; they did not turn over the soil and left a wedge of undisturbed
earth between each furrow. This plough was not well suited to the
heavier soils of northern Europe, particularly in the lowlands.
The heavy plough needed a team of eight oxen to pull it but it did enable a
much larger area to be cultivated than before, though it could not solve
the problem of low nutrient levels. Improvement in crops came very
slowly with the increasing use of legumes capable of fixing nitrogen and
therefore improving soil fertility and of fodder crops to provide winter
feed for animals. It was not until about 1300, and then only in a small
area of Europe (principally Flanders), that their use became at all
widespread.

For thousands of years European agriculture remained at a low level
of productivity and the majority of the people lived on the edge of
starvation. There is evidence that European societies were more suc-
cessful than those elsewhere in the world in limiting their population.
This was achieved through a number of responses loosely linked to the
fortunes of the main economic activity — agriculture. The most import-
ant of these responses were late marriages or fewer marriages. There is
some evidence that the age of marriage and the number not marrying
rose when population was higher and so nearer the limits of food
production and fell when population pressure eased following famine or
disease. These methods could never be more than partially successful
and there were still many occasions when even at the relatively low
levels common in the medieval and early modern periods Europe was
’overpopulated’ in relation to the supply of food.

In 1000, the population of Europe was about 36 million. In the next
three centuries, numbers more than doubled to reach 80 million in
1300. Many parts of Europe became severely overcrowded — the
population of northern Italy, Flanders, Brabant and the Paris area was
probably as high as in the early nineteenth century despite the lower level
of agricultural productivity. The supply of new land was virtually
exhausted in the late thirteenth century, and yields were also falling as
more land was put under crops as a short-term measure to try and
increase food production, thus reducing the number of animals kept and
therefore the amount of manure produced. The shortage of land, com-
combined with the rising population, was causing cereal prices to rise
and many people suffered from underemployment and must have lived
at a very low level of subsistence. The growing shortage of food was
exacerbated by the fact that the nobility and clergy were taking about
half of the peasants’ output of food once tithes, rents, taxes and the time
they were forced to spend working on the lord’s estate are taken into
account. Most of this wealth was spent on conspicuous consumption.
By 1300 European population was beyond the optimum that could be
supported by the technology and institutions of the time. At the
beginning of the fourteenth century there is clear evidence of falling
population brought about through permanent malnutrition and near
starvation in many areas of Europe from Tuscany and Provence to
Normandy and south-east England. The major famine of 1316—17
added to the number of casualties but the pressure of population on
resources was not removed until after the outbreak of the Black Death
in 1346 and the subsequent recurrences of the plague for the rest of the
century.

The period from the late fourteenth century until the mid-fifteenth
was one of comparative prosperity as population remained below the
peak of 1300 for about two hundred years. However by 1600 it was near 90 million, slightly higher than in 1300, even though there had been little improvement in agricultural productivity. The signs of 'overpopulation' and an imbalance between food supply and numbers appeared again. Settlements expanded into new areas but often the soils were poor and output low. In England agricultural prices were rising from about 1550 as shortages started to develop and real wages fell by a half in the period 1500–1620 causing immense distress to those already on the margins of society and unable to find any form of regular work. 

By the 1620s population growth slowed down as malnutrition and higher mortality caused by inadequate food supplies took their toll. The same symptoms can be found in France. By 1570 most usable agricultural land was in production and, although numbers were kept in check by the continual civil wars of the period, a crisis was reached early in the seventeenth century. Food prices continued to rise, land holdings got smaller and real wages fell drastically. Population rose on occasions to about 20 million but fell back rapidly since at that level it was out of equilibrium with the number that could be fed in the long term. A series of severe famines between 1660 and 1710 demonstrated that population was still higher than the agricultural system could regularly feed.

In all the agricultural societies around the world the outcome of the harvest was crucial. A bad harvest was a calamity but two in succession could bring disaster — not just for the poor who were the first casualties of reduced supplies and increased prices but also for the peasants and eventually even for the whole of society. The temptation, especially for the peasants, not surprisingly, was to consume what little food was available leaving inadequate quantities of seeds to plant for the next crop, thus increasing the chance of disaster the next year. The elite in each society were normally in a position to be able either to force the peasantry to hand over enough food or to buy it even at highly inflated prices. Starvation affected those unable to retain enough of their crop to live on until the next harvest and those, mainly in the towns, who could not pay high food prices. Under such circumstances large numbers, already badly nourished, easily succumbed to the outbreaks of disease that normally followed a period of bad harvests.

The most important influence on the outcome of the harvest and, because of the overwhelming importance of agriculture in the economy, the state of society, was the weather. Any one of a number of permutations — a wet, cool period that reduced the chances of seed germinating, a dry spell when the crops were growing or wet weather during harvesting — could threaten output by severely reducing the harvest. Nearly every government paid great attention to detailed accounts of the weather from around the country, the prospects for the harvest, the price of grain and bread as one of the main indicators of the level of social unrest. Crops were affected not only by annual variations in the weather but also by the long-term cycles in the earth's climate, which could cause widespread dislocation of agricultural systems. For example, colder periods shortened growing seasons, made some areas marginal for crop production and, in general, reduced yields. While they lasted there would be an increased risk of a poor harvest in any particular year and a succession of poor harvests resulted in the build up of internal strains within society. Warmer periods increased the areas where crops could be grown, improved food supply and reduced the pressure stemming from the number of people who had to be fed. Most of the available evidence about these long-term climatic cycles comes from Europe and the detailed effects of the changes were different in other parts of the world — for example, one of the coldest spells in Japan coincided with one of the warmest in Europe.

Since the end of the last ice age there have been alternating periods of warmer and colder weather in Europe. After a steady improvement from about 10,000 BC, which marked the end of the last ice age, the warmest period of all came in the two thousand years after 5000 BC when temperatures were between one and two degrees centigrade above twentieth century levels. Vegetation zones moved northwards and it is interesting that this period of climatic optimum coincided with the development and spread of agriculture across Europe. A general decline in temperatures then set in, reaching a low point between 900–300 BC, a time of very high rainfall too. An improvement was noticeable by around 100 BC when vines spread further north, but it petered out...
around 400 AD with a cool spell that lasted for around four hundred years. Then a warm period that was shorter and less intense than the first peak (perhaps one degree centigrade warmer than today) reached its height about 1200. A steady decline followed, reaching a long low between 1430–1550, the ‘Little Ice Age’, when temperatures were between one and two degrees centigrade lower than at present. The main impact was felt in very severe winters, with summer temperatures not much different from current levels. These climatic changes have been established through a multitude of different techniques – pollen records from mud cores, isotope analysis of foraminifera in ocean cores, the recording of changes in lakes, glaciers and tree lines plus some historical records. Although the broad trends have been firmly established, it is only for the last two periods – the warm spell that ended around 1200 and the ‘Little Ice Age’ – that detailed analysis of the effects of climate is possible.

At the height of the warm period which lasted for about four hundred years before 1200 the tree line in central Europe was about 500 feet higher than today, vines grew in England as far north as the Severn and farming was possible on Dartmoor as high as 1,300 feet. Large parts of the uplands of southern Scotland were arable land and in 1280 the sheep farmers of Northumbria were complaining about the continual encroachment of arable fields on their upland pastures. One of the most important effects of the milder climate was on the Viking voyages and settlements. Iceland was colonised from Norway in 874 at the beginning of the warmer period and Greenland from 986. Both of these societies were on the climatic margins of Europe and their existence was largely dictated by the weather. The Greenland settlement flourished during the warm period with a population of about 3,000, almost 300 farms, sixteen churches and even a cathedral in the main village. But it remained a marginal and highly vulnerable society, dependent on the mild weather for its very existence.

The gradual deterioration in the climate after 1200 caused a steady decline in Greenland. The hay growing season gradually became shorter and shorter, yet the Viking settlers tried to retain their way of life based on cattle instead of shifting to the more readily available marine resources. As the climate deteriorated the Inuit moved further south and the Viking western settlement of Godthaab Fjord was destroyed shortly after 1350. The severer climate meant that pack ice remained in the seas around Greenland throughout the summer and contact with the rest of Europe was lost after 1408. The eastern settlement at Julianehaab died out, probably under Inuit attack, about 1500. Iceland, too, became a much more marginal society under the impact of a worsening climate. Wheat growing died out (a one degree centigrade fall in annual temperatures in Iceland reduces the growing season by almost a third) and marine resources became overwhelmingly important in the economy. In the harsher climate the numbers that could be supported were much less and the population fell from about 77,000 at the height of the warm period around 1100 to 38,000 in the late eighteenth century.

The increasingly colder climate affected the rest of Europe too. The uplands of southern Scotland reverted to pasture and the growing of vines for wine-making died out in England about 1400. But the real impact of a much worse climate was felt after the middle of the sixteenth century – a series of severe winters and a period of much greater climatic instability began that was to last for almost three hundred years. After 1580 the glaciers in the Alps, Iceland and Russia advanced, in many places by over a mile, and did not begin to retreat until after 1850. Between 1564 and 1814 the Thames froze in the winter at least twenty times, as did the Rhone three times between 1590 and 1603 and even the Guadalquivir at Seville froze in the winter of 1602–3. At Marseilles the sea froze in 1595 and in 1684 there was pack ice off the coast of England. From the 1580s the Denmark Strait between Iceland and Greenland was regularly blocked by pack ice even in summer. Across Europe the lower temperatures reduced the growing season by about a month and lowered the height at which crops could be grown by about 600 feet, with consequent adjustments to the cultivation areas of nearly all crops. Outbreaks of even more severe weather within the overall pattern of a deteriorating climate could have devastating effects. For example, a series of cold mistral winds destroyed many of the olive groves of Provence between 1599 and 1603 and very heavy frosts around Valencia in the same period ruined many of the fruit trees.

The effects varied in different parts of Europe. There was no simple relationship between the temperature, the amount of rain and the size of the crop since the most important factor was how these influences were distributed through the seasons. The overall decline in temperature had its greatest impact in Scandinavia, where the reduced growing season made many areas extremely marginal for growing crops. Further south a very cold winter might have some beneficial effects by killing a higher than normal number of pests. But even here the consequences of a deteriorating climate can be detected. In England there was a shift towards spring rather than autumn sown crops in order to try and avoid damage from a harsh winter. In the Netherlands,
buckwheat, which is hardy and has a short growing season, but which was hardly grown in Europe before 1550, became increasingly important in the next hundred years. Other evidence from the Netherlands suggests that a cold, late spring reduced grass growth so that pastures were late to develop, reducing dairy output, increasing prices and also leading to a slaughter of cattle the following year if the hay crop was not sufficient to provide enough feed till the new grass had grown. In other areas increased rain could be most damaging, especially in the winter, by reducing arable yields because of waterlogged soils. This long period of poor climate came at a time when European population was already at the limit that the agricultural system could support. The worsened growing conditions meant a significant reduction in food production leading to increased malnutrition, widespread famine and death. One consequence was a period of much greater internal instability within the European states, which was particularly acute in the early seventeenth century.

For the overwhelming majority of people food meant vegetables. Nearly all the available land was needed to feed humans rather than provide pasture and there was not enough surplus grain to feed many animals. Where animals were kept their output was low. A medieval cow in Europe produced about one-sixth of the milk and one-quarter of the meat of a modern animal. In China 98 per cent of the calorific value of the diet came from vegetables, primarily rice. In Europe most people survived on a monotonous diet of vegetable and grain gruels and bread; meat and fish were very rare items except for the upper classes. As late as 1870, 70 per cent of the French diet consisted of bread and potatoes and in 1900 only 30 per cent of the calories came from animal products. Throughout Europe the majority of people lived on a maximum of about 2,000 calories a day (about the level of modern India), slightly higher in more prosperous countries such as England and Holland, but everywhere there were gross inequalities within society that meant that many obtained far less than this. In the early nineteenth century, in Norway, France and Germany, the average food consumption was still below 2,000 calories a day — less than contemporary Latin America and North Africa. The poorer regions of Europe had a particularly meagre diet. In some areas of France in the eighteenth century, for example in the Auvergne and the foothills of the Pyrenees, large parts of the population were still dependent on chestnuts for two to three months a year together with slops of maize and buckwheat, with some milk from a cow fed on weeds from the side of the road, and their intake was probably as low as 1,800 calories a day. This compares badly with the bushmen of the Kalahari desert who live on about 2,100 calories a day obtained by about three days work a week.

There was no steady improvement in food supplies. For a century or more after the plagues of the fourteenth century people were reasonably well fed because of the reduction in numbers but standards fell dramatically between 1500 and 1800 — indeed the level of meat consumption in Germany did not return to medieval levels until the mid-nineteenth century. Supplies also fluctuated during the year. Everywhere in Europe (and the pattern would have been the same elsewhere) the best time of the year would be the harvest (assuming it was at a reasonable level), which would be a time for celebration and for eating more food than usual. Winter was a bad time but the worst period was the early spring — before the first crops were ready and when food supplies laid in from the previous year were at their lowest. These problems were exacerbated by any outbreak of animal disease (which could spread rapidly in what were often undernourished herds) such as the epidemic of rinderpest that spread from Russia into western Europe between 1769 and 1774 and which killed one-and-a-half million cattle. For human beings a permanent state of poor diet led to constant malnutrition, susceptibility to disease and a continuing high level of mortality. For example, in France in the late seventeenth century between a fifth and a quarter of the population died before their first birthday, half before they were twenty and only one in ten lived till they were sixty.

This endemic level of inadequate diet and malnutrition for most of the people in the world was frequently turned into disaster by the outbreak of famine, which usually stemmed from crop failure following bad weather. In China in two thousand years between 108 BC and 1910 there were 1,828 years (over 90 per cent of the total) with recorded famines involving at least one province in the country. In France between 970 and 1100 there were sixty years of famine (about 45 per cent of the total at a time of expanding agricultural output) and in Tuscany between 1351 and 1767 there were 117 years of famine but only sixteen with good harvests (less than 4 per cent of the total). In Ethiopia in the two hundred years after 1340 there were ten major famines affecting the whole country. In France the rate of general famine affecting the whole country was high between the tenth and eighteenth centuries. In that period by far the worst century was the eleventh, with twenty-six famines affecting the whole country, but the lack of any overall improvement in the situation is demonstrated by
the fact that the eighteenth century had the second worst record with sixteen famines. The best, or least bad, century was the twelfth (when new land was being brought into production) with only two famines, followed by the fourteenth which had four, an improved performance largely due to the fact that the population was severely reduced by the plague after 1346. When food supplies did fail the scale of the subsequent tragedy could be immense. In 1666–97 in Finland between a quarter and a third of the population died as the result of famine. About the same proportion died in Bengal in 1769–70, when the total number of deaths was around 10 million, and Ethiopia suffered a similar loss of its population between 1888 and 1892.

The origins and effects of widespread famine can be illustrated by the events of 1315–17 when medieval Europe experienced its worst ever food shortages at a time when the population was at the very limit that the agricultural system could support. In 1314 the harvest was reasonable but the weather in 1315 was dreadful, being wet in every season. The spring sowing failed in most areas because of waterlogged fields, ploughs stuck in the mud and the hay crop was not properly ripe or dry when cut and stored. Crop yields were about half the normal level and what was available was of a low quality. By early 1316 food was already in short supply across the whole of Europe and seed for the next crop was being eaten. The winter and spring were again very wet and the rain continued through the summer producing another harvest at about half the average level. The resulting food shortage brought catastrophe to most of Europe. Wheat prices rose to three times their normal level and in some places of acute shortage they were over eight times higher. This meant that many of the poor could no longer buy food but people with money often could not buy simply because there was no food available – as even Edward II discovered for himself when the court arrived in St Albans in August 1316. The King of Bohemia lost thousands of sheep because he could not buy feed for them. All over Europe animals were killed in huge numbers as feed supplies ran out. The poor were dying in large numbers or turned to robbery in an attempt to get food; huge bands of starving peasants swarmed across the countryside. The food that was available was often of very low quality – bread would be mixed with pigeon and pig droppings, and animals that had died of disease were eaten causing outbreaks of disease in the human population. Some people were driven to even more desperate measures, as many reports of widespread cannibalism in an area stretching from England to Livonia on the Baltic coast bear witness. In Ireland in 1318 bodies were dug up from graves to provide food and in Silesia executed criminals were eaten. There were still cases of people eating human flesh into 1319. Animal diseases, probably aided by the lack of feed, added to the carnage, killing about 70 per cent of the sheep in some areas and in the four years 1319–22 some two-thirds of Europe’s population of oxen died. Only slowly did better weather and improved harvests bring some relief from the catastrophe.

The conditions that agricultural societies, utterly dependent on fragile food supplies, faced during a time of harvest failure is illustrated in graphic and harrowing detail by an account, contained in the parish register of Orsola in western Sweden, of the terrible famine at the end of the sixteenth century:

‘In 1596 at midsummer-tide the land was abundantly covered with splendid grass and much corn, so that everybody thought that there would be sufficient corn in the country. But ... when the people were at Skara market [June], there came so much rain and flood that all the bridges floated away. And with that same flood ... the water went over the fields and pastures, so that the corn and the grass were ruined, and thus there was little of both grain and hay. ... In the winter the cattle fell ill from the rotten hay and straw which was taken out of the water. ... It went the same way with the cows and the calves, and the dogs which ate their dead bodies also died. The soil was sick for three years, so that it could bear no harvest. After these afflictions it happened that even those who had good farms turned their young people away, and many even their own children, because they were not able to watch the misery of them starving to death in the homes of their fathers and mothers. Afterwards the parents left their house and home going whither they were able, till they lay dead of hunger and starvation. ... People ground and chopped many unsuitable things into bread; such as mash, chaff, bark, buds, nettles, leaves, hay, straw, peatmoss, nut-shells, peat-stalks, etc. This made people so weak and their bodies so swollen that innumerable people died. Many widows, too, were found dead on the ground with red hummock grass, seeds which grew in the fields, and other kinds of grass in their mouths. ... Children starved to death at their mothers’ breasts, for they had nothing to give them to suck. Many people, men and women, young and old, were compelled in their hunger to take to stealing. ... At times these and other afflictions came and also the bloody flux [dysentery] which put people in such a plight that countless died of it.’
Europe emerged from the constant threat of famine very gradually. The 1594–1597 famine affected the whole of the continent after a succession of four bad harvests that again produced widespread cannibalism and the eating of cats and dogs. That period marked the last severe famine in southern England although the north of the country was still seriously affected in 1623 when, for example, one in eight of the population of Penrith died. France was still badly affected by famine throughout the seventeenth century and the first decade of the eighteenth. In 1693–1694 about 10 per cent of the population of northern France died: in the Auvergne it was twice this figure and the total number of deaths may have been near two million. In 1709–1710 a famine of similar proportions occurred and also affected Prussia on a large scale. The last severe crisis to affect the whole of Europe came in 1816–1817. Although partly the result of the dislocation caused by the Napoleonic wars, its main origins lay in appalling weather across the continent (it affected the United States too), probably as a result of the large amount of volcanic dust in the atmosphere following the eruption of the Tambora volcano in Indonesia in 1815. Throughout the summer the weather was cool (July was the coldest on record) and rainfall was 50 per cent above average. In England two-thirds of the year’s rain fell in the summer months of July, August and September. As a result the harvest was six weeks late and the wine harvest was the latest ever known – extending into November in some places. Crop failure was widespread, wheat prices doubled from an already high level and the real wages of peasants and workers fell drastically. The result was widespread food riots in England, France and Belgium in 1816 and across most of the continent the following year. Death rates rose, though they were not as high as in earlier famines, and the number of epidemics increased, especially in southern Europe.

The last major famine to strike Europe came about thirty years later in Ireland. The social and economic conditions and its fragile agricultural base were in many ways similar to those in the rest of Europe centuries earlier. The root cause of the famine was population pressure on the available land. The population of Ireland rose ten-fold from about 800,000 in 1500 to eight-and-a-half million in 1846 and inheritance practices had produced a large number of very small holdings averaging half an acre. There were also about 650,000 landless labourers living in permanent destitution and most of the rural population lived in squalid, one room cabins. The need to provide food from tiny plots of land encouraged adoption of the potato, universally regarded throughout Europe as the food of the poor. Half an acre of land solely growing potatoes could provide a family with a monotonous diet but one that supplied a minimum level of nutrition. By the early nineteenth century potatoes took up about 40 per cent of the total crop area in Ireland and constituted the sole food of nearly half the population. However the potato was a crop vulnerable to a number of diseases and not well adapted to growing in the wet climate of north-west Europe. Disease and poor weather brought about widespread crop failure in 1739–1741 and about 500,000 people died. By the 1830s poor harvests were almost becoming the norm, which meant that even in good years a high proportion of the population would be on the edge of starvation, particularly during the early summer before the new crop was ready.

Catastrophe was triggered by the arrival in June 1845 from America of potato blight, a type of fungal disease which causes a rapid deterioration in healthy plants and spreads quickly given the right weather conditions. It can wipe out a whole crop and cause tubers to rot in storage. By August the disease had spread throughout Europe and for the next two years virtually no potatoes were on sale anywhere. The failure of the 1845 crop in Ireland was only partial but that of 1846 was almost total. The human consequences of that failure in Ireland were largely the result of the policies adopted by the British government and their determination not to interfere with the workings of the free market in food. The Corn Laws were repealed to allow the import of grain (partly because the English harvest had been bad). Although a large quantity of grain was imported, the problem was that the impoverished Irish peasantry had little money with which to buy wheat or maize and often no utensils to cook it. At the same time a large part of the Irish grain harvest was exported, often under armed guard. At the height of the famine in the summer of 1846 the government closed all public relief works, such as road building, in order to stop the people becoming dependent on government welfare. The only works that were allowed had to be paid for by the local districts which, because of the famine, had little revenue to fund such projects. The provision of relief food was left to private enterprise or voluntary efforts. Later in the year some works were reinstated but only for about 500,000 people – when even in a good year about two or three million would have been destitute. Government food stocks were only sold at market prices so as not to undercut private traders. Not until the winter of 1847 were soup kitchens provided, although in parallel all relief works were stopped as were any government imports of food. The consequence was that, overall, about one million people died either directly from lack of food.
or from the subsequent outbreak of diseases that affected the under-
nourished population. Another million people emigrated during the 
famine period and immediately afterwards, often in wretched condi-
tions. By the end of the nineteenth century a further three million had 
left Ireland and the population of the island was four-and-a-half 
million, almost half what it had been in the mid-1840s.

The Irish famine illustrates two important aspects of the problem of 
food supplies. First, that it was still possible even in a supposedly 
advanced area of the world such as Europe in the nineteenth century for 
a million people to starve to death. Second, that famine is not just a 
simple matter of food shortage. There was plenty of food in Ireland –
those who died could not afford to buy it and the authorities were not 
prepared to give it to them. The question of who is entitled to obtain 
food (either through purchase or gift) has formed a central part of 
contemporary analysis of recent famines in the Third World. In cases 
such as the recent famines in Ethiopia, the Horn of Africa and the Sahel 
there is normally plenty of food in the country and exports also 
continue. What happens is that certain groups of people are unable to 
obtain food, either because their own crops have failed or because they 
cannot afford to buy food at the high prices which are a consequence of 
the famine. For example, in Bengal in 1943 (when about three million 
starved to death) people died despite well-stocked food shops that were 
protected from looting by the police and the army. In Russia in 1911–
1912 there was a major famine affecting sixty regions in the country, 
but amidst widespread starvation and death a fifth of its vast grain 
production was exported to the west (about a quarter of the world’s 
trade in grain). In the Soviet Union, in the early 1930s, peasants died 
because the government appropriated the harvest to feed the cities and 
to provide exports to fund imports required for the industrialisation 
drive. But this is not just a contemporary phenomenon – similar 
examples can be found throughout history.

In its deepest sense the problem of famine stems from the change of 
attitude towards food that goes back to the emergence of agriculture. 
Gathering and hunting groups do not regard food as something to be 
traded but as available to all within the group. The problem of 
entitlement arose once ownership of land and food became the norm 
when settled; agricultural societies emerged. The dependence of these 
societies on a limited range of crops increased the risk of failure and 
when this happened the poorest members of society found themselves 
unable to obtain food. The problem of access is evident in the earliest 
accounts of famine in ancient societies although in some cases, and the 

later great medieval famine of 1315–1317 is probably an example of 
this, there was an absolute shortage of food.

The problem of access to food emerges plainly throughout Europe 
when contemporary accounts are available. The frequent response of 
those suffering from an inability to buy food at prices they could afford 
was to turn on the merchants, who were accused of withholding 
supplies from the market or moving them out of the region to areas 
where they could be sold at even higher prices. Fearing social unrest 
governments often intervened to try and provide food, particularly in 
the important towns. Occasionally they tried to buy food or force 
merchants to sell it but the normal response to shortage from ancient 
Greece and Rome through medieval to early modern Europe was to try 
and fix prices. It was rarely successful and often counter-productive by 
ensuring that food was withheld from the market. The scale and 
frequency of outbreaks of popular discontent is illustrated by the series 
of riots in various towns across France at the turn of the fourteenth and 
fifteenth centuries; there were violent protests against merchants moving 
food out of the area in Bayonne (1488), Montauban and Moissac 
(1493), Paris (1500), Agen (1514) and Lyons (1517). For at least 

another three centuries these events were constantly repeated across 
France (and other parts of Europe). The fears and perceptions of the 
people about the supply of food and those they believed were withholding 
it from the market were a central factor in influencing the actions of 
the crowds during a number of crucial episodes during the French 
Revolution. The same reactions to food shortage were still apparent as 
late as the agricultural crisis that affected Europe in 1816–17. For 
example, in 1816 at Dumfries in Scotland, a crowd seized oatmeal at the 
docks when it was being exported and took it to the town where they 
forced it to be sold to the public at what they thought were reasonable 
prices. A year later in Toulouse crowds stopped the export of grain and 
forced its sale in the town.

An existence under the constant threat of starvation and in the face of 
the daily reality of an inadequate diet and malnutrition has been the 
common lot of most of humanity since the development of agriculture. 
Only slowly, in a few areas of the world, did some societies (principally 
Europe and its colonies in North America and Australasia) emerge from 
this long struggle to survive. They were able to do so as a result of a 
combination of developments which made much larger quantities of 
food available to them. Over the centuries a number of small-scale 
improvements slowly raised agricultural output and productivity. Once 
records are available it is possible to trace a slow improvement in
European output and efficiency in the six hundred years after 1200; by 1800 yields were about two-and-a-half times higher. This was the result of a wide variety of changes. The range of fodder crops was increased, legumes were more widely used to improve fertility, better breeding of animals and more cross-breeding enhanced output, rotations became more complex and manuring more widespread as more animals could be fed during the winter months. Just as important though was the introduction of new crops and animals, which widened the agricultural base, provided greater stability against failure and improved food output. Some of these changes were the result of the slow diffusion of animals within a limited area – particularly from southern Europe to the northern parts. For example the Romans introduced the chicken from the Mediterranean region to north-west Europe and the white grape to the Moselle valley. Rabbits were introduced into Britain from southern Europe as a domesticated animal in the twelfth century and only subsequently escaped into the wild. Pheasants and fallow deer were also introduced about this time although the latter did not become a wild animal until the 1930s. But the major changes in the distribution of plants and animals in the world took place in two phases – in the Islamic world from the seventh to the tenth century and following the first European contacts with the Americas after 1492.

There was no contact between the agricultural systems of Europe and the Americas until the sixteenth century AD. The various empires that dominated Mesopotamia had numerous contacts with western India (and often controlled parts of the area) but very little with states further to the east. Even at the time when both the Roman and Han empires were at their height there was only a small amount of contact between them (little of it direct) and they continued to develop in their own way.

The rapid rise of Islam after the death of Muhammad in 632 and the conquest of most of the Near East, North Africa, Spain, Armenia, Georgia, Afghanistan and north-west India by the early eighth century did not result in a long lasting unified empire, but it did produce a vast area of considerable cultural uniformity which extended its influence further into south-east Asia and along the east coast of Africa through trading links. The creation of the Islamic empire with its trading network brought about a substantial diffusion of crops from south-east Asia and India westwards to the Near East, the Mediterranean region and eventually parts of southern Europe. India was a major centre for the transmission, especially after the conquest of Sind in 717, and Oman was also an important area where the sub-tropical crops of south-east Asia were gradually acclimatised to new growing conditions. From these centres the new crops spread into North Africa, with some reaching as far west as Spain and others penetrating west Africa, and progressing along the trade routes of the east coast of Africa to reach Zanzibar and later Madagascar.

Some of the crops such as the coconut palm could only grow in sub-tropical climates and therefore did not spread beyond the Gulf area and East Africa but most were gradually acclimatised to new growing conditions over a wide area. The most important of these crops for the future history of world agriculture was sugar cane. It was brought from India to Mesopotamia in the seventh century and then it spread westwards to the Levant, Egypt and the islands of the eastern Mediterranean, especially Cyprus, by the tenth century. Because of the large amount of labour required on the plantations, slavery became the basis of sugar cane cultivation in the areas dominated by Europeans from Cyprus to the islands of the Atlantic and the Americas. Almost as important as sugar cane was the slow spread of hard wheat from Ethiopia to the Mediterranean, where it became a staple part of the diet in North Africa (cous-cous) and in Italy (pasta) after the thirteenth century. Rice also spread from the Near East to large areas of Africa and reached the Po valley in northern Italy by the late fifteenth century. Citrus trees, the sour orange, lemon and lime, were brought by Islamic traders from south-east Asia (though they originated in eastern India)
to the Mediterranean, where their cultivation spread quickly, reaching Seville in southern Spain by the tenth century. Sorghum, which had originally spread from Africa to India about 2000 BC moved westwards to North Africa and Spain. Vegetables such as spinach and aubergines were brought from Persia and India to North Africa and eventually came to Spain by the eleventh century.

The new crops diffused through the Islamic world and beyond did not transform agriculture or provide more than a few mainly supplementary crops. A much more radical change took place after the Spanish conquered the Caribbean islands and the Aztec and Inca empires in the early sixteenth century. The Europeans who went to settle the Americas took with them their own crops and animals (wheat, sugar cane, cattle, sheep and horses). In the process they significantly altered the environment (a story that will be examined in detail in later chapters). But equally important were the consequences of bringing back previously unknown American crops, which influenced the agriculture of not just Europe but also the Near East, India, Africa and China. The two most important introductions from the 'New World' were the dietary staples of Mesoamerica and Peru – maize and potatoes. Maize was a highly productive crop (the yield was about twice that of wheat) but it took a long time to spread, particularly in Europe, even after the development of new varieties, possibly because of the poor climate in the area during the 'Little Ice Age'. The central point for the dispersal of maize was the Mediterranean area, where it could be grown without difficulty. It proved particularly well suited to conditions in Egypt, where it became a staple crop by the seventeenth century. In Europe it did not reach the Balkans until the eighteenth century and its movement further north had to await both an improvement in the climate and the development of types able to thrive in cooler conditions and a shorter growing season. Maize was not common in India until the early nineteenth century but then spread rapidly. China however adopted maize very early in the sixteenth century and it was soon a primary food crop in the upland areas of the south west of the country but did not reach the north for another three centuries. The great attraction of maize was its high yield enabling more people to be fed from the same amount of land. In China, particularly, this was important at a time when rice growing had begun to reach its natural limits. In the seventeenth century rice constituted about 70 per cent of the national food output, but this had fallen to less than 40 per cent by the early twentieth century as crops originally of American origin became more important. Maize also arrived in West Africa from Brazil in the sixteenth century and rapidly replaced millet and sorghum to become a central part of the diet because of its higher yields.

Adoption of the potato as a major crop was as long drawn-out a process as the spread of maize. It reached Spain by 1570, England and Germany by the end of the sixteenth century and Scandinavia about a hundred years later, and was introduced into North America from Europe in 1718. It seems that most people did not take readily to eating potatoes and originally they were grown as a fodder crop rather than for human consumption. Only in Ireland and parts of the Balkans did the potato become a staple food in Europe before the nineteenth century. Its chief advantage – the ability to provide a large amount of food from a small area – was widely recognised but the potato was normally only adopted after the failure of other crops. The other major crop of the Americas to be widely adopted was a tropical plant – manioc. In the early seventeenth century it was brought from Brazil to the mainland of Africa, where its very high yields combined with drought and pest resistance were rapidly appreciated. Once the problems associated with processing it into an edible food by removing the poisons were understood, it formed a vital part of the diet in the tropical areas, becoming particularly important in the nineteenth century. In this period farmers also adopted it in the southern parts of India. Apart from the major crops of maize, potato and manioc, the Americas also provided important supplementary crops. Particularly important was the tomato, adopted initially in the Mediterranean area (and also in India and the Near East) and later further north as varieties capable of growing in a cooler climate and shorter season were developed. (Europe now produces about 40 per cent of the world's tomato crop.) A wide variety of beans (an important source of protein) were rapidly adopted as were flavourings and spices such as chillies, to such an extent that they are now seen as integral parts of the 'local' cuisine of many areas of the world and especially India.

One major beneficial effect of the spread of new crops was that the subsistence base of many societies, which was often narrow and therefore highly vulnerable, became wider and this reduced the risk of catastrophic crop failure and famine. Another important gain was nutritional. Not only was more variety available in the poor and very limited diets of the majority of people but many of the foods, particularly plants such as tomatoes and chillies, were rich in vitamins and could help to reduce the risk of some deficiency diseases. However in some areas over-reliance on maize (especially without adopting the American way of preparing and cooking it) produced the deficiency
disease—pellagra. Despite improvements in reliability, quality and variety associated with the introduction of new crops the basic problem remained that of quantity. Some of the more productive crops, especially maize and potatoes, improved food output but in nearly every society these new crops did not solve the age-old problem of keeping a balance between human numbers and the amount of food that could be produced. In many cases the new higher yielding crops, rather than providing more calories per head, had the effect of allowing the population to grow more quickly until it reached a point at which it was out of balance with food supplies, as happened among the potato growing peasantry of Ireland before the disaster of the famine.

Only slowly, and in the relatively recent past, did a few societies begin to escape from a situation where a large part of the population lived on a poor diet barely adequate for minimum subsistence and under the constant threat of starvation. The first to move along this path was the Netherlands in the sixteenth and seventeenth centuries. Here the population doubled from around one million in 1500 to two million in 1650, which required a major adjustment in the agricultural system. Food output increased as new land was brought into cultivation (some of it was completely new land created from drained marshes or reclaimed from the sea) and more intensive farming systems were introduced (using clover, legumes and fodder crops together with increased amounts of manure from the extra animals that could be kept). In this period Dutch agriculture was certainly the most productive in Europe with yields about two-thirds higher than in England. However, much of the extra food required by the rising population was imported from the semi-colonial grain growing areas around the Baltic through the Dutch domination of the trade of the area. Without this additional source of food it is doubtful whether the larger numbers could have been fed.

England gradually adopted many of the improved agricultural methods developed in the Netherlands so that by the middle of the eighteenth century, output was rising faster than population growth. But the gain proved only temporary as the country experienced an unprecedented high growth in population between about 1780 and the end of the nineteenth century, and again population threatened to outstrip the capacity of even the improved English agricultural system. Growth averaged about 1 per cent a year and the population of England and Wales rose from 7½ million in 1780 to 14 million in 1831 and 32½ million in 1901. The response of English agriculture to this rise was much the same as in the past - new land was brought into cultivation (about a 50 per cent rise between 1700 and 1850), fallow land was reduced (equivalent to a further 40 per cent increase) and lower quality food was grown (the area under potatoes increased three-and-a-half fold in the first half of the nineteenth century). Agricultural productivity rose, partly through the further spread of some of the new ideas introduced in the eighteenth century but also through the introduction of more machinery, new fertilizers and new feeds such as oilcake (which was becoming common in the 1820s). Another bonus (a side effect of the large amount of cheap labour available in the countryside) was achieved by more weeding.

The rural population rose rapidly in this period (almost doubling) producing immense social pressure through rising rents and prices. Poverty was on the increase, especially in the east and south of the country where new machinery was introduced, and the number dependent on the potato rose to about two million. It was only the drift of a large part of the rural population into the new industrial towns in search of employment that avoided a major rural crisis in early nineteenth century. Even so, by the 1840s, only minor improvements in subsistence levels had been achieved for most of the population. This period, marked by the triumph of the industrial over the agricultural interest with the repeal of the Corn Laws in 1846, saw the swing towards importing food. In the 1840s about 5 per cent of Britain's food was imported. By the end of the century the situation had been transformed: 80 per cent of the grain for human consumption, 40 per cent of the meat and 72 per cent of dairy products were imported. It was only this use of other countries to supply the food that Britain needed that was to provide a solution to the perennial problem of feeding a rapidly rising population and improving the amount of food available per head.

The experience of Europe in the early nineteenth century demonstrates that the process of escaping from the problems of the past was slow and sporadic. Rural problems were particularly acute in the period between 1815 and about 1850 and population growth had reached the maximum that could be sustained, with a rapidly increasing subdivision of landholdings, rising rents and prices and therefore falling real wages together with the adoption of inferior foods such as the potato. In the early nineteenth century the response of the agricultural system was much the same too - an increase in the cultivated area even though this meant using more marginal land and reducing the amount of fallow land. Agricultural techniques had been improving fairly steadily for centuries but in this period these measures were only just sufficient to
maintain food output per head. Some of the pressure was relieved by the steadily improving climate after 1850 and, in the case of England, through movement into the new industrial towns, whereas in other countries, such as Ireland and Norway, emigration to the United States or elsewhere was the only solution.

The real revolution in the European food situation came after about 1850 with large-scale importation of food from the rest of the world and the use of imported resources such as guano from South America and other fertilizers from colonial territories to improve domestic productivity. This solution was not possible for other societies such as China that lacked colonial territories to exploit and they, therefore, continued to suffer the traditional problems of malnutrition and starvation stemming from population pressure. One of the main reasons for Europe’s success in breaking free from the long struggle to survive that had dominated the experience of nearly every society since the development of agriculture lay in its changing relationship with the rest of the world and, in particular, its ability to control an increasing share of the world’s resources.

7
THE SPREAD OF EUROPEAN SETTLEMENT

The history of the spread of European settlement falls into two phases — internal expansion followed by external colonisation — which can be seen as part of a single process driven by the same sort of pressures. The combined impact of these two movements has in effect formed the modern world. They transformed Europe from being one of the more backward societies in the world, which was the case until at least the fifteenth century, into the most advanced, able and willing not merely to influence the pace and nature of development elsewhere, but also, though a variety of means, to impose radical changes on the rest of the world. These changes involved the way people thought about the world around them, the use of natural resources and the exploitation of much of the rest of the world for the benefit of Europeans. The effects are still being experienced worldwide. But the most striking and immediate effect of the spread of European settlement beyond the boundaries of Europe itself was its lethal impact on indigenous peoples and societies. The sequence of events set in train by the arrival of the Europeans, despite differences in the native cultures and the country of origin of the settlers, reveals a consistent pattern. If events are interpreted in terms of the spreading of European culture, the opening up of new territories and the building of global empires, then it may be seen as a story of success. If the focus is on what happened to the people, the land and the environment generally, then it is an altogether different story.

For most of history, Europe, apart from the Mediterranean area, was a backwater. The earliest gathering and hunting groups only settled the area intermittently and at the height of the last ice age, when the people living in south-west France were producing their great cave paintings, the local population was probably no more than 10,000, with perhaps 100,000 in the whole of Europe, about five per cent of the world’s population. The development of agriculture took place outside Europe and only spread there thousands of years later. The first settled societies