

Introduction

THE GOOD OLD DAYS ARE NOW

Nothing is more responsible for the good old days than a bad memory.

Franklin Pierce Adams¹

Terrorism. ISIS. War in Syria and Ukraine. Crime, murder, mass shootings. Famines, floods, pandemics. Global warming. Stagnation, inequality, refugees.

‘Doom and gloom, everywhere’, as a woman on the street responded when public radio asked her to describe the state of the world.² It seems to be the story of our time.

These perceptions feed the fear and nostalgia on which populists of the Right and the Left campaign. Donald Trump’s presidential campaign slogan made the case that America had to become great *again*, like it was in the good old days. Fifty-eight per cent of those who voted for Britain to leave the EU in the country’s recent referendum say life is worse today than thirty years ago.

In 1955, thirteen per cent of the Swedish public thought

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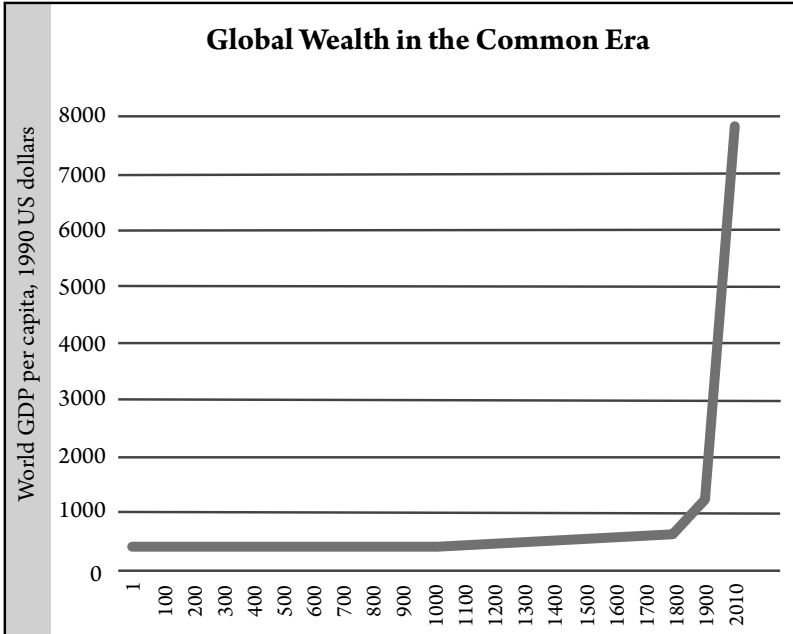
that there were ‘intolerable conditions’ in society. After half a century of expanded human liberties, rising incomes, reduction in poverty and improved health care, more than half of all Swedes thought so.³

Many experts and authorities agree. General Martin Dempsey, chairman of the Joint Chiefs of Staff, recently testified before US Congress: ‘I will personally attest to the fact that . . . [the world] is more dangerous than it has ever been.’⁴ Pope Francis claims that globalization has condemned many people to starve: ‘It is true that in absolute terms the world’s wealth has grown, but inequality and poverty have arisen.’⁵

On the political left, activist Naomi Klein argues our civilization is ‘on a collision course’, and that we are ‘destabilising our planet’s life support system.’⁶ On the right, philosopher John Gray thinks that human beings are ‘homo rapiens’, a predatory and destructive species that is approaching the end of civilization.⁷

I used to share their pessimism. When I began to shape my worldview in Sweden in the 1980s, I found modern civilization hard to stomach. Factories, highways and supermarkets to me were a dismal sight, and modern working life seemed sheer drudgery. I associated this new global consumer culture with the problems of poverty and conflict that television brought into our living room. Instead, I dreamed of a society that put the clock back, a society that lived in harmony with nature. I hadn’t thought about the way people had actually lived before the Industrial Revolution, without medicines and antibiotics, safe water, sufficient food, electricity or sanitary systems. Instead I had thought of it more in terms of a modern excursion into the countryside.

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Source: Maddison 2003.⁸

But I started reading history and travelling the world. I found I could no longer romanticize the good old days once I began to understand what they had really been like. One of the countries on which I focused my studies experienced chronic undernourishment – it was poorer, with shorter life expectancy and higher child mortality than the average sub-Saharan African country. That country was my ancestors' Sweden, 150 years ago. The truth is that the good old days were awful.

Despite what we hear on the news and from many authorities, the great story of our era is that we are witnessing the greatest improvement in global living standards ever to take place. Poverty, malnutrition, illiteracy, child labour and infant mortality are falling faster than at any other time in human

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history. Life expectancy at birth has increased more than twice as much in the last century as it did in the previous 200,000 years. The risk that any individual will be exposed to war, die in a natural disaster, or be subjected to dictatorship has become smaller than in any other epoch. A child born today is more likely to reach retirement age than his forebears were to live to their fifth birthday.

War, crime, disasters and poverty are painfully real, and during the last decade global media has made us aware of them in a new way – live on screen, every day, around the clock – but despite this ubiquity, these are problems that have always existed, partially hidden from view. The difference now is that they are rapidly declining. What we see now are the exceptions, where once they would have been the rule.

This progress started with the intellectual Enlightenment of the seventeenth and eighteenth centuries, when we began to examine the world with the tools of empiricism, rather than being content with authorities, traditions and superstition. Its political corollary, classical liberalism, began to liberate people from the shackles of heredity, authoritarianism and serfdom. Following hot on its heels was the Industrial Revolution of the nineteenth century, when the industrial power at our disposal multiplied, and we began to conquer poverty and hunger. These successive revolutions were enough to liberate a large part of humanity from the harsh living conditions it had always lived under. With late twentieth-century globalization, as these technologies and freedoms began to spread to the rest of the world, this was repeated on a larger scale and at a faster pace than ever before.

Humans are not always rational or benevolent, but in general they want to improve their lives and the lives of their families, and with a tolerable degree of freedom they will work hard to

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make this happen. Step by step, this adds to humanity's store of knowledge and wealth. In this era, more people are allowed to experiment with different perspectives and solutions to problems than before. So we constantly accumulate more knowledge and every individual can contribute and achieve on the shoulders of hundreds of millions who have come before in a virtuous cycle.

This book is about humanity's triumphs. But it is not a message of complacency. It is written partly as a warning. It would be a terrible mistake to take this progress for granted. There are forces at work in the world that would destroy the pillars of this development – the individual freedoms, open economy and technological progress. Terrorists and dictators do what they can to undermine open societies, but there are also threats from within our societies. Nationalist and authoritarian politicians want to dismantle individual freedoms and start building walls between countries again.

These forces want us to think that the world is dangerous and that things are spiralling out of control, because frightened people think differently. Social psychologists who study authoritarian attitudes make the case that they are not based on a stable personality trait, but on a predisposition that can be activated under certain circumstances. When people think that their society or their group is under threat they begin to express more authoritarian and protectionist views even on issues that are not related to the particular threat. It's a flight from freedom, and into something supposedly familiar, safe and secure.

Frightened people do not ask for opportunities, but for protection. They don't vote for openness and freedom, but for the strongman who promises them security and provides easily

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identifiable scapegoats. If we think we don't have anything to lose in doing so, it's because we have a bad memory.

It is precisely for this reason that we have to remember that when people are allowed freedom, they don't create chaos, but progress. At this point in time we have to study the amazing accomplishments that resulted from the slow, steady, spontaneous development of millions of people who were given the freedom to improve their own lives, and in doing so improved the world. It is a kind of progress that no leader or institution or government can impose from the top down.

This book is about this progress, about what happened, how it happened and why we missed it.

It is surely humanity's greatest achievement. If we could divert our eyes from our cellphones' news flashes more often, and look around us, at the science, technology and wealth that are now an integrated part of our lives, we would see proof of our abilities every day. So I borrow my dedication from the epitaph of Sir Christopher Wren, the architect who built and is buried in St Paul's Cathedral: *Si monumentum requiris, circumspice* ('If you are looking for a monument, look around you').

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[W]hoever could make two ears of corn, or two blades of grass, to grow upon a spot of ground, where only one grew before, would deserve better of mankind, and do more essential service to his country, than the whole race of politicians put together.

Jonathan Swift¹

One winter's day in 1868 my great-great-great-great grandfather, Eric Norberg, returned to Nätra in northern Ångermanland, Sweden, with several bags of wheat flour in his cart. He came from a family of 'south carters', northern farmers who flouted Sweden's trade barriers and monopolies by going on long trading journeys. Eric Norberg sold country-woven linens in the south of Sweden and returned with salt and cereals.

Seldom, though, was his return so longed for as on this occasion. It was a famine year. Crops had failed everywhere in the country and those who were short of flour had to mix bark into their bread. A man from the neighbouring parish of Björna recalls his personal experience, aged seven, of those hungry years:

We often saw mother weeping to herself, and it was hard on a mother, not having any food to put on the table for her hungry

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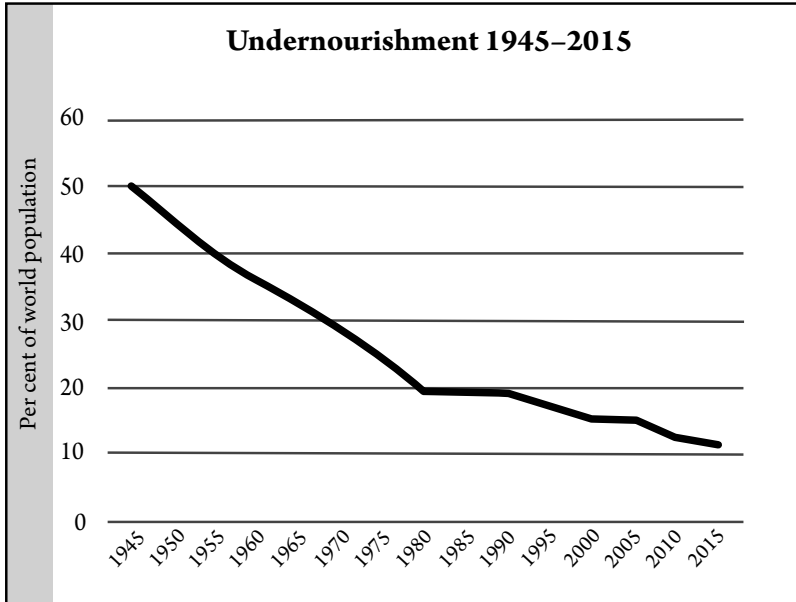
children. Emaciated, starving children were often seen going from farm to farm, begging for a few crumbs of bread. One day three children came to us, crying and begging for something to still the pangs of hunger. Sadly, her eyes brimming with tears, our mother was forced to tell them that we had nothing but a few crumbs of bread which we ourselves needed. When we children saw the anguish in the unknown children's supplicatory eyes, we burst into tears and begged mother to share with them what crumbs we had. Hesitantly she acceded to our request, and the unknown children wolfed down the food before going on to the next farm, which was a good way off from our home. The following day all three were found dead between our farm and the next.²

Young and old, haggard and pale, went from farm to farm, begging for something to delay their death from starvation. The most emaciated livestock were tied upright because they could not stand on their own feet. Their milk was often mingled with blood. Several thousand Swedes died of starvation within that year and the next.

Failed harvests were not uncommon in Sweden. A single famine, between 1695 and 1697, claimed the lives of one in fifteen, and there are references to cannibalism in oral accounts. Without machinery, cold storage, irrigation or artificial fertilizers, crop failures were always a threat, and in the absence of modern communications and transportation, failed harvests often spelled famine.

Getting enough energy for the body and the brain to function well is the most basic human need, but historically, it has not been satisfied for most people. Famine was a universal, regular phenomenon, recurring so insistently in Europe that it

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Sources: FAO 1947, 2003, 2015.³

‘became incorporated into man’s biological regime and built into his daily life’, according to the French historian Fernand Braudel. France, one of the wealthiest countries in the world, suffered twenty-six national famines in the eleventh century, two in the twelfth, four in the fourteenth, seven in the fifteenth, thirteen in the sixteenth, eleven in the seventeenth and sixteen in the eighteenth. In each century, there were also hundreds of local famines.⁴

In times of famine, peasants from the countryside turned to the towns, where they crowded together and begged for food and often died in squares and streets, as in Venice and Amiens in the sixteenth century. The cold weather in the seventeenth century made the situation much worse. In 1694, a chronicler in Meulan, Normandy, noted that the hungry harvested the

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wheat before it was ripe, and 'large numbers of people lived on grass like animals.'⁵ They might have been relatively lucky – in central France in 1662, 'Some people ate human flesh.'⁶ In Finland, the years 1695–7 are known as 'the years of many deaths' when between a quarter and a third of the entire population died of famine.

Braudel points out that this was in privileged Europe; 'Things were far worse in Asia, China and India.' They were dependent on rice harvests crossing vast distances and every crisis became a disaster. Braudel quotes a Dutch merchant who witnessed the Indian famine of 1630–1:

'Men abandoned towns and villages and wandered helplessly. It was easy to recognize their condition: eyes sunk deep in the head, lips pale and covered with slime, the skin hard, with the bones showing through, the belly nothing but a pouch hanging down empty . . . One would cry and howl for hunger, while another lay stretched on the ground dying in misery.' The familiar human dramas followed: wives and children abandoned, children sold by parents, who either abandoned them or sold themselves in order to survive, collective suicides . . . Then came the stage when the starving split open the stomachs of the dead or dying and 'drew at the entrails to fill their own bellies'. 'Many hundred thousands of men died of hunger, so that the whole country was covered with corpses lying unburied, which caused such a stench that the whole air was filled and infected with it . . . in the village of Susuntra . . . human flesh was sold in open market.'⁷

Even in normal times margins in the most developed countries were exceedingly narrow, and the food not always very

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nutritious, nor could it be kept very long. Often it had to be procured just before eating. People dried and salted down their food for storage, but salt was expensive. In an ordinary home in my ancestors' province of Ångermanland a hundred years ago, there were four meals: potatoes, herring and bread for breakfast; porridge or gruel for lunch; potatoes, herring and bread for dinner; and porridge or gruel for supper. This is what people ate every day, except on Sundays, when they had meat soup (if there was any meat) mixed with barley grains. There being no china, everyone ate from the same dish, using a wooden spoon which was afterwards licked clean and put away in the table drawer.⁸

The importance of adequate nutrition for people's health and survival has been documented in a disturbing way by a study of life expectancy at the age of fifty in what are now rich countries, at the turn of the last century. It turns out that it is almost half a year longer for those born in the Northern Hemisphere between October and December than for those born between April and June. In the Southern Hemisphere, it is the other way around. Those born in the Northern Hemisphere, who later migrated to the South, also live longer if they were born between October and December. One of the probable reasons for this is that fresh fruit and vegetables were more readily available in the autumn until quite recently, even in rich countries. It seems that nutrition in the womb and early infancy was better for these children, since birth weights were also higher in the autumn.⁹

At the end of the eighteenth century, ordinary French families had to spend about half their income on grains alone – often this meant gruel. The French and English in the eighteenth century received fewer calories than the current average

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in sub-Saharan Africa, the region most tormented by undernourishment.¹⁰

If you sometimes hear about short working hours in the ancient past, don't be too envious. People worked as long as they could. The main limiting factor was that they did not have access to the calories they needed for children to grow properly or for adults to maintain healthy bodily functions. Our ancestors were stunted, skinny and short, which required fewer calories and made it possible to work with less food. The economist and Nobel laureate Angus Deaton, who is one of the world's leading experts on health and development, talks about a 'nutritional trap' in Britain in the eighteenth and early nineteenth century: because of this lack of calories people could not work hard enough to produce enough food to be able to work hard.¹¹

It has been estimated that 200 years ago some twenty per cent of the inhabitants of England and France could not work at all. At most they had enough energy for a few hours of slow walking per day, which condemned most of them to a life of begging.¹² The lack of adequate nutrition had a serious effect on the population's intellectual development as well, since children's brains need fat to develop properly.

Some thinkers at the time assumed this would always be the case. In the eighteenth century, the Reverend Thomas Robert Malthus concluded that human numbers would always outrun the amount of food available. He saw that population doubled at an exponential rate – from two to four to eight to sixteen – whereas agricultural production only increased at a linear rate – from two to three to four to five. Whenever food was abundant it would result in more surviving children, which would result in even more deaths later on. Humanity would always suffer from famine, Malthus concluded in 1779:

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The power of population is so superior to the power in the earth to produce subsistence for man, that premature death must in some shape or other visit the human race. The vices of humanity [infanticide, abortion, contraception] are active and able ministers of depopulation. They are the great precursors in the great army of destruction, and often finish the dreadful work themselves. But should they fail in this war of extermination, sickly seasons, epidemics, pestilence, and plague, advance in terrific array, and sweep off their thousands and ten thousands. Should success be still incomplete, gigantic inevitable famine stalks in the rear, and with one mighty blow, levels the population with the food of the world.¹³

Malthus accurately described humanity's predicament as it stood. But he underestimated its ability to innovate, solve problems and change its ways when Enlightenment ideas and expanded freedoms gave people the opportunity to do so. As farmers got individual property rights, they then had an incentive to produce more. As borders were opened to international trade, regions began to specialize in the kinds of production suited to their soil, climate and skills. And agricultural technology improved to make use of these opportunities. Even though population grew rapidly, the supply of food grew more quickly. The per capita consumption in France and England increased from around 1,700–2,200 calories in the mid-eighteenth century to 2,500–2,800 in 1850. Famines began to disappear.¹⁴ Sweden was declared free from chronic hunger in the early twentieth century.¹⁵

However, as late as 1918, in a book about the food situation, the United States Food Administration published a 'Hunger Map of Europe', showing the threats to food security in Europe

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at the end of the First World War. A few countries, such as Britain, France, Spain and the Nordic countries, were deemed to have 'sufficient present food supply but future serious [shortages]'. Italy had a 'serious food shortage' and countries such as Finland, Poland and Czechoslovakia suffered from 'famine conditions'. 'Remember,' the book said, 'that every little country on the [map] is not merely an outline, but represents millions of people who are suffering from hunger.'¹⁶

One of the most powerful weapons against the scourge of hunger was artificial fertilizer. Nitrogen helps plants to grow and some of it is available in manure, but not much. For more than a century, the world's farmers used bird droppings accumulated over centuries on the coast of Chile, which contained huge quantities of sodium nitrate. But not enough of it was available. Scientists and entrepreneurs thought that there must be some way of fixing nitrogen from the atmosphere, where it is abundant.

The German chemist Fritz Haber, working at the chemical company BASF, was the first to solve the problem. Based on his theoretical work, and after several years of experiments, in 1909 he succeeded in producing ammonia from hydrogen and atmospheric nitrogen. The problem was that he could only do it on a very small scale. There were no large containers that functioned at the temperatures and pressures needed. A colleague at BASF, Carl Bosch, carried out over 20,000 experiments in over twenty reactors before he came up with the right process to synthesize ammonia on an industrial scale. The Haber-Bosch Process made artificial fertilizer cheap and abundant, and soon it was used all over the world.

'What has been the most important technical invention of the twentieth century?' asks Vaclav Smil in *Enriching the Earth*.

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He rejects suggestions like computers and aeroplanes, going on to explain that nothing has been as important as the industrial fixing of nitrogen: 'the single most important change affecting the world's population – its expansion from 1.6 billion people in 1900 to today's six billion – would not have been possible without the synthesis of ammonia.' Without the Haber-Bosch Process about two-fifths of the world population would not exist at all, Smil claims.¹⁷

Sadly, Fritz Haber's brilliant mind was also put to the task of killing. He was a pioneer in chemical warfare and developed chlorine gas for the German troops to use against enemy forces. He directed the first release of fatal gas himself on 22 April 1915, at the Second Battle of Ypres. Six thousand French soldiers were killed. As Haber put it, 'During peace time a scientist belongs to the World, but during war time he belongs to his country.'¹⁸ Coming from a man who saved more lives than perhaps anyone else, but also destroyed lives on a massive scale, this might be one of the best possible arguments against war.

There were downsides to artificial fertilizer as well. Nitrogen makes everything grow. Agricultural run-off from our coasts causes algae to bloom, which results in oxygen depletion as they decay. This has a serious effect on other organisms, and those that cannot escape from the environment become ecologically stressed or die out. From the northern Mexican Gulf to the Baltic Sea, we have seen more 'dead zones' like this in the last half century, which has resulted in tighter regulation of the use of nitrogen fertilizer in several countries.

But in parallel to this, every other form of agricultural technology has also improved. A hundred and fifty years ago it took twenty-five men all day to harvest and thresh a ton of grain.

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With a modern combine harvester, a single person can do it in six minutes. In other words, it contributed to a 2,500-fold productivity increase. It used to take half an hour to milk ten litres. With modern milking machines it takes less than one minute.¹⁹ Expanded trade, better infrastructure, cheap electricity and fuel, food packaging and refrigeration have all made it possible to move food from surplus areas to places with shortfalls. In the USA, it took about 1,700 hours to purchase the annual food supply for a family in the late nineteenth century. Today, it takes no more than 260 hours.²⁰

In the mid-nineteenth century, the average daily calorific intake in western Europe was between 2,000 and 2,500 – below what it is in Africa today. In 1950, it was already around 3,000. One indicator of health is average height, since the human body reduces its growth if the necessary amount of nutrition is not available. The historical records show that the difference in height between western Europe and the rest of the world was marginal until about 1870. After that, the average western European grew in stature by around one centimetre per decade, from 167 centimetres to 179 centimetres a century later.²¹ This was incredibly important for health, since taller people generally lived longer and children who received better nutrition could resist disease and stood a better chance of surviving.

It was not just an increase in food that saved us from Malthus's nightmares, but also lower fertility. As people became richer and better educated, they had *fewer* children, not more, as had been predicted. US fertility rates plummeted from seven children per woman in 1800 to 3.8 children in 1900, and to 1.9 children in 2012 – below the replacement rate. The trend is the same all over the Western world.²² It seems that, when child health improved, parents could assume that their offspring

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would survive to adulthood, and as human capital increased in value, economically it made more sense to have fewer children and bestow them with a longer education instead. The argument of Malthus was turned on its head – food production exploded, but population growth slowed.

For the first time in humanity's history, the food problem was being solved. In some places it even started to be overtaken by the opposite problem – that of obesity. But still, many assumed that it would be impossible to feed the rest of the planet. As mortality rates plunged, a growing global population had to be fed. From 1950 to the mid-1980s, world population doubled from 2.5 to five billion, and many neo-Malthusians predicted mass starvation. 'The battle to feed all of humanity is over,' Paul Ehrlich wrote in *The Population Bomb* in 1968. 'In the 1970s, the world will undergo famines – hundreds of millions of people are going to starve to death.'²³ In *Famine 1975!* William and Paul Paddock predicted that 'in fifteen years the famines will be catastrophic.'²⁴

Yet the exact opposite happened. Just when they said that the battle was lost, we made huge gains, and no one fought more bravely for humanity than Norman Borlaug, an agronomist from Iowa, who was obsessed with the problem of global hunger. In one episode of the TV series *Bullshit!* the magicians Penn and Teller play a game of 'The Greatest Person in History', with all the pretenders, religious leaders, presidents and revolutionary heroes in one deck. Like poker, each player places bets based on how good their cards are – but they might be bluffing. Penn draws one card and immediately goes all in, because he knows he is going to win. He got lucky: he drew Norman Borlaug.

The story of Borlaug and the global Green Revolution that he initiated begins in Mexico in 1944, when he started working

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there for the Rockefeller Foundation on agricultural development.²⁵ The programme was initiated to teach Mexican farmers new methods, but Borlaug was obsessed with coming up with better, higher-yield crops. He grew up in the US Midwest, and noticed that horrible dust storms and crop failures had the least impact where farmers had begun with high-yield approaches to farming. He wanted more countries to have access to this.

After thousands of crossings of wheat, Borlaug managed to come up with a high-yield hybrid that was parasite resistant and wasn't sensitive to daylight hours, so it could be grown in varying climates. Importantly, it was a dwarf variety, since tall wheat expended a lot of energy growing inedible stalks and also collapsed when it grew too quickly. When he introduced this new hybrid, Borlaug also showed farmers how modern irrigation and artificial fertilizer increased the yields. The new wheat was quickly introduced all over Mexico, and amazingly in 1963, the harvest was six times larger than in 1944. Overnight, Mexico became a net exporter of wheat.

Borlaug worked in the developing world for most of his life, spreading these technologies, but he struggled against local mores, feudal traditions, hostility to Westerners, and often Westerners themselves, who claimed that a better food supply would cause overpopulation, and it would be better to let nature do its work.

In 1963, Borlaug moved on to India and Pakistan, just as it found itself facing the threat of massive starvation. Immediately, he ordered thirty-five trucks of high-yield seeds to be driven from Mexico to Los Angeles, in order to ship them from there. First, the convoy was held up by Mexican police and then blocked at the US border because of a ban on seed imports. Then it was stopped by the National Guard, because riots had

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blocked the harbour. But in the end, the ship sailed. That was only the beginning of the problems, however: 'I went to bed thinking the problem was at last solved,' Borlaug said, 'and woke up to the news that war had broken out between India and Pakistan.'

But Borlaug and his team worked tirelessly throughout the war, planting seeds sometimes within sight of artillery flashes. Despite a late planting and the many logistical problems, yields rose by seventy per cent that year, enough to prevent a general wartime famine. Because of the risk of wartime starvation, he got the go-ahead from both governments to roll it out on a larger scale. The next harvest was even bigger, and the food situation was beginning to come under control. Suddenly there was a shortage of labour to harvest all the crops, and a dearth of everything from jute bags to railcars. Some school buildings had to be closed temporarily, so they could be used for grain storage.

Just a few years later the impossible had happened, and India and Pakistan were self-sufficient in the production of cereals. Today they produce seven times more wheat than they did in 1965. Despite a rapidly growing population, both countries are much better fed than they used to be.

Borlaug also convinced many governments to pay their farmers world market prices for their grain, rather than forcing them to sell at a fixed, low price. This widespread price regulation was a policy intended to help the urban population, but resulted in lower production and hunger. Inspired by his success with better crops, colleagues of Borlaug developed high-yield rice varieties that quickly spread around Asia.

This was the Green Revolution, which has given poor countries better crops and bigger yields, and has alleviated rural poverty. The average global daily intake of calories was 2,200 in

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1961, but has since increased to more than 2,800. Back then, people in fifty-one countries, including Iran, Pakistan, China and Indonesia, consumed less than 2,000 calories per person, per day. By 2013, that number had fallen to just one: Zambia. Even after the increase in food prices in the last few years, world agricultural prices (as measured by the Grilli-Yang Index) are now half of what they were in the early twentieth century.²⁶

The Food and Agricultural Organization of the United Nations (FAO) reported in 1947 that around fifty per cent of the world's population was chronically malnourished.²⁷ Around this time, nitrogen fertilizer was introduced broadly and many low- and middle-income countries began to modernize their agricultural sectors. In 1969–71, the FAO estimated that thirty-seven per cent of the developing world population was undernourished, and today this has declined to around thirteen per cent.

Table 1. Undernourishment, percentage of population

	1969–71	1979–81	1990–2	2000–2	2014–16
Latin America	20	14	15	11	6
Asia	40	30	24	18	12
Africa	34	31	28	25	20
Developing world	37	28	23	18	13
World	29	19	19	15	11

Sources: FAO 2003, 2015.

Since 1990–2, the proportion of chronically undernourished people has declined from twenty-three to thirteen per cent of the global low- and middle-income country population. The number of hungry people has been reduced by 216 million. Since the population has grown by 1.9 billion people at the

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same time, the FAO estimates that about two billion people have been freed from a likely state of hunger in the past twenty-five years.

One country that has seen more progress than others is Peru, which has reduced malnutrition by seventy-six per cent since 1990. Today, 4.7 million fewer Peruvians experience undernourishment. One reason is that Peru introduced an open trade regime, property rights and transactions reform, which gave more farmers access to credit and incentives to improve their farms. As a result, agricultural productivity has soared. Similar reforms in Vietnam, including the opening up of the rice market and reduced agricultural taxes, have reduced the number suffering from malnutrition there by more than twenty million people.

Africa has the worst indicators. Hunger in Africa south of the Sahara decreased from thirty-three to twenty-three per cent from 1990 to 2014, but because of the increase in population, the number of chronically undernourished people has increased by almost forty-five million. However, there are success stories in Africa too. Even though the population grew by more than eighty million in Nigeria between 1990 and 2015, the number of undernourished people declined by around eight million. Countries such as Angola, Cameroon and Mozambique cut their rate of malnutrition by more than fifty per cent.

After the Second World War, average height started to increase in developing countries, just as it had in rich countries before them. In East Asia it increased from 166 centimetres in the 1930s to 172 in the 1980s. In Japan it increased by ten centimetres in just fifty years. In sub-Saharan Africa, by contrast, average height actually decreased by one centimetre

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between the 1960s and the 1980s. Interestingly, there is a clear correlation between height and GDP per capita (though it plateaus in wealthy countries).²⁸ The prevalence of child stunting – when malnutrition stops children’s growth – has declined by twenty-five per cent since 2000.²⁹

It has been estimated that in the first decade of the twentieth century, 3.1 million children died annually because of conditions related to malnutrition. This increased to about four million children in the 1950s and 1960s because of population growth, but then it started to decline rapidly, even in absolute numbers. In the first decade of the twenty-first century, 1.7 million children died because of malnutrition – still a shockingly high number, but a sixty per cent reduction since the 1950s, even though world population more than doubled.³⁰

There have been negative side effects of this more intensive farming, including over-extraction of groundwater for irrigation and nitrate pollution of water bodies. But the Green Revolution also made it possible to save pristine land from being turned into farmland. Between 1700 and 1960, farmland quadrupled, as people made use of forests and grassland to feed themselves. But after fixing nitrogen and developing new seeds, it was possible to produce more from the same amount of land. For the first time, for the world as a whole, food production has been decoupled from land use.

From 1961 to 2009, farmland increased by only twelve per cent, while farm production increased by about 300%. It has been estimated that, had agricultural yields stayed the same, farmers would have needed to turn another three billion hectares into farmland – immense continental areas, about the size of the USA, Canada and China put together. Artificial fertilizer has caused oxygen depletion in many marine systems,

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but it also saved us from depleting wildlife and turning our planet into 'Skinhead Earth'.³¹

In 1970, Borlaug won the Nobel Peace Prize for his work in increasing the global food supply. As US Senator Rudy Boschwitz put it:

Dr. Norman Borlaug is the first person in history to save a billion human lives. But he must also get credit for saving the wild creatures and diverse plant species on 12 million square miles of global forest that would long since have been ploughed down without the high-yield farming he pioneered. The two accomplishments combined make him dramatically unique.³²

Nonetheless, arguments against modern agricultural technology have had a huge impact on the debate, and some environmentalists object to nitrogen fertilizer on principle, despite the human cost. Today we see the same objections to genetically modified crops, which would increase our yields even further. Environmental campaigners have had an impact on one continent, Africa, where they pressured big foundations and the World Bank to back away from introducing the Green Revolution, which Borlaug had considered the next priority. This is now the only region where the number of undernourished people has continued to increase, and where wild habitats are being depleted by slash-and-burn subsistence agriculture.

Borlaug has reacted angrily to this campaign:

Some of the environmental lobbyists of the Western nations are the salt of the earth, but many of them are elitists. They've never experienced the physical sensation of hunger. They do

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their lobbying from comfortable office suites in Washington or Brussels. If they lived just one month amid the misery of the developing world, as I have for fifty years, they'd be crying out for tractors and fertilizer and irrigation canals and be outraged that fashionable elitists back home were trying to deny them these things.³³

Borlaug has succeeded in privately funding several African projects since the early 1990s, with the help of former US president Jimmy Carter and the Japanese philanthropist Ryoichi Sasakawa. At first Borlaug thought they should start with a few years of research, but after he saw the terrible circumstances there, he changed his mind and proposed that they 'just start growing' and proceeded to triple corn yields. One of his most successful projects has focused on Ethiopia. It is now one of a few African countries that have managed to reach the Millennium Development Goal of halving the proportion in hunger between 1990 and 2015. Almost six million fewer Ethiopians face chronic hunger today than in 1990, even though the population has increased by more than forty million.

Quite possibly, the most important long-term effect of the Green Revolution was that it reduced the number of mouths that had to be fed, long-term. When children began to survive to adulthood, parents began to have fewer children. The demographic transition that the West has already gone through is now being repeated across the developing world. The neo-Malthusians claimed this wouldn't happen at all, but in fact it has happened much *faster* in low- and middle-income countries.

Between 1950–5 and 2010–15, the number of children per woman declined from 6.1 to 2.6. The unprecedented

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demographic transition that took the Western world 200 years was repeated by the developing world in just sixty years. In East Asia, it declined from 5.6 to 1.6, in South Asia from 6 to 2.6, and in Latin America from 5.9 to 2.2. The region where the transition has been slower is also the one with the least progress in wealth, health and education, but even in sub-Saharan Africa the fertility rate has declined, from 6.6 to 5.1, and according to the UN projections, it will decline to four in 2030 and to three in 2050.³⁴ The combination of more food per hectare and smaller families will mean that the increase in farmland has almost slowed to a halt, which will be a huge boon to biological diversity in the coming century.

Even better news than the decline of chronic undernourishment is the disappearance of major famines. Over the last 140 years, there were 106 episodes of mass starvation that each killed more than 100,000 people. From 1900 to 1909, twenty-seven million people died in famines, and more than fifteen million died every decade from the 1920s to the 1960s. Those famines were often partly or wholly man-made.³⁵ In the earliest era this was a result of imperial policies that dismantled local farm production and trade and forced peasants to produce for exports. War famines killed millions in Asia in the 1930s and 1940s. Communist regimes in the Soviet Union, China, Cambodia, Ethiopia and North Korea killed tens of millions because of forced collectivization and the use of hunger as a weapon.

In our own time, the most ruthless regimes still produce the most horrific conditions. Jang Jin-sung, a member of North Korea's elite, described what he saw in the late 1990s, before he fled to the West. The starving were sent to parks to beg until they died. A special 'Corpse Division' would poke at bodies

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with sticks to see if they were already dead. He saw them loading corpses on a rickshaw, on which bare and skeletal feet poked out in odd directions.

In a crowded market, Jang saw an adult woman and a girl of about seven. The woman had hung a sign around the girl's neck: 'I will sell my daughter for 100 won' – less than ten pence. Apparently, the father had already died of starvation. An army lieutenant agreed to take the girl. The mother ran away with the money, but soon returned with a packet of bread. She asked her daughter for forgiveness, sobbing violently while she began to put pieces of bread into the child's mouth: 'This is all I can give you before I go.' Several in the crowd began to cry.³⁶

But the experience of North Korea is an outlier: in general, communism has collapsed and empires have fallen. Farmers have received the formal titles to their land, which has given them an incentive to invest in better equipment and irrigation systems. Trade across borders and within countries has made it possible for other regions to supply those that have a temporary shortage, so that today, those in the position of my ancestor needn't travel hundreds of miles in search of food.

The death toll from great famines declined to 1.4 million during the 1990s. In the twenty-first century, thus far, the death toll is near 600,000 – just two per cent of what it was 100 years earlier, even though world population is four times bigger than it was then. These modern famines are the result of armed conflicts in countries such as Sudan, Somalia and the Democratic Republic of Congo.³⁷

Strange as it sounds, democracy is one of our most potent weapons against famine. As the economist Amartya Sen has pointed out, there have been famines in communist states, absolute monarchies, colonial states and tribal societies, but

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never in a democracy. Even poor democracies, such as India and Botswana, have avoided starvation despite having a poorer food supply than many countries where disaster has struck. Rulers who are dependent on voters do everything to avoid starvation, and a free press makes the public aware of the problems, so that they can be tackled in time. In authoritarian states, by contrast, there have sometimes been famines for the simple reason that the rulers have believed their own propaganda, and no one dares to tell them that people are starving.³⁸

There is probably no country that has suffered greater famine than China. From 1958 to 1961, the dictator Mao Zedong tried to show the superiority of his brand of communism by a 'Great Leap Forward' of forced industrialization. Remaining private land and even cooking utensils were confiscated and agricultural workers were diverted to steel making and public works projects. As a result, around forty million people are estimated to have starved to death, and life expectancy collapsed by twenty years.

Even after this disaster, food was scarce in China because the collective farms stifled work and innovation. No one could make more by working harder or investing in better methods. Today, China's leaders are proud of its productive agricultural sector, but it did not change because of a top-down decision. It was started by a few brave peasants in the Xiaogang village in Anhui province in December 1978.

The eighteen families of the village were desperate. The communist system did not supply them or their children with enough to eat. Some families had to boil poplar leaves and eat them with salt; others ground roasted tree bark to use as flour. So they met in secret late one night and agreed to parcel out the communal land among themselves. Every family would make

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its own decisions on what and how to farm and how much to work, and each family would be allowed to sell what they produced themselves, after the government took the share it demanded.

They wrote it down as a formal contract so that everyone would be bound to it, and signed or gave their fingerprints by the light of an oil lamp. Now that it was down in writing, the stakes were incredibly high. If the document was found, they would be punished with the full weight of the regime. The villagers agreed that if word got out and any of them were jailed or executed, the others would raise their children. The farmer who had drawn up the contract hid it inside a piece of bamboo in the roof of his house, and hoped that the officials would never find it.

In the end, word of this secret privatization got out. The result was just too good to keep a secret. The farmers did not start the workday when the village whistle blew any longer – they went out much earlier and worked much harder. There was a dramatic surge in production. Grain output in 1979 was six times higher than the year before. Other villages could see that Xiaogang did better, and that people there were better fed, and tried to find out what they had done differently. Individual farming spread ‘like a chicken pest’, as one farmer put it. ‘When one village has it, the whole country will be infected.’³⁹

The communist party was hostile to individual initiative and should have punished the farmers. But the grassroots reforms were incredibly popular and the party realized this was the only way to put an end to hunger and inefficiency. In 1982, in an unprecedented about-turn, the party endorsed the reforms, and allowed other villages to do the same. Two years later, there were no communes left in China. A country that experienced

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one of the worst famines in history just two decades earlier now produced a surplus of food for the world markets.

Guan Youjiang, one of the original signatories of the Xiaogang agreement, remembers that people used to die of hunger in his village. He used to roam the countryside begging. The freedom to choose one's work, and to reap the rewards, made all the difference. 'Before, farmers were happy if they had a meal a day. Now they have three – and sometimes a drink too.'⁴⁰