5

ENDING EXTREME POVERTY

I. The Reasons to Believe That Extreme Poverty Can Be Ended

We have studied the process of modern economic growth and have seen how a persistent rise in gross domestic product (GDP) per person has occurred and spread throughout almost all the world, while a few remaining regions of the world have not yet taken off. Where growth has occurred, extreme poverty has declined, often to negligible levels. There is reason to believe that

sustained economic growth can spread to the remaining regions—especially to tropical Africa—and thereby eliminate the remaining pockets of extreme poverty. Yet for reasons that I will discuss, the favorable prospect is by no means guaranteed. It will have to be achieved through deliberate local, national, and global effort and will not simply happen on its own.

We will analyze the possible pathways to ending extreme poverty in the next fifteen to twenty years. Yet to do so, we first need a working definition of extreme poverty. The World Bank's poverty line is certainly the most widely used. The World Bank defines extreme poverty as an income below a poverty line of $1.25 per day, measured in U.S. dollars at international prices of 2005. By this measure, there were an estimated 1.2 billion people below the extreme poverty line as of 2010, the year of the most recent data.

The World Bank's definition is surely too narrow. It would be better to define

the extreme poverty line according to the ability of individuals to meet basic material needs (SDSN 2012b). These material needs include: food, clean water, sanitation, shelter, clothing, access to health care, access to basic education, and access to essential services such as transport, energy, and connectivity. These basic needs are the minimum needed for survival and human dignity. We could define those living in poverty as individuals that by lack of household income or public services are unable to meet their basic needs. By this broader definition, the number of those in poverty would surely rise above 1 billion, and perhaps could reach 2 billion people. Unfortunately, as of now, there is no comprehensive, worldwide data on this broader sense of extreme poverty. We therefore tend to fall back on the more limited World Bank definition. Perhaps in the period of the Sustainable Development Goals (SDGs), a broader and sounder definition will be practicable and

measured globally.

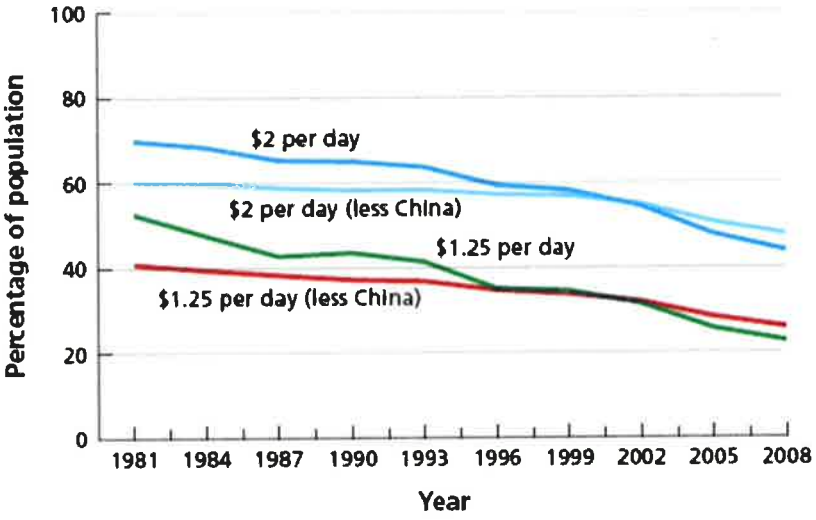
The World Bank also measures other threshold lines above the $1.25 per day mark. Another common line is drawn at $2 per day, also at international 2005 prices. Naturally, a higher proportion of the world falls under the $2 per day mark, an estimated 2.4 billion people as of 2010.

The *headcount poverty rate* measures the share of the population under a given poverty line. The recent trend from 1981 to 2010 is shown in figure 5.1. Note how steeply it has come down: from 52 percent of the developing world population in 1981 to 43 percent in 1990, 34 percent in 1999, and 21 percent in 2010. Note that the poverty rate has declined by half between 1990 and 2010. The first Millennium Development Goal (halve, between 1990 and 2015, the proportion of people whose income is less than $1.25 a day) has thereby been achieved, if we consider the developing countries as a single entity. This gives us hope that

extreme poverty can be reduced in those places where it remains high until today, most importantly in sub-Saharan Africa.

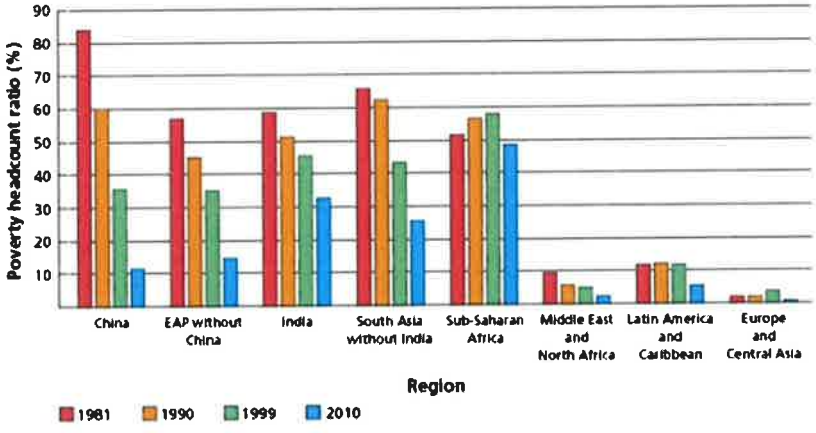
The headcount poverty rate by major region is shown in figure 5.2, for the years 1981, 1990, 1999, and 2010. We see that China has achieved the most remarkable poverty reduction in history, with extreme poverty falling from 84 percent in 1981 to just 12 percent in 2010. This remarkable progress has, of course, been accompanied by an equally remarkable rate of economic growth, roughly 10 percent per year during these three decades. On the other extreme is sub-Saharan Africa. The poverty rate actually rose between 1981 and 1999, from 51 percent to 58 percent. It was only after the adoption of the Millennium Development Goals in 2000 (discussed later in the chapter), that the rate of extreme poverty began to fall. South Asia is the region in between. In India, the poverty rate declined from 60 percent in 1981 to 33

percent in 2010. In the rest of South Asia, the poverty rate went from 66 percent to 26 percent in that time interval.



5.1 Poverty rates for the developing world (1981–2008)

Source: PovcalNet/World Bank.



5.2 Extreme poverty rates by region

(1981–2010)

Source: PovcalNet/World Bank.

By adopting the methods of differential diagnosis, we can help regions still stuck in poverty to overcome the chronic low growth that has kept poverty rates high throughout modern history. Indeed, with sound policies in today's high-poverty regions, it is possible to realistically foresee the end of extreme poverty on the planet within this generation, perhaps by 2030 or 2035. The idea that humanity could actually put behind it the ancient scourge of extreme poverty is a thrilling idea. It may seem fanciful or utopian, but it is actually very practical. It is based on strong evidence and the experiences of recent years.

Those parts of the world still stuck in extreme poverty can get out of the poverty trap if they pursue policies aimed at overcoming the specific barriers to growth that now hold them back. Indeed, sub-Saharan Africa has

already embarked on that effort, and growth rates have recently risen to around 6 percent per annum. They can go even higher. Success, though, will require not only sound domestic policies but also the partnership of other parts of the world.

It is our job to understand how the end of poverty can be achieved and then act to make it happen. It is extraordinarily important to take note of and appreciate the progress that has already been made, as well as recognize that the setting of a global goal to end extreme poverty is, by itself, one of the most important tools that we have.

The great British economist John Maynard Keynes raised the idea of ending poverty back in 1930, though he was certainly referring at that stage to the industrialized countries, not to the entire world. In his famous essay, "Economic Possibilities for Our Grandchildren," Keynes begins by noting that from the time of the Roman Empire until the early eighteenth century, the

rate of technological progress remained extraordinarily low (Keynes 1930). It was so low, Keynes notes, that a peasant from the Roman Empire would have felt relatively at home in rural England in the early 1700s. Keynes then goes on to describe the explosion of technological advances from the Industrial Revolution onward, and draws the lesson that soon enough, productivity would rise to the point where poverty in Britain and other high-income countries would actually be brought to zero. Here is how he puts it:

> I would predict that the standard of life in progressive countries one hundred years hence will be between four and eight times as high as it is to-day. There would be nothing surprising in this even in the light of our present knowledge. It would not be foolish to contemplate the possibility of a far greater progress still ... I draw the conclusion that, assuming no important wars and no important increase in population, the

> economic problem may be solved, or be at least within sight of solution, within a hundred years. This means that the economic problem is not—if we look into the future—the permanent problem of the human race. (Keynes 1930, 3)

When Keynes refers to "the economic problem," he means poverty; thus, he is stating that poverty could be a thing of the past within one century, by 2030. In fact, Keynes was proved right roughly a half-century from the writing of his essay. By around 1980, extreme poverty was a thing of the past in the high-income world, consigned to the "dustbin of history."

What is interesting is that Keynes' 100-year forecast might prove to be correct for the entire world, not just the "progressive countries," as he termed the industrialized countries of his day. Even more remarkable, perhaps, is that when Keynes made his forecast, the world population was just 2 billion. The world population is now 7.2 billion, more

than three times the population of 1930, and by the middle of this century it will be likely be more than 9 billion. Keynes also added another condition that barred further world wars. However, there was another major war—World War II. Despite both of these conditions, the massive increase of world population and the continuing tragedies and destruction of war, Keynes's basic insight that technological progress can bring about the end of poverty remains true and prescient and is now within reach of the entire world.

The Millennium Development Goals

> We will spare no effort to free our fellow men, women and children from the abject and dehumanizing conditions of extreme poverty, to which more than a billion of them are currently subjected. We are committed to making the right to

> development a reality for everyone and to freeing the entire human race from want. We resolve therefore to create an environment—at the national and global levels alike—which is conducive to development and to the elimination of poverty.
>
> —UN General Assembly, "United Nations Millennium Declaration"

In September 2000, a remarkable thing happened. More than 160 heads of state and government gathered at the United Nations to usher in and convey the world's hope for the new millennium. The secretary-general of the United Nations at that time, Kofi Annan, put forward to the world leaders a pathbreaking "Millennium Declaration." The declaration called on the world to honor the new millennium by committing to great global goals: universal human rights, peace and security, economic development, environmental sustainability, and the

drastic reduction of extreme poverty. As part of the "Millennium Declaration," the world leaders adopted eight specific development goals that quickly became known as the Millennium Development Goals (MDGs), shown in figure 5.3.

Why a cartoon drawing for each goal? The goals are meant for the average person in the street, not for high theorists. This is important to appreciate. The goals are phrased in a way that they can be understood in the villages, the slums, the places where poor people live and work and fight for their survival. The goals serve to orient humanity around a great moral challenge: to improve the life conditions of the most vulnerable people on the planet. They exist to spur action across the society: by governments, businesses, communities, families, faith groups, academicians, and individuals. They are meant to spur broad social change, not just a few technical fixes here and there.

Goal number 1 calls for eradicating

extreme poverty and hunger. Goal number 2 is to achieve universal primary education. Goal number 3 is to promote gender equality so that women, like men, have rights and access for economic progress. Goal number 4 is to sharply reduce child mortality. Goal number 5 is to sharply reduce maternal mortality and ensure a healthy childbirth process for mothers and their children. Goal number 6 is to fight the raging pandemic diseases of AIDS, malaria, and other mass killers. Goal number 7 is to promote environmental sustainability. Finally, goal number 8 is to promote a global partnership whereby rich countries help poor countries to achieve the first seven goals.

5.3 The eight Millennium Development Goals

UNDP Brazil.

Beneath this general description are some specific quantitative targets and many dozen indicators; the example for MDG 1 is described in table 5.1. For the eight MDGs there are twenty-one specific quantified targets, as well as approximately sixty detailed indicators to measure the progress. It has been my great honor to serve as special advisor to the UN secretary-general on the MDGs, first for UN Secretary-General Kofi Annan (during 2001–2006), and now for UN Secretary-General Ban Ki-moon (2007 to the present). My responsibility has been to help analyze and design strategies to support countries in achieving the MDGs and to work with the UN agencies and donor governments as well to help implement those strategies.

Table 5.1 Targets and Indicators for MDG 1

Goal 1: Eradicate extreme poverty and hunger	
Target 1A: Halve, between 1990 and 2015, the proportion of people whose income is less than $1 a day	1.1 Proportion of population below $1 (PPP) per day
	1.2 Poverty gap ratio
	1.3 Share of poorest quintile in national consumption

Target 1B: Achieve full and productive employment and decent work for all, including women and young people	1.4 Growth rate of GDP per person employed
	1.5 Employment-to-population ratio
	1.6 Proportion of employed people living below $1 (PPP) per day
	1.7 Proportion of own-account and contributing family workers in total employment
Target 1C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger	1.8 Prevalence of underweight children under five years of age
	1.9 Proportion of population below minimum level of dietary energy consumption

Source: United Nations Statistics Division

2008.

It's been wondrous to see how the MDG goal setting has energized civil society and helped to orient governments that otherwise might have neglected the challenges of extreme poverty. The MDGs have drawn global attention to the plight of the poor and also have helped to motivate problem solving around the world to overcome the remaining extreme poverty. Of course, as economic history shows, and as Keynes emphasized, the long-term fundamental forces driving poverty down are technological. Yet the MDGs have been important in encouraging governments, experts, and civil society to undertake the "differential diagnoses" necessary to overcome remaining obstacles.

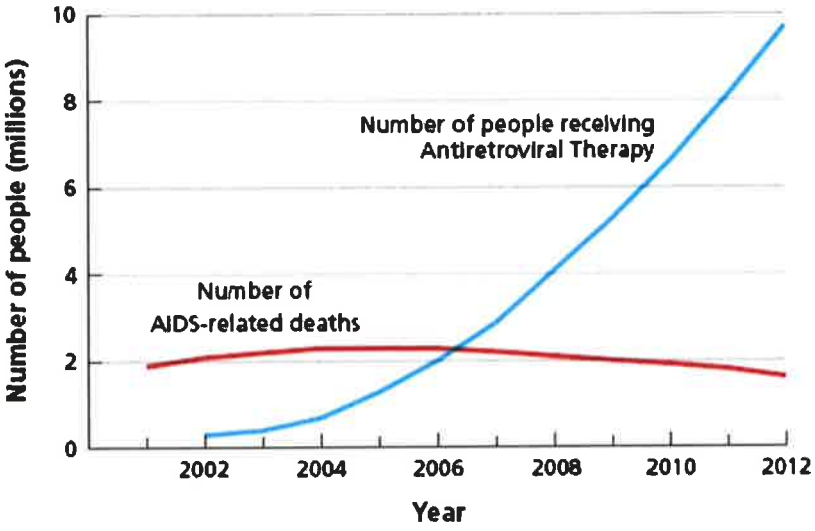
Progress has been quite notable, and breakthroughs have occurred in some of the poorest countries and regions of the world. The overall decline of the rate of extreme poverty, as we have noted,

has been dramatic: down by more than half since 1990. Of course the MDGs were not the main factor in the biggest success of all: China. However, in Africa, the MDGs have played a far more significant role in helping to end a long period of stagnation and rising poverty and to begin a period of falling poverty, improving public health, and more rapid economic growth.

The gains have been made not only in reducing poverty but also in many of the other MDGs. Consider the fight against disease for example. Figure 5.4 shows the rapid increase in the number of HIV-infected people kept alive by antiretroviral medicines (ARVs), shown by the blue curve. If not controlled by ARVs, the HIV virus causes AIDS and almost-certain death. Now, with the spur of the MDGs and the health programs they have promoted, millions of people in low-income countries are alive today, because they have been given free access to lifesaving ARVs.

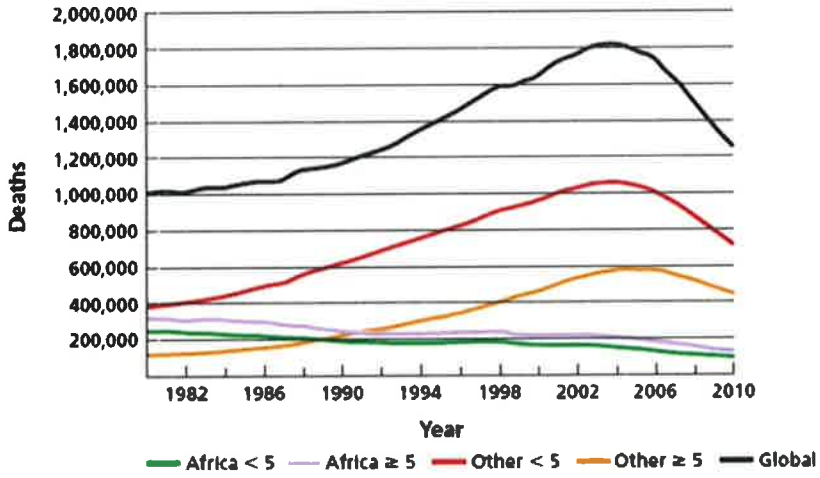
Figure 5.5 demonstrates another

public health triumph that I would ascribe to the public awareness and problem solving promoted by the MDGs: the reduction of the malaria burden and malaria deaths. Note how malaria deaths in Africa peaked around 2005 and then began to decline markedly. This was achieved through the scaling up of malaria-control programs based on a number of cutting-edge technologies, including long-lasting insecticide-treated bed nets; a new generation of antimalaria medicines; and various other advances (such as rapid diagnostic tests) enabled by scientific progress. The MDGs encouraged the creation of several special programs to fight malaria, and these programs have by now led to a remarkable decline of malaria prevalence and malaria deaths, especially in sub-Saharan Africa.



5.4 AIDS treatment recipients (2002–2010) and AIDS-related deaths (2000–2010)

Source: Joint United Nations Programme on HIV/AIDS (UNAIDS).



5.5 Malaria deaths by age and region (1980–2010)

Source: Murray, Christopher J. L. et al. 2012. "Global Malaria Mortality Between 1980 and 2010: A Systematic Analysis." The Lancet *379: 413–431.*

The combination of continued rapid technological change and a good "differential diagnosis" to identify priority needs of each low-income region can thereby direct investments toward high-return antipoverty programs, whether for infrastructure (such as roads, rail, power, connectivity, and ports), health care, safe drinking water and sanitation, or improved access to schooling. Just as public health has improved with the scaling up of programs to fight AIDS and malaria, similar breakthroughs can be made in other areas: more productive farming, new industrial development, and greatly improved educational attainment.

II. Strategies to End Extreme Poverty

The end of extreme poverty is within reach. As we've noted, there are roughly 1.2 billion people still living below the World Bank's current poverty line of $1.25 per person per day. Thankfully, this number has been sharply reduced from 1.9 billion people in 1990. So where are those remaining areas of extreme poverty?

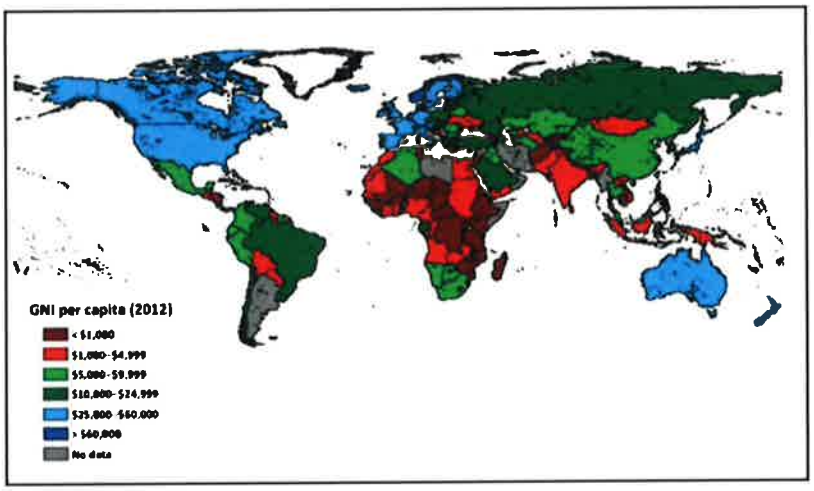
There are two main regions of the world still stuck in a poverty trap (World Bank 2014d). The most poverty-stricken region of the world is tropical sub-Saharan Africa. In 2010, an estimated 48.5 percent of the population of tropical sub-Saharan Africa remained below the poverty line. Fortunately that rate is declining now and has been declining since the start of the new millennium. Some estimates put the poverty rate even lower today, though the data are much debated. The other place where extreme poverty in large numbers remains is South Asia, where the poverty rate in 2010 was estimated to be 31 percent of the population. In

raw numbers, in 2010, around 413 million people lived in extreme poverty in tropical sub-Saharan Africa, and 507 million people lived in extreme poverty in South Asia. Just these two regions constitute around 76 percent of all of the world's extreme poverty.

In East Asia, around 20 percent of the total population, or 250 million people, are still in extreme poverty, even though East Asia has enjoyed by far the fastest decline of extreme poverty of any region, in conjunction with its remarkably high rate of economic growth. In the Middle East and North Africa, around 10 percent of the total population lives in extreme poverty, around 100 million people. The remaining 100 million or so of the world's poor are scattered in the other regions of the developing world (Latin America and the Caribbean, Europe, central Asia, small island states).

The two big regions needing future breakthroughs are therefore sub-Saharan Africa and South Asia. Let us

first make a differential diagnosis for sub-Saharan Africa, to see what can be done to accelerate Africa's economic growth and poverty reduction. We will then turn to South Asia.



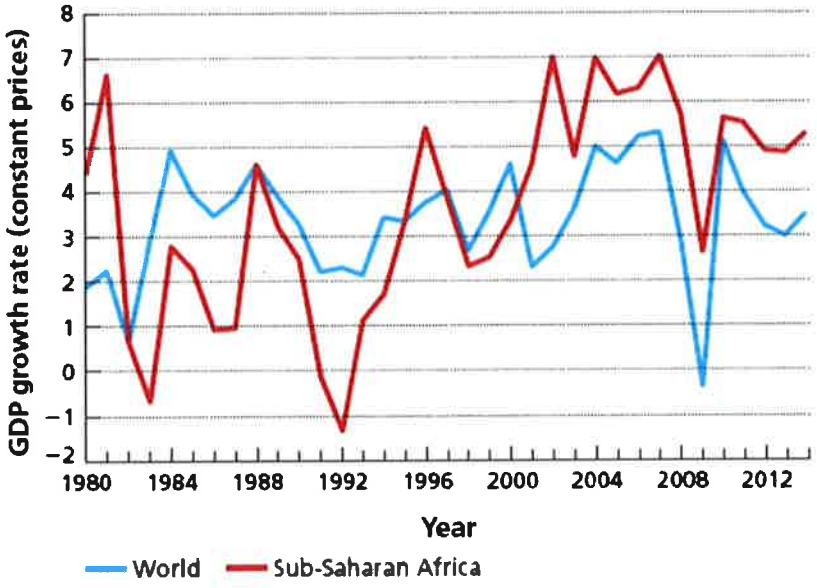
5.6 Gross national income per capita (2012)

Source: World Bank. 2014. "World Development Indicators."

Ending Extreme Poverty in Sub-Saharan Africa

There is definitely good news in Africa. Figure 5.7 shows the year-to-year growth rates of the world economy and of sub-Saharan Africa (International

Monetary Fund [IMF] 2014). The average growth rate in sub-Saharan Africa picked up significantly after the year 2000. Indeed, sub-Saharan Africa has been growing faster than the average of the world economies, at around 5 percent per year and even faster in certain years. For 2014, the IMF forecasts annual growth of around 6 percent. This growth rate implies a doubling time of around 12 years (= 70/6). With population growth at around 2.5 percent per annum, however, the growth of GDP per capita is considerably lower, around 3.5 percent per year, with a doubling time therefore of around 20 years (= 70/3.5).



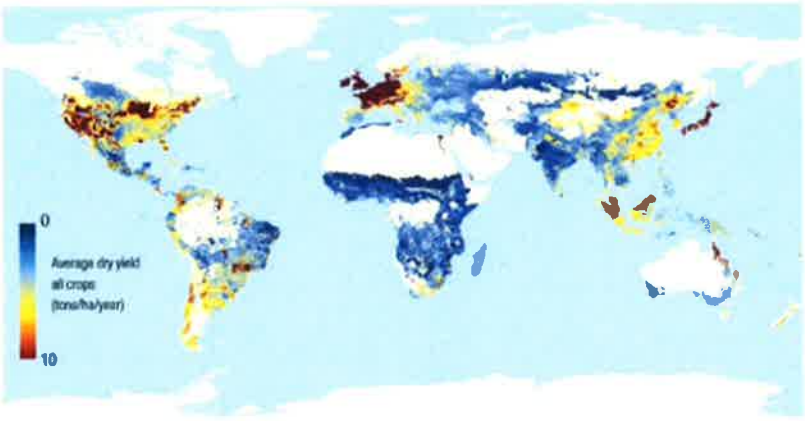
5.7 GDP growth annual change (1980–2012)

Source: International Monetary Fund. 2014. World Economic Outlook Database.

Something is beginning to go right, and it is possible for sub-Saharan Africa to achieve even faster progress. A differential diagnosis of Africa's problems shows that there are challenges in nearly all of the seven big categories: poverty trap, economic policy framework, fiscal framework, physical geography, governance patterns and failures, cultural barriers,

and geopolitics. To organize a complex discussion, I will focus on four particular areas where Africa can achieve rapid breakthroughs: farm productivity, urban productivity, national infrastructure, and human capital investment.

Figure 5.8 shows the crop productivity (tons of grain per hectare) in different parts of the world. Africa is almost solid blue, which in this map means that it achieves very low farm yields. On average, smallholder farmers in sub-Saharan Africa have produced a yield between half a ton and one ton of grain per hectare. This is very poor in international comparative terms. Many other parts of the developing world achieve four or five times that yield. In the most productive grain belts of the world, for example, in the United States, western Europe, and Japan, yields often rise to ten times Africa's yield.



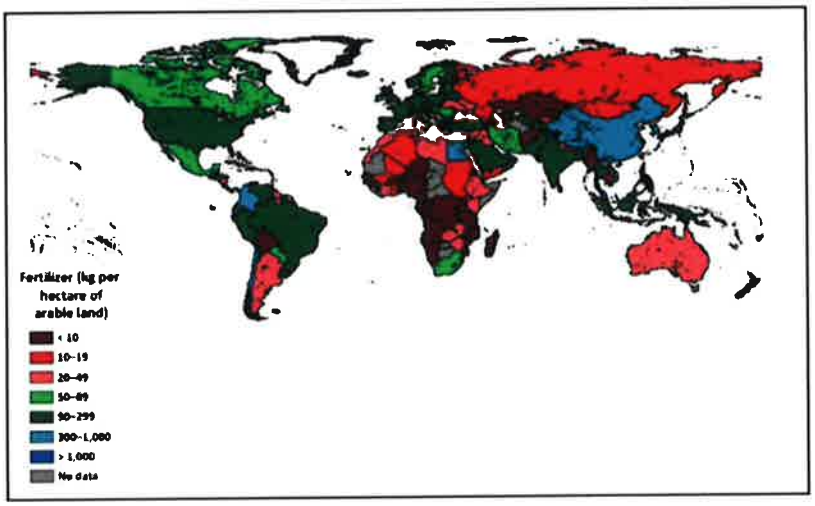
5.8 Average global crop yields

West, Paul C., Holly K. Gibbs, Chad Monfreda, John Wagner, Carol C. Barford, Stephen R. Carpenter, and Jonathan A. Foley. "Trading Carbon for Food: Global Comparison of Carbon Stocks vs. Crop Yields on Agricultural Land." Proceedings of the National Academy of Sciences. *November 1, 2010. doi:10.1073/pnas.1011078107.*

What is the cause of Africa's low farm yields? In fact, African farms face many obstacles. One key challenge is soil-nutrient depletion. Africa's farmers have generally been too poor to keep their farms' soils replenished with the nitrogen, potassium, and phosphorous necessary for decent crop yields. Just as with undernourished human beings,

undernourished crops also fail to grow and thrive. In Africa, with farmers unable to use fertilizers to replenish their soils, the farmlands have been exhausted of the nutrients needed for high yields. The map in figure 5.9 shows the details.

Farmers in almost all other parts of the world use extensive fertilizers, both organic and chemical, to replenish the key nutrients that are removed with each harvest. When a crop is harvested, the nitrogen and other nutrients leave with it. Somehow those nutrients have to be put back in the soil, whether through green manures, chemical fertilizers such as diammonium phosphate and urea, or long fallow periods, in which nitrogen is replenished through natural processes.



5.9 Global fertilizer use

Source: AAAS Atlas of Population and Environment.

Yet most of Africa's peasant farmers have been so poor that they have been farming without the advantages of those added nutrients, and the resultant low yields trap the farmers in a poverty trap (SDSN 2013c, 6). They get low yields year after year. Since the farmers are too poor to buy the fertilizers that they need, their soils continue to be depleted of key nutrients. The yields remain low, and every year the farmers get a very meager income that does not help their families' struggles with

hunger or give them the income necessary to buy inputs that would enable higher production.

In addition to fertilizer, other inputs are also necessary for high yields, such as good water management and irrigation where possible. This typically requires wells and pumps. Additionally, good seed varieties are needed to contribute to high yields. All of these improved inputs are beyond the means of Africa's peasant farmers. In the same way that African farmers have lacked the means to replenish the soil nutrients, they have also lacked the means to invest in irrigation and high-yield seeds.

The problem adds up to an agricultural poverty trap. A high priority for Africa is to invest in its smallholder farmers, with government programs that enable even the poorest farmers to get the inputs that they need, whether on credit or as a grant, so they can enjoy higher farm yields and higher incomes and thereby start investing in these

crucial inputs on their own. Over time, these farm households will build up their capital and their creditworthiness. The government programs needed to help them at the start can then gradually be withdrawn, allowing banks rather than government aid to do the same job of financing inputs.

To end extreme poverty in Africa will also require a major buildup of infrastructure, including roads, rail, power, ports, and communication networks. As in many other areas, Africa's colonial rulers left the newly independent African nations with a poor start in infrastructure upon independence. This can be illustrated by comparing India's rail grid with Africa's rail grid, as shown in figure 4.16. Remember that India had just one imperial ruler, Great Britain. Britain constructed a full rail network in part to be able to bring India's cash crops such as cotton to the coastal ports. In Africa, by contrast, there were several European imperial powers (Great Britain,

France, Italy briefly, Spain, Portugal, Germany until World War I). They did not connect their separate investments and indeed never built much of a rail system at all. Africa's rail system was mainly single lines running from ports to particular mines and plantations. Modern-day Africa faces extremely high overland transport costs, in part because of the weakness of the rail network, combined with a wholly insufficient highway system. And the fact that the African continent hosts fifty-four countries, including forty-nine in the sub-Saharan region, makes the creation of a modern, continent-wide transport network a continuing unmet challenge.

Other aspects of infrastructure are also especially important in the twenty-first century (SDSN 2013a, 21). There can be no economic development on a sustained basis without mass electrification. Figure 5.10 is a well-known satellite photo of the Earth at night, indicating the places with

nighttime electrification and illumination. It shows the bright lights of the United States (especially in the populous eastern half of the country), Europe, coastal China, Japan, coastal South America, India, Southeast Asia, and the Arabian Peninsula. But in sub-Saharan Africa, the lights are out at night. To this day, a large part of rural Africa still lacks access to electricity. In addition to not having access to lights at night or electricity for home activities, there is a critical lack of power for pumping water for irrigation; for refrigeration; for preservation of agricultural outputs; for industrial processing of food, textiles, and apparel; and for every other kind of industrial activity.

5.10 Lights on at night around the globe

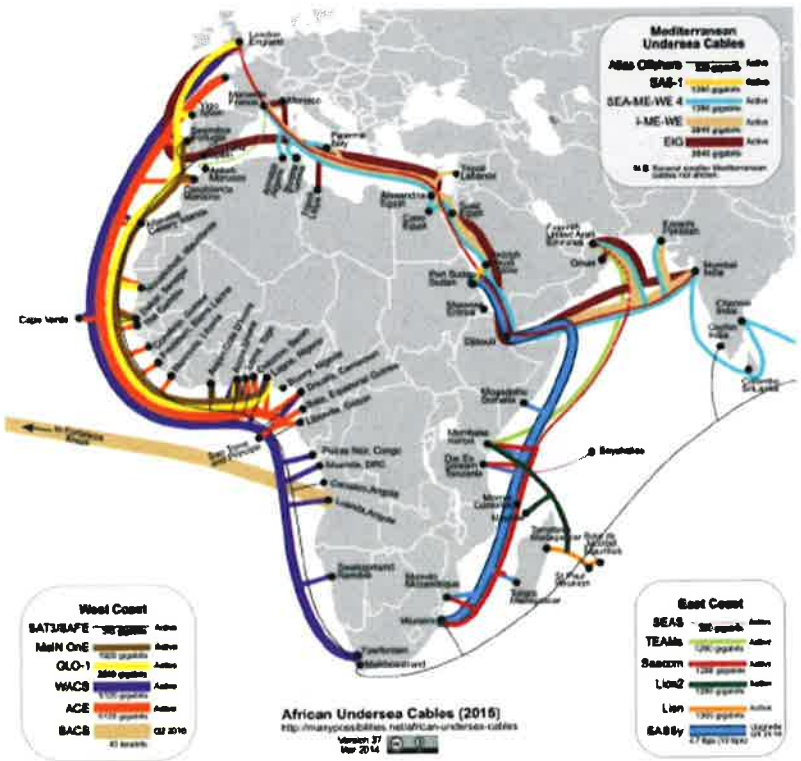
Data courtesy Marc Imhoff of NASA Satellite GSFC and Christopher Elvidge of NOAA NGDC. Image by Craig Mayhew and Robert Simmon, NASA GSFC.

The absence of electrification has been a huge chronic barrier to Africa's development and another aspect of Africa's poverty trap (SE4All 2012). Without electricity, productivity is very low. Low productivity means very low output per person, which in turn means low income and thus poverty. Poverty means low tax collections by government, and therefore the inability of the government to invest in the electricity needed to lift the region out of poverty. Once again, we see the vicious circle of poverty. African governments know very well they need to build the power capacity; yet they lack the resources to do so out of their own revenues and the creditworthiness to do so through borrowing. They are stuck, trapped, and in need of a

temporary boost of grants and low-interest loans to move out of the rut.

Another critical dimension of infrastructure in the twenty-first century is information technology (IT). The good news is that because these technologies are so powerful and their costs have fallen so far, Africa is already on its way to mass coverage by mobile telephony, which already reaches even the most remote villages. Private investors have already laid, or will soon lay, submarine fiber-optic cables that will slash Internet prices and facilitate the spread of broadband throughout the continent. Since these investments are being made by the private sector, with favorable profitability and lower fixed costs than power generation, the Internet grid and mobile telephony are spreading without the need for public financing or foreign aid. ICT has already given a huge boost to Africa's development, and the boost will be even larger in the years ahead when mobile broadband dramatically improves

access to health care, education, banking, and other services.



5.11 African undersea cables (2013)

Map courtesy of Steve Song (http://manypossiblities.net).

The moral of the story is that Africa, like the rest of the world, is now poised for a breakthrough—if it can mobilize targeted investments in agricultural productivity, in health care, and in continent-wide infrastructure. In my

view, Africa will be able to make the breakthrough in long-term economic growth that has so far eluded it throughout its modern history.

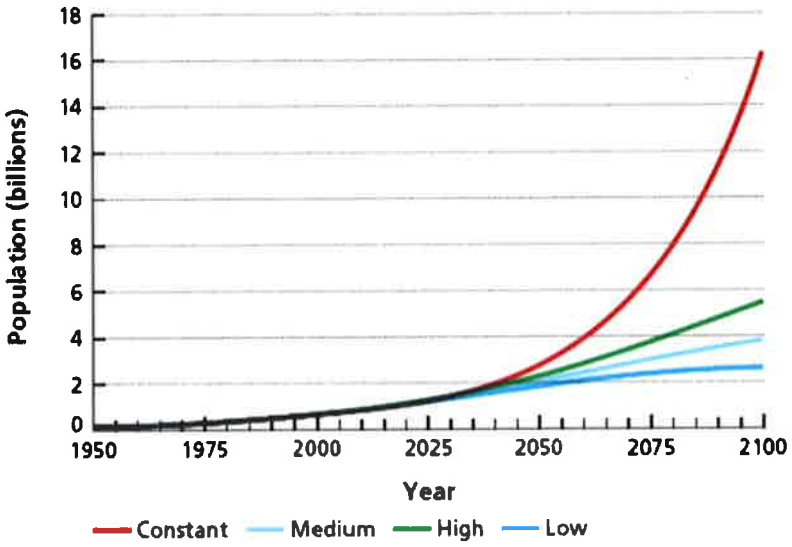
However, there is one final challenge that Africa must surmount. Africa still has a very high fertility rate, meaning that family sizes are very large on average, and the population is growing remarkably rapidly (UN Department of Economic and Social Affairs Population Division [DESA Population Division] 2013). The fertility rate for 2010–2015 is estimated to be 5.1 children, meaning that each woman on average is having more than two daughters to replace her in the next generation. Not surprisingly, the population is growing rapidly.

Note in figure 5.12 that in 1950, sub-Saharan Africa's population was a mere 180 million people. Just sixty years later, sub-Saharan Africa's population is now around 900 million, an increase of five times. And the United Nations projects further rapid growth of the population during the twenty-first

century, unless Africa is able to make a transition to a lower fertility rate faster than on the current trend. Based on a *moderately rapid* decline in the high fertility rate, Africa's population is projected to reach an astounding 3.8 billion people as of 2100, roughly four times larger than now. (This is the so-called medium-fertility variant of the UN Population Division.) If the decline in the fertility rate is slower than in the medium-variant, the UN high-fertility variant finds that Africa's population would be even larger, roughly 5.3 billion people. On the other hand, if the fertility rate falls more rapidly than the UN now projects as likely, the population in 2100 in the low-fertility variant would be 2.6 billion people, lower by more than 1 billion persons compared with the medium-fertility variant (DESA Population Division 2013).

Africa will reap many development benefits if it keeps the population on the low-fertility variant. First, there would be a lower population, and therefore more

land, oil, timber, water, and other natural resources per person. Second, and crucially, families would be smaller, so that each family could invest more per child in education, health, and nutrition. Third, the population age would be higher on average, as there would be a better balance between parents and children in each generation. Fourth, the population would grow less rapidly, so a smaller fraction of savings and investment would be used simply to keep up with the growing population. More of the savings and investment could be used to raise the amount of capital (such as roads, infrastructure, vehicles, and machinery) available to each person. In short, there are great benefits for Africa in fostering through voluntary means a lower fertility rate and thereby faster economic development.



5.12 UN population scenarios for sub-Saharan Africa (1950–2100)

Source: United Nations Department of Economic and Social Affairs Population Division (DESA Population Division). 2013. "World Population Prospects: The 2012 Revision." New York.

It is worth emphasizing the huge gains in African educational attainment that would likely ensue with lower fertility rates. With a smaller youth cohort, each family would be able to ensure the health, education, and nutrition of every child. Now, poor families choose among their children—

perhaps educating the first son but not the rest—while with a smaller cohort of children, all could be educated. Moreover, the government would not be facing an endless race against time and against a rising population, always needing to build more schools and train more teachers, at great expense, not to improve education but simply to keep pace if possible with the rising population.

In summary, in addition to the vital investments in agriculture, health, education, physical infrastructure, fiber optics, and electrification, Africa will benefit by investing more in the rapid voluntary reduction of today's high fertility rates. How does a government "invest" in voluntary fertility reduction? First, the government ensures that girls are enabled to stay in school at least through the high school diploma level, in order to discourage child marriages. Second, the government should invest in child survival, to convince each family that having fewer children is "safe" in

terms of their ultimate survival. Families do not need to be large simply to ensure the survival of a few of the children. Third, the government should make sure that family planning and modern contraceptives are available for free or low cost for those households that voluntarily decide to reduce their fertility rate.

III. South Asia—the Continuing Challenge of Food Supply

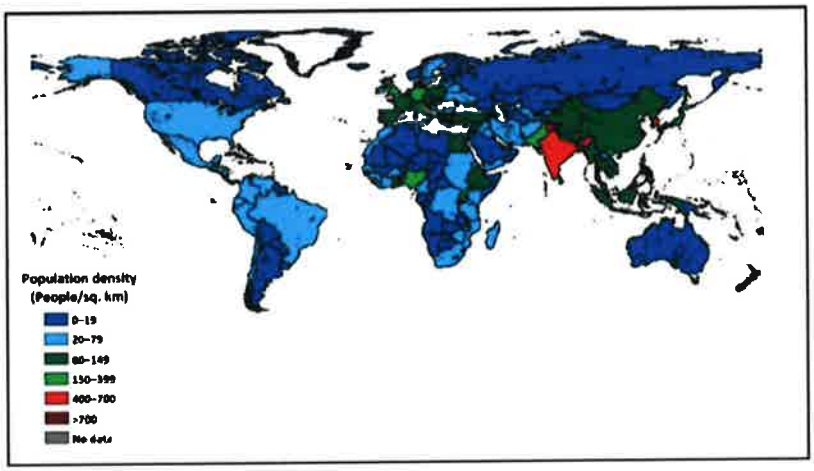
We have seen that there are two main regions in the world where there is still extensive extreme poverty: sub-Saharan Africa and South Asia. With the necessary investments, Africa can break free of extreme poverty. So too can South Asia, comprising India, Bangladesh, Bhutan, India, Nepal, and Pakistan. South Asia is already making notable progress in poverty reduction, but still has around 500 million poor

people out of the region's total population of around 1.6 billion people. There are still major challenges of poverty in both the rural and the urban areas of South Asia.

What distinguishes South Asia from other regions? There are, of course, various aspects of wondrous culture, traditions, and the many remarkable dimensions of the physical environment. But the one distinguishing aspect to underscore is the extraordinary population density of South Asia.

Consider India with its 1.2 billion people, equaling roughly 16 percent of the world's population. Yet India has just 2.5 percent of the world's land area, and many parts of that landmass of India are very dry or even desert. Figure 5.13 shows countries shaded according to their population density, and India and its next-door neighbor, Bangladesh, are shaded as two of the most densely populated parts of the world. The numbers indeed are quite staggering.

Bangladesh has on average 1,200 people per square kilometer. India has about 410 people per square kilometer, but many of those square kilometers are nearly empty desert regions, making the populated regions even more densely packed. The United States, by contrast, has about 32 people per square kilometer. The population density in India is more than 10 times higher than in the United States.



5.13 World population density (2013)

Source: World Bank. 2014. "World Development Indicators."

The implications of this very high population density throughout India's

history have been adverse. Indian farms are very small, and farmers traditionally have been able to grow only a small amount of food. The cities are extraordinarily crowded, and India's and South Asia's cities more generally have dramatically increased in population in recent decades.

Many people in the 1950s and 1960s thought the situation was hopeless for South Asia. They thought that the population was so large (and increasing so rapidly) that India and its neighbors would not be able to feed themselves. These observers forecast mass deaths from famine. When Bangladesh gained its independence from Pakistan in the early 1970s, Henry Kissinger notoriously called it a "basket case." Thankfully, the forecasts of mass famine have proven to be off the mark. Indeed, India not only has avoided famine, but it has grown reasonably rapidly over the past twenty years. It takes pride in being one of the world leaders of the IT revolution, with wonderful engineering and innovation in

using IT for economic development. Through IT, India has become integrated into the world economy, often in cutting-edge industries, using creative programming and IT systems developed by India's top-notch engineers.

How did India avoid the fate that was so widely predicted for it? India's success begins naturally with agriculture, because India was overwhelmingly a smallholder peasant society deeply challenged with food insecurity. It was a great breakthrough in agricultural technology in the 1950s and 1960s that enabled India to overcome chronic famines of the past and to begin the liftoff into sustained economic growth. That breakthrough in agricultural technology has been famously dubbed the "Green Revolution."

What is the Green Revolution? It started with the individual pictured on the left in figure 5.14, Norman Borlaug. Borlaug was a highly skilled agronomist who used his great ingenuity and

determination to develop high-yield seed varieties for wheat while working in Mexico in the 1940s and the 1950s. (He later won the Nobel Peace Prize for these accomplishments.) Borlaug was invited to India in the early 1960s to see whether his high-yield seed varieties might help India to raise farm yields. His counterpart was yet another great agronomist pictured on the right in figure 5.14, M. S. Swaminathan.

Borlaug and Swaminathan took the special seeds that Borlaug had developed for Mexican conditions and planted them in Indian soils in Indian conditions. The first year did not work out well. They reviewed the situation and decided on a different approach. The second year proved that, lo and behold, the varieties developed by Borlaug for Mexican conditions worked beautifully in the Indian conditions if planted in the right way. Borlaug and Swaminathan quickly realized that a Green Revolution for India was within technological reach. To make it happen,

they had to add a third partner to form a historic triumvirate. He is seen at the bottom in figure 5.14, Chidambaram Subramaniam, who was the dynamic minister of agriculture of India in the early to mid-1960s. The core idea of the new Green Revolution was to multiply Borlaug's Mexico seeds for use in India, and then to plant them with added fertilizer, irrigation, and transport facilitation in order to jumpstart a major takeoff of crop yields.

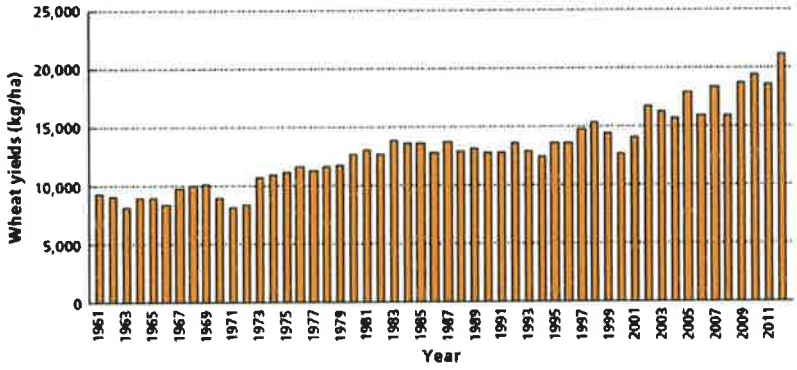
5.14 *(top left)* **Norman Borlaug** *Photo courtesy of the Norman Borlaug Institute for International Agriculture at Texas A&M University.*

(top right) **M.S. Swaminathan** *"Monkombu Sambasivan Swaminathan—Kolkata 2013-01-07." Biswarup Ganguly, Wikimedia Commons, CC BY 3.0*

(bottom left) **Chidambaram Subramaniam**
Age Fotostock/DINODIA

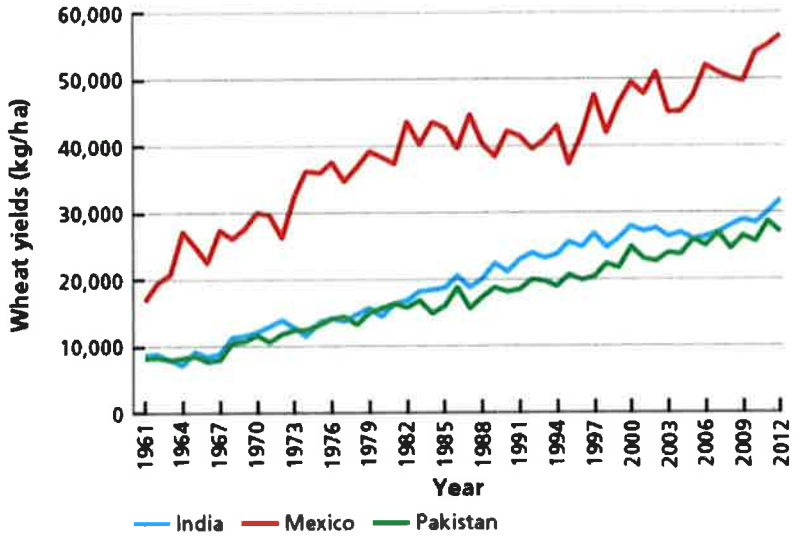
The results were spectacular. India's yields soared, and then the concept of high-yield varieties began to spread around the world. A true Green Revolution began to unfold worldwide by the end of the 1960s. Figure 5.15 shows the impacts on yields for the developing countries as a whole. Up to the mid-1960s, average yields were still less than 1,000 kilograms per hectare of arable land, that is, less than 1 ton per hectare. But then, with improved seed varieties and greater use of fertilizers and irrigation, yields began to rise significantly. By 1980, yields averaged 1.5 tons per hectare. By the year 2000, they were above 2.5 tons per hectare. In many parts of the developing world, yields routinely exceed 3 tons per hectare, one example being Mexican wheat, as shown in figure 5.16. India and Pakistan have not reached Mexican productivity levels, but they have

increased their yields by three to four times since the mid-1960s.



5.15 Wheat yields in developing countries (1961–2012)

Source: Food and Agriculture Organization of the United Nations. 2014. "Crops." Latest update: 7/18/2014. http://faostat3.fao.org/faostat-gateway/go/to/download/Q/QC/E.



5.16 Wheat Yields in Mexico, India, Pakistan (1961–2012)

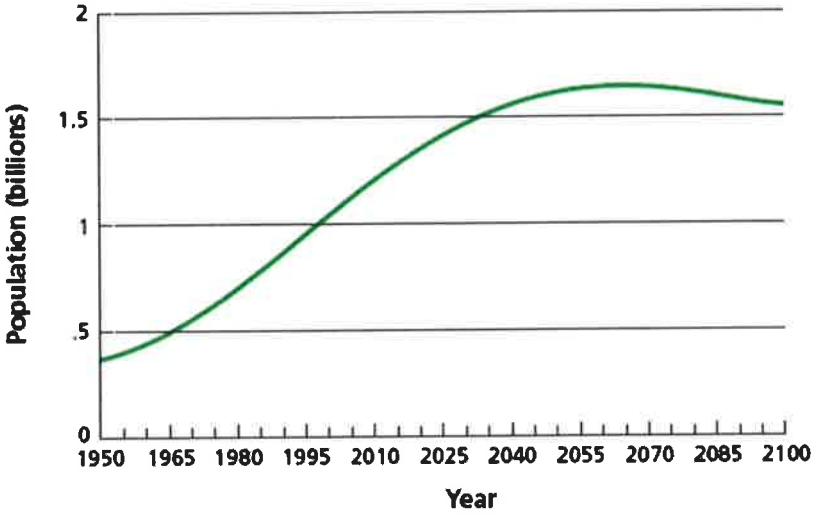
Source: Food and Agriculture Organization of the United Nations. 2014. "Crops." Latest update: 7/18/2014. http://faostat3.fao.org/faostat-gateway/go/to/download/Q/QC/E.

However, there is still a problem: India's population growth remained rapid as well after 1965. The population did not grow so rapidly that it literally and figuratively ate up all the gains in grain yields, but it did grow rapidly enough so that many of the agricultural gains, when measured in per capita terms, eventually diminished and by now have created a renewed food crisis in some parts of India and South Asia.

Figure 5.17 shows India's population growth (UNFPA 2013). In 1950, India's population was about 400 million; India was already a huge and densely populated country. Yet by 2014, that population has roughly tripled. So while grain production has roughly increased

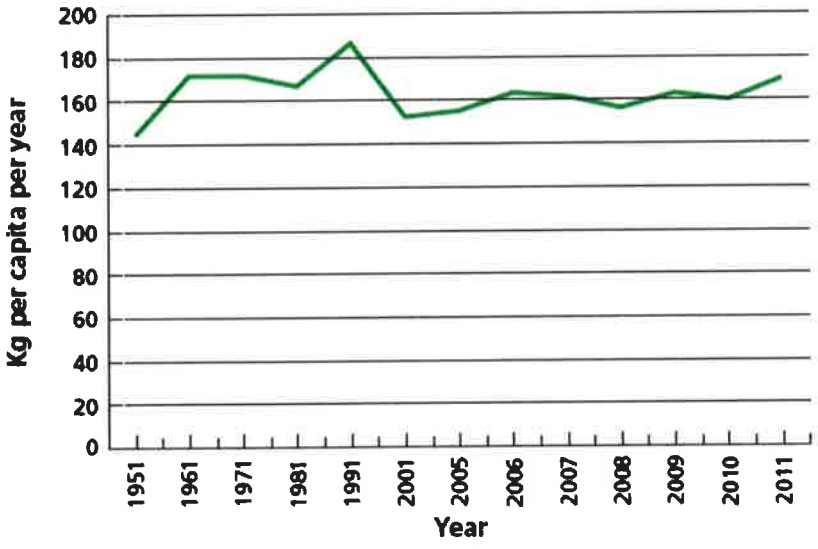
fourfold, population has tripled, unfortunately undoing most of the gains in production per person.

Figure 5.18 shows the feed grains per capita from the beginning of the 1950s to today. The curve was rather significantly rising up until around 1990. The spikes in the curve come from the fact that some years were favorable monsoon years, while others were bad monsoon years, which strongly impact the yields. Yet from the early 1990s onward, India's continued population increase meant that the increase of grain output per Indian essentially stopped. India is now actually producing less feed grain per person than it did twenty years ago.



5.17 India's population (medium-variant after 2010)

Source: United Nations Department of Economic and Social Affairs Population Division (DESA Population Division). 2013. "World Population Prospects: The 2012 Revision." New York.

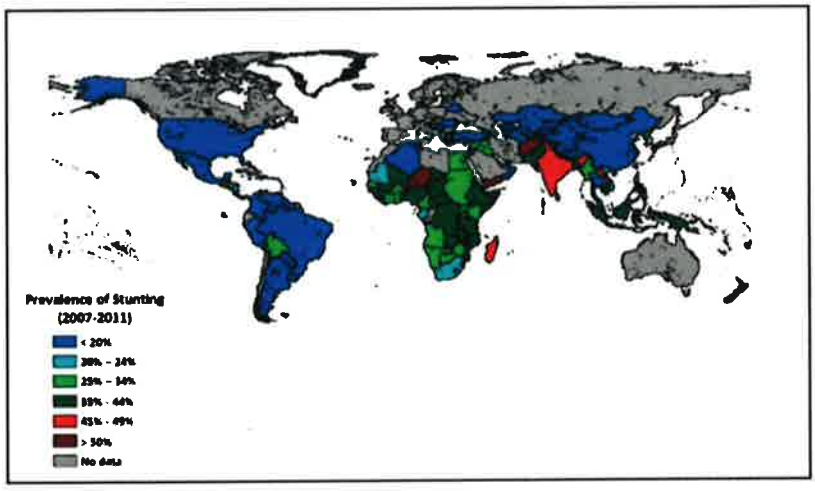


5.18 India's total food grain production per capita (1951–2011)

Source: Food and Agriculture Organization of the United Nations. 2014. "Crops." Latest update: 7/18/2014. http://faostat3.fao.org/faostat-gateway/go/to/download/Q/QC/E.

The stagnation, even decline, of grain output per person has created a new round of troubling hunger issues and stresses in the Indian countryside. India's recent rapid economic development, while very real, is still burdened and held back by problems of hunger and poverty in the countryside. One stark condition, childhood stunting, exemplifies the problem. Childhood stunting is an indication of chronic undernutrition of young children. When young children do not get the nutrients they need, they do not achieve their potential height for age. Stunting signifies a significant reduction of height for age relative to the potential of the population at each age. Figure 5.19

shows where childhood stunting is highest in the world today. As with extreme poverty, stunting is highest in tropical Africa and South Asia. India is the country with the largest number of stunted children. While there are many wondrous aspects of India's development—its rapid growth in IT and manufacturing, its leadership in global engineering, and its potential to grow in the future—there remains the worry over food security and decent nutrition, especially among poor farmers.



5.19 Global prevalence of stunting

Source: UN data.

It is also true to say, as M.S.

Swaminathan has emphasized repeatedly for decades, that India needs a *second Green Revolution*, or what he has called an *Evergreen Revolution*. This second Green Revolution or Evergreen Revolution would not be exactly like the first one. In view of the rising environmental threats faced by India and the world, the second Green Revolution must emphasize not only crop yields (tons per hectare) but increased crop efficiency in the low use of water, fertilizers, and other inputs. The first Green Revolution used massive amounts of groundwater, but that groundwater is now close to depletion in many sites. The first Green Revolution called for a massive increase in fertilizer use, and some of that fertilizer has polluted India's rivers and coastlines. The first Green Revolution did not pay heed to long-term climate change, which was not yet recognized. The second Green Revolution will need to develop crop varieties that are resilient to heat waves, droughts, floods, and

other shocks that will rise in the future as part of the consequences of human-induced climate change.

India and South Asia also face the continuing challenge represented by MDG 3 on gender equality. In many traditional South Asian cultures, women face massive burdens. Many are not allowed to be in the labor force or to own or inherit property. They may not be allowed to manage money. Girls are often left with insufficient nutrition, health care, and access to even basic education. The burdens of gender inequality are passed from mother to daughter. One of the recent breakthroughs in South Asia has been the empowerment of women and girls, but there are still major areas of discrimination to overcome.

One of the noteworthy ways that rural women have been empowered in recent decades has been through microfinance institutions, a new method of small-scale lending that is well adapted to the needs of impoverished rural women.

The key innovations were pioneered in Bangladesh by two NGOs that are now rightly world renowned, Grameen Bank (founded by Nobel Peace Prize laureate Muhammad Yunus) and BRAC (founded by social entrepreneur and innovator Sir Fazle Hasan Abed).

Both NGOs pioneered women's empowerment in the villages through self-help groups and undertook a massive expansion of microfinance through a group lending process. In group lending, seen in figure 5.20, an entire group of women jointly guarantees the repayment of loans made to a single member of the group, thereby lowering the risk of default and enabling the loan to take place. The members allocate the funds to the other group members and manage the loan repayments. Each borrower might receive a few dozen dollars in a month, which provides working capital such as the inventory for a small retail shop or the inputs for a bakery. The repayment rates of Grameen and BRAC and other

such microfinance providers have generally been very strong, except when the national economy has been hit by macro-scale shocks. Because of these successful results, both in managing small loans and in empowering rural women, microfinance has spread throughout the world as a powerful tool for grassroots empowerment, gender equality, and income generation.

5.20 Grameen women's microfinance group

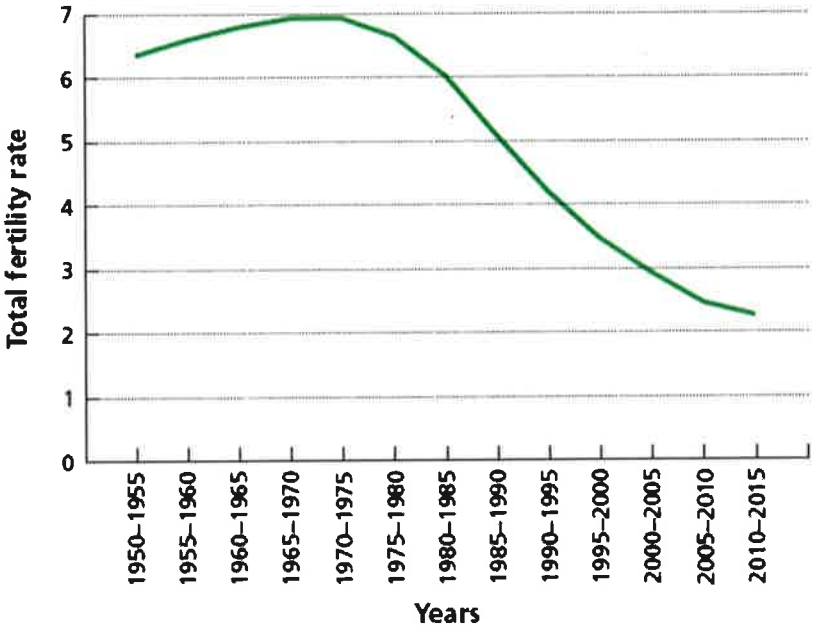
Grameen Foundation.

One of the notable features of female empowerment, sometimes in the

context of the self-help groups, is that it has given young women the incentive to marry later and reduce their total fertility. A mother in the labor force who earns her own income knows through experience and through knowledge from her peers that having fewer children will not only enable her to spend more time at work to earn a higher income but will also enable the household to invest more in each of her children so that he or she will have a chance for a better life.

Bangladesh has seen a significant decline of the fertility rate, as shown in figure 5.21 (DESA Population Division 2013). Back at the time of independence in 1971, Bangladesh's total fertility rate (TFR) was around seven. For every 1,000 women there would be 7,000 children, of whom 3,500 would be girls. In one generation, therefore, every 1,000 mothers would be raising 3,500 future mothers, signifying a dramatic expansion in population from one generation to the next. Yet

through the movement for women's empowerment—backed by microfinance, expanded educational opportunities, and less onerous cultural and legal barriers for women—the TFR began to decline very rapidly on a voluntary basis. By now, the TFR is at the so-called replacement level of two. Each woman, on average, has two children, and therefore one daughter. Each woman, on average, replaces herself with a daughter in the next generation. Over time, the population will tend to stabilize, thereby improving the overall prospects for economic development.



5.21 Total fertility rate in Bangladesh (1950–2015)

Source: UN data.

Another feature of South Asia's poverty has been the chronic undernutrition of children, which in turn has hindered their survival, health, and capacity to learn. Disturbingly high proportions of young children in South Asia are stunted, that is, very short for their age. There are at least three factors in this stunting: inadequate dietary intake, chronic infections by

worms and other disease-causing agents, and the lack of access to safe water and latrines to prevent a rapid reinfection after each bout of illness. The result is that children eat too little and lose too many of the nutrients they receive to parasites and frequent bouts of disease. Stunting could be overcome through a three-pronged effort: better diets, deworming (and other disease control), and provision of safe water and sanitation (latrines). By overcoming stunting, the South Asian region would also be positioned to make much greater strides in primary education. Of course the education systems of the South Asian countries would benefit from higher budgets and the introduction of innovative twenty-first-century approaches, such as the effective use of new information technologies in the classroom and home study.

South Asia, like sub-Saharan Africa, has the end of extreme poverty within reach. But South Asia will require major

efforts to achieve the Second Green Revolution, as well as focused investments in infrastructure, water and sanitation, health care, education, and in the empowerment of girls and women to complete the demographic transition and to raise the skill levels of the population. By mobilizing its great skills in IT and other areas of high-tech knowledge, India is especially well poised to achieve a sustainable development breakthrough. It will need effective leadership and good governance for success.

IV. A Closer Look at Official Development Assistance

Our differential diagnoses of sub-Saharan Africa and South Asia have shown how targeted investments in agriculture, health, education, infrastructure, and women's empowerment can help these regions to free themselves from the ancient

scourges of extreme poverty. I have often described these targeted investments as getting onto the "first rung of the development ladder" (Sachs 2005). By that I mean that key investments in basic education, health, infrastructure, and farming can enable a poor household, or indeed a poor region, to earn enough added income and garner enough wealth to be able to finance the next stage of development. By getting on the first rung of the ladder, the household (or region) is able to ascend to the second rung, then the third rung, and so forth, thereby enjoying self-sustaining growth that eventually will lead to the end of extreme poverty.

The problem with the poverty trap, however, is that a country may be too poor to get on the ladder by itself. The country's leaders may be visionary; they may have an excellent idea of how to carry out the needed investments. Yet they simply lack the cash flow—whether out of government revenues or new borrowing—to do so. In short, the

impoverished country (and the individual impoverished households within it) needs a "hand up" to get onto the development ladder. This is the main argument for foreign development assistance.

The idea of official development assistance (ODA), meaning development aid from governments or international agencies, has been around since just after World War II, when the United States launched the famous Marshall Plan to help postwar Europe rebuild and recover after the devastation of the war. The Marshall Plan offered a temporary injection of funds, given mostly not as a loan but as a grant, to help jump-start a renewal of economic life and self-sustaining growth. The Marshall Plan lasted for about four years, from 1948 to 1952, and did wonders in helping western Europe get back on its feet. It provided an inspiration for a growing system of grants and low-interest loans not only for postwar reconstruction but for jump-

starting long-term economic growth, for example, in the poor, newly independent countries of Africa and Asia.

It is important to understand that from the very start, few people advocated the use of ODA as a long-term way of life. Advocates of foreign assistance, including myself, believe that aid is a *temporary* measure to help a poor country make the crucial early investments needed so that the economy can soon stand on its own and begin climbing the development ladder. Aid is not a permanent need or solution. Countries that receive aid can reach a level of income through economic growth whereby they soon "graduate" from the need for aid entirely. China and Korea are two examples of countries that relied on aid when they were poor and then graduated from aid and indeed more recently became significant donor countries. Roughly speaking, graduation from aid can occur when a country passes from low-income to middle-income status. This

occurs at a GDP per capita of around $1,200 per year (measured at the market exchange rate), or roughly $3,000 per person per year when GDP is measured at international (purchasing power parity, or PPP) prices.

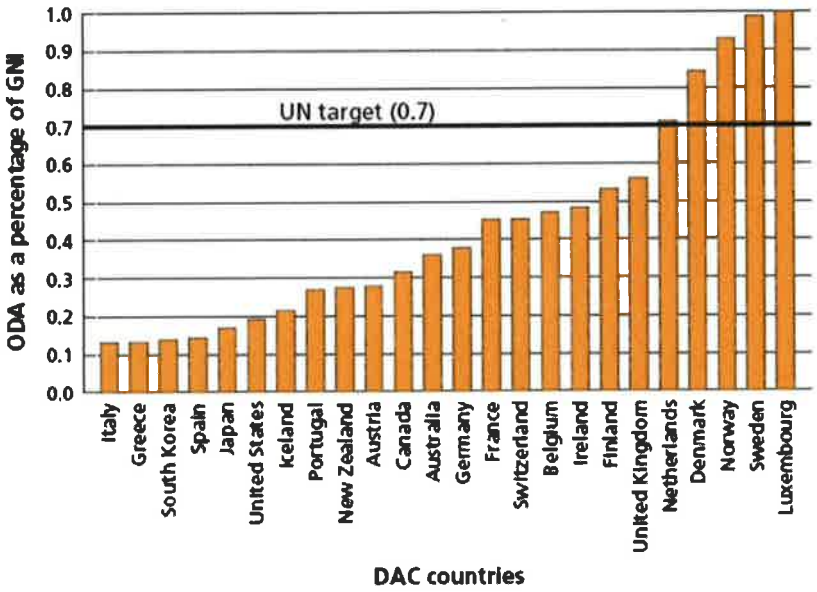
Official development aid became a basic pillar of the global community around 1970 (OECD 2010). A commission on international development headed by a former prime minister of Canada and Nobel Peace Prize laureate, Lester Pearson, recommended a global commitment to ODA. The commission's report, *Partners in Development*, called on high-income countries to become donors to poor countries. The report suggested that the high-income countries donate around 1 percent of their GDP to help the low-income countries to overcome poverty. Of that 1 percent of national income, around two-thirds, specifically 0.7 percent of national income, should come through official channels, mainly government-to-government grants and

low-interest loans. The remaining 0.3 percent of GDP should come through private contributions, mainly from corporations, foundations, individual philanthropists, and charitable organizations. Based on this commission report, the UN General Assembly in 1970 formally adopted the goal that high-income countries should contribute 0.7 percent of their national income to ODA.

Consider the United States, today a $16 trillion economy. The 0.7 percent of GDP standard would lead to ODA equal to $112 billion dollars of ODA each year. Alas, the United States is not close to that standard. The ODA given by the United States is around $30 billion dollars per year, closer to 0.18 of 1 percent of the U.S. national income and therefore less than one-third of the international standard.

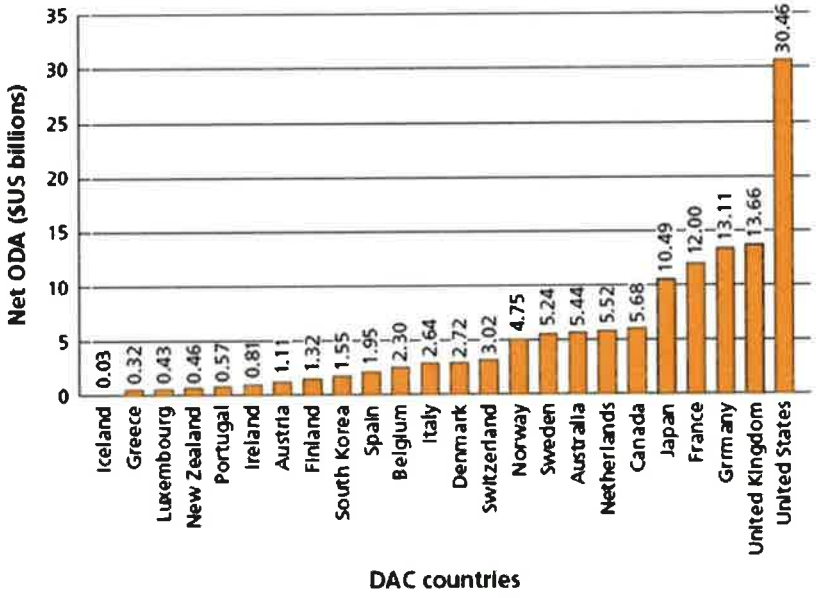
Figure 5.22 shows the ODA given by high-income countries (OECD 2014). Only five countries among the donors typically reach the targeted threshold of

0.7 percent of national income: Sweden, Norway, Denmark, Luxembourg, and the Netherlands. Sweden and Luxembourg indeed are at 1 percent of national income. At the other end of the spectrum are countries that give quite low proportions of national income, including the United States. Since the United States is such a large economy, it still gives a lot of money in absolute terms and indeed is the largest single donor. The combined income of the donor countries is around $40 trillion per year. At the official aid target level of 0.7 percent of national income, total donor aid for the poor countries would be about $280 billion dollars per year of aid. In fact, the aid is around $120 billion per year, or just 0.3 percent of gross national income.



5.22(A) Official development assistance (percent of GNI) (2012)

Source: Organization for Economic Co-operation and Development. 2013. "Compare your country—Official Development Assistance 2013." Paris: OECD. http://www.oecd.org/statistics/datalab/oda2012.htm.



5.22(B) Net official development assistance (2012)

Source: Organization for Economic Co-operation and Development. 2013. "Compare your country—Official Development Assistance 2013." Paris: OECD. http://www.oecd.org/statistics/datalab/oda2012.htm.

What kind of spending does the ODA support? Official development assistance has to fit the following criteria. First, the money must go to poor countries. Second, the money must be provided by an official agency of the donor country. Third, the money

must be used for economic development in the recipient country. It cannot be used, for example, for arms purchases or to support troops, sports games, or cultural events.

There is another important distinction to make between types of aid. Aid given as emergency relief, for instance, food aid in the middle of a famine, is called humanitarian relief. Similarly, emergency help after a natural disaster is also counted as aid, but it typically will save lives rather than promote long-term development. The kind of development aid that can help a country make a breakthrough out of poverty is something quite different. The most effective kinds of development assistance build capital—such as paved roads, an expanded power grid, and more clinics and schools—or capacity, such as training and salaries for teachers and health workers, or social investments such as health care delivery.

There is a lot of confusion about

whether aid works or not, because not all aid is the same. If a donor rather cynically gives boxes of cash to warlords because it thinks that such bribes will be good for a war effort, or it gives money to governments for corrupt reasons (such as to secure an arms deal), then such "donations" may be called aid but will do nothing to foster economic development. The kind of ODA that works for long-term development and poverty reduction is used to support investments in the critical areas I have discussed in this chapter. When *that* kind of aid is given, the evidence is very strong that it can have a large and important effect. Make no mistake about it—aid that is poorly directed or misused can be wasted. But aid that is well targeted to urgent needs can be crucial to help countries achieve the MDGs and to get onto the ladder of economic development.

During the MDG period, the most effective scale-up of ODA was in the area of public health. After the year

2000, there was a major increase of ODA for health. That increased assistance played an enormous role in helping poor countries to control AIDS, malaria, and tuberculosis and in helping to ensure that mothers are safe in childbirth and newborns can survive the difficult first days of life. That kind of aid helps to ensure that young children get adequate nutrition and are protected against childhood scourges for which vaccines exist. That kind of aid can help to ensure that children can attend school and thereby reach their full individual potential. We have already noted the big breakthroughs that have come after the year 2000 in lower mortality rates of children and of mothers during pregnancy and childbirth. We have already noted the large gains in fighting AIDS and malaria. We have seen the increased economic growth of sub-Saharan Africa. In all of those cases, ODA played a positive role alongside other factors.

Official development assistance, in

other words, can make a huge difference when it is operated for the real purpose of development and on a professional basis grounded in an accurate differential diagnosis of the needs of a low-income country. ODA can be the difference between success and failure in breaking free of the poverty trap. It comes at very low cost, less than 1 percent of the national income of the donor countries. If the rich world makes that effort, and if the funds are well used, ODA indeed can help to ensure that we are the generation that ends extreme poverty.

V. Designing Practical Interventions—the Case of the Millennium Villages

After you as a clinical development specialist have made the correct differential diagnosis, mobilized the development aid, and understood the key concepts of targeted investments in

basic needs, then the real-life problem of implementation of development programs becomes the key. Real-life implementation of targeted investments is a major operational challenge. When the MDGs were first enunciated and I was asked by then UN Secretary-General Kofi Annan to advise the UN system on how the MDGs could be achieved, I called on colleagues and professionals from around the world to suggest the most effective approaches for implementing the needed investments, in a four-year project called the UN Millennium Project (2002–2006).

The expert advice came from many different disciplines: agronomy, education, public health, urban and rural engineering, and community development, among others. In 2005, the UN Millennium Project presented a long synthesis report (UNMP 2005b) and many supporting volumes of detailed information to the member states of the United Nations. In a

special session of the General Assembly in the fall of 2005, the UN member states adopted a number of the key ideas on how to proceed in a practical way to achieve the MDGs.

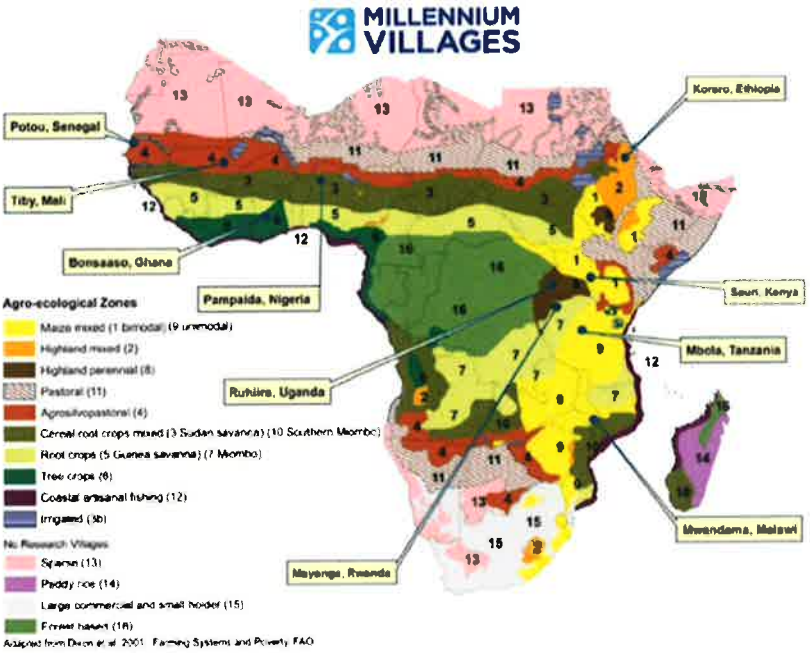
My colleagues and I then undertook to implement these ideas in a few selected places in rural Africa, to learn how our recommendations could best work on the ground. That is how the ten-year Millennium Villages Project (MVP) got started. The recommendations from the UN Millennium Project became the basis for village-level work in ten countries across sub-Saharan Africa. The goal was to demonstrate pathways to achieve the MDGs (MVP 2011).

The map in figure 5.23 shows the locations of the Millennium Villages. It also shows Africa in a brightly colored depiction, based on the distinctive farm systems in Africa. The yellow areas along the east coast of Africa, for example, covering parts of Kenya, Tanzania, and Malawi, are maize-producing regions. The beige area of

northern Ethiopia is a highland region where the main staple crop is a grain called teff, which is used for wonderful bread traditional in the Ethiopian diet but not widely known in the rest of the world. The brown-shaded region stretching east to west from West Africa are regions of cereal crop production in dry regions. And the orange area just above it, known as the Sahel, is an even drier region of crops mixed with pastoralist livestock management.

We wanted to see how the MDGs could be approached in each of these distinctive "agro-ecological zones," because each eco-zone poses specific challenges. How can farmers best grow each type of crop? How can pastoralists best manage their livestock, especially in the face of repeated droughts? The disease burdens are also quite different across these eco-zones. In the highlands, for example, malaria is not a crushing problem, while in the tropical lowlands, malaria can be holoendemic,

meaning that it infects just about everybody year-round unless it is brought under control. With the help of the host governments, in 2005–2006, the MVP identified ten very poor rural villages as the base for the project. Each of these Millennium Villages was initially a "hunger hot-spot," meaning that there was chronic undernourishment of at least 20 percent of the population. In other words, not only were the villages in poor countries, they were also in very poor parts of these poor countries. The idea was to use all eight MDGs as the guiding principles to promote the long-term development of these villages.



5.23 Millennium Villages and Africa's agro-ecological zones

From the Millennium Villages Project.

Applying the MDGs meant designing programs to achieve all eight of the MDG goals. There are two big reasons for that holistic approach. One is that each of the eight MDGs is meritorious in its own right. But another reason for the holistic approach is that the goals are synergistic. Providing safe water in a community can not only rid the community of part of the disease

burden but also can help the children be healthy enough to go to school. Similarly, fighting malaria not only protects the lives of the community but also helps protect its productivity. Malaria control helps to ensure that people are not sick when it is planting or harvest season and that the children are not too sick to go to school. Not only do we want to achieve the eight MDGs because each is important, but because achieving one of the MDGs helps to achieve the others as well.

The MVP used development assistance of $60 per person per year during the first five years of the project (roughly 2006–2010). The local government and local NGO partners provided an additional $60 or so. Total spending therefore amounted to around $120 dollars per villager per year to address the MDG challenges. This development assistance made it possible to build schools, clinics, water points, road, power grids, and other infrastructure. The project has shown

that even a very small amount of money, if properly directed and based on a proper differential diagnosis, can have a big impact in improving health, education, and infrastructure. The holistic approach seems to be working, though the final evaluation of the project will take place in 2015 and 2016, at the conclusion of the MDG period.

One of the most exciting developments in the Millennium Villages has been the development of the local health system. We are witnessing a major improvement in public health, including sharp reductions in child and maternal mortality. The project has helped to spur innovations in health care delivery, for example, by empowering Community Health Workers (CHWs) to reach even the poorest households in the villages (One Million Community Health Workers Campaign 2013).

The new CHW system is one of my own favorite developments of the Millennium Villages Project. People

from the poor communities are becoming effective guardians of their own good health. A CHW is typically a young woman from the community, maybe with ten to twelve years of schooling in total. She has no medical degree or nursing degree. Yet with a little bit of training over a few months, the local worker with a backpack with the right kinds of medical supplies can transform, improve, and save lives in her community.

Each CHW carries in her backpack the tools to fight malaria. First, she will do a rapid diagnostic test for malaria with just a drop of blood from a child. There is no longer the need for the test to be done at a laboratory in a clinic many kilometers away. Second, the CHW will have the necessary medicines to fight malaria if the diagnostic test is positive. Again, the parent does not have to carry a very sick and feverish child to a clinic; the CHW can effectively treat the child at home. Third, the CHW will have a mobile phone. It will be

possible to call an ambulance or to call the clinic for advice from the nurse or doctor on duty. More and more, these smartphones are also being programmed with expert information systems to receive needed advice and information automatically by phone and to track information about patients.

5.24 CHW with a backpack of supplies

Credit: Yombo Tankoano.

I am happy to say that the Millennium Villages have already inspired many of the host governments to scale up large national programs in malaria control,

AIDS treatment, help for smallholder farmers, and electrification with off-grid solar-based systems. Many other innovations have been tested, demonstrated, and pioneered in the Millennium Villages. The successful projects are now spreading. The project began in ten countries, but has already expanded to more than twenty countries. Many of the ideas tested in the individual villages are now applied across entire countries. It is very exciting to see this kind of progress on the ground. It is especially thrilling to see what is now possible through improved technologies: information systems that work at very low cost for better health, better education, and improved access to infrastructure. These are the technological and systems advances that encourage us to envision the end of extreme poverty in this generation.