

YOU CAN LISTEN TO THE ACADEMICS, OR YOU CAN LISTEN TO THE FARMERS.

Smallholder farmers throughout Africa are adopting conservation agriculture practices on their farms to improve their farming operations and their livelihoods. The soil health and resilience benefits of conservation agriculture mean these families can now afford to send their children to school, have sufficient supplies of food, have more fertile and durable farmland; and have healthier livestock.

Protecting our soils and practicing smarter methods of farming is critical. *Brown Revolution: Save Our Soils, Save Our Future* is an initiative to raise awareness about and promote the adoption of conservation agriculture practices. By educating farmers about the positive impact healthy soils have on productivity and conservation, as well as demonstrating an improved return on investment, we can feed the world more profitably and sustainably – *now and for generations to come.*

ABOUT THE HOWARD G. BUFFETT FOUNDATION

The Howard G. Buffett Foundation is a private family foundation working to catalyze transformational change to improve the world and the lives of the most impoverished and marginalized populations. The Foundation has invested over \$150 million in research to improve agriculture and an additional \$350 million in agriculture-related programs globally.

THE ACADEMICS

“CA (conservation agriculture) does not “fit” within the majority of smallholder farming systems in Africa.”
– **Ken Giller**, Professor, the Wageningen Centre for Agroecology and Systems Analysis

“The big challenge for agriculture is that we need to further increase yields but greatly reduce our environmental impacts. The common assumption that no-till is going to play a large role in the sustainable intensification of agriculture doesn’t necessarily hold true, according to our research findings.”
– **Cameron Pittelkow**, Assistant Professor of Crop Sciences, the University of Illinois

THE FARMERS



“Before I only had 0.3 Ha; now I am farming an additional 0.8. The land I have under CA is beautiful, soft, and fertile, with no erosion. It is so fertile now that it doesn’t need chemical fertilizer to produce well, unlike my conventional plots.”

– **Ansila Gerald**, 60 years old, Maweni Village, Tanzania



“As a widow, I realized that this [CA] is the only way I can get significant production. I have really improved my farm production and as a side benefit I have a stronger cattle herd.”

– **Sostina Mlambo**, 51 years old, Midzi Village, Zimbabwe



“Conventional production isn’t very reliable. When yields were poor, we had to rely on vegetable gardening to get by. I bought 4 goats with the income from CA fields, as well as paid the school fees for my grandchildren.”

– **Ruth Muleya**, 55 years old, Hanyanga Village, Zambia



“In the old system, I had to invest \$157 a year per acre to grow crops. Now, with no-till, I spend only \$26 per acre. Once established in no-till, corn yields tripled, from 4 to 12 bags per acre.”

– **Samuel Amponsah**, 46 years old, Amanchia, Ghana



“[With CA], I’ve had a 70 percent drop in my cost of labour and my yields have increased by 30 percent.”

– **M’Mutea Kiagora**, 52 years old, Mbajone Village, Kenya



“Production is a lot better under CA. There is a lot less erosion; you can really see the difference between my fields and my neighbor’s fields.”

– **Veronica Mutono Mwongela**, 34 years old, Lairangi, Kenya



“Before [CA], we didn’t have enough to eat and sell. We had enough last year to sell 7 bags and could still send our kids to school with maize to eat.”

– **Neda Muninge**, 42 years old, Mongole Village, Zambia

Africa's NO-TILL REVOLUTION

*Sustainable, integrated
cropping systems
improve food security
and add value
among smallholder
African farmers.*

WRITTEN BY HOWARD G. BUFFETT

In a quiet rural corner of Ghana, near the dusty village of Amanchia, Dr. Kofi Boa goes about revolutionizing African food production one farmer at a time.

"It is my dream that the whole of Africa will know how to sustain the productivity of a piece of land," he tells a group of seed growers who have flown in from several African countries to learn new farming techniques at the Centre for No-Till Agriculture. Hundreds of African farmers have already adopted his methods, and more learn each day. It is this work that proves without a doubt that no-till is changing lives on the front lines of agriculture, despite the conclusions reached by some who have never farmed themselves.

In Ghana, where agriculture makes up 60 percent of GDP and accounts for over a third of all employment, Dr. Boa is something of a hero. One by one he shows farmers how traditional slash-and-burn methods only exacerbate erosion and degrade soils, keeping yields low and farmers impoverished.

He then demonstrates – in his own test plots – how no-till farming methods, rotation and cover crops can break those cycles. As a result, African farmers are learning to treat their soil like valuable working capital, and that capital is now paying dividends.

In rural Ghana farmers have no safety nets. There is no pension, social security or retirement plan, and there certainly is no federally-subsidized crop insurance. In severe cases, a poor crop can be a matter of life and death for an African family. Many live on the hard edge of hunger at least half of every year.

Smallholder farmers are motivated to succeed, striving for greater profits through higher yields. But they often lack market opportunities, credit and access to improved inputs – things American farmers take for granted. They do enjoy some advantages. Most villages have, at least for now, plenty of inexpensive hand labor available for seasonal farm work.

In farming, we all seek solutions. In Africa the main question is how to raise yields and profitability with limited resources on degraded soils. There seems to be some mystery about smallholder farmers in Africa, but there's no romance in hunger.

To move up the wealth ladder, African farmers, like all of us, are just trying to improve. They're learning what will work on their farms and being patient as they embrace new methods.

African farmers now have a unique opportunity to do something American farmers did not originally embrace: develop agriculture in a conservation-focused way. Africa's "Dust Bowl" is their degraded and weathered soils. However, as African farmers increase production and expand to more mechanization, they can do so with the lessons of American, Argentinian, Brazilian, Australian and other farmers who have pioneered no-till, strip-till and other conservation practices.

"African farmers now have a unique opportunity to do something American farmers did not originally embrace: develop agriculture in a conservation-focused way."

In North America we plowed everything for years because we became conditioned to believe that practice was the foundation for row crop agriculture. It may be one reason why it is difficult to convert U.S. farmers to no-till practices, because change is difficult.

In Africa, no-till is not just an opportunity, it must become a mandate. Africa has a high percentage of degraded soils that must be replenished. Africa will never feed itself without conservation agriculture.



Above: In South Africa, oxen pull a roller crimper designed to kill cover crops or weeds. This process eliminates or reduces the need for chemicals. **Insert:** After the cover crop dies and lays flat, researchers check areas for weed growth.

Slash-and-burn agriculture is used by upwards of 500 million smallholder farmers worldwide. As a result, the International Fertilizer Development Center (IFDC) estimates Sub-Saharan soils lose around 8 million tons of soil nutrients a year. Over 250 million acres of African land has been degraded to the point of greatly-reduced productivity. We need new solutions.

With no other options, limited agricultural extension and limited available education, many farmers continue doing what they have always done. Until now.

"When we were doing slash-and-burn we didn't know the land was suffering," says Ama Adutwumwaa, a 33-year-old farmer who plants corn, cassava, cocoyam, cacao and peppers. She saw corn yields more than quadruple after her first no-till growing season.

"I was very happy when I saw my plants emerge and start growing," she says. *"Even during the dry season, the plants were still growing. It was because the land is now soft and can hold moisture."*

Another farmer, Teresa Amankwah, 60, has been farming since she was a child, following traditional slash-and-burn methods most of these past four decades. She has four children to feed and struggled to pay for basic high school education. When she noticed neighboring farms flourishing with no-till, *"I knew I needed to change,"* she says.

With slash and burn methods, Teresa grew cassava, cocoyam, corn, plantain and cacao. Her production costs came to 300 Cedi (\$81) per acre with a net per acre profit of \$54. She's planting the same crops in no-till with a similar cost structure.

"When I look at the crop I can see I'm going to get higher yields, so I know I will be getting higher profits when I'm finished with harvest," she says.

What's her outlook for farming now compared to when she began some four decades ago? *"Because of no-till and the mulch, plants are growing bigger,"* she says. *"I can see this practice is going to really help, compared to the old ways."*

Thanks to no-till, Teresa now expects to have money to pay for her children's education. No-till has changed the way she views her profession.

"When I see my plants growing, it makes me happy," she says. And, at the end of the day, isn't that how most farmers respond to a great-looking crop? If enough African farmers embrace this system, you can be sure there will be more good news coming from a continent that must succeed in meeting its food demands.

THE HOWARD G.
BUFFETT
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ABOUT THE AUTHOR

Howard G. Buffett is a farmer and Chairman and CEO of the Howard G. Buffett Foundation. He has farmed for over thirty-five years, and the Foundation has invested over \$150 million in research to improve agriculture and an additional \$350 million in agriculture-related programs globally.

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**BROWN
REVOLUTION**
SAVE OUR SOILS. SAVE OUR FUTURE

NO-TILL, *African* STYLE.



WRITTEN BY HOWARD G. BUFFETT

In the far-off rainforests and sub-Saharan climates of Africa, smallholder farmers are successfully implementing no-till practices to boost production and save soil. And they are doing it the same way many American farmers have for decades: through trial and error, using practices that make sense based on local conditions and existing customs.

Africa is the epicenter of chronic hunger, but it is also a continent with great potential for substantial gains in productivity. The dream for every humanitarian working on hunger issues is to see Africa feed itself, and to do so using resource-saving sustainable practices is the ultimate achievement.

The African no-till movement is timely, too. Africa's soils are weathered from years of plowing and 'slash-and-burn' farming. Weather changes which have brought heavier, faster rainfalls and hotter, drier conditions will result in winners and losers on farms around the world. Many African farmers live on the edge of subsistence farming; hunger is often around the corner, so they cannot afford to lose this battle. Conservation farming is more important than ever.

African farmers are discovering how no-till allows them to mitigate the risks of weather extremes and produce more food, as they become better guardians of their soils.

Many smallholder farmers use a machete to clear a field by chopping the vegetation into small pieces. He or she then might string out a rope to ensure straight rows for planting. The machete is used to clear a small spot in the mulch, slit open a hole, and plant the seed. Crop canopy is used strategically to shade out weeds and reduce the heat on the soil. In some cases they intercrop vegetables, like tomatoes and peppers, between tree crops like cacao or plantains, until the tree crops grow too shady.

No-till is well suited to the tropics, where cover crop mulch can protect fragile soils and rolling ground from harsh rainfalls. It is also well suited to smallholder farmers who can do much of this with inexpensive hand labor, sometimes small amounts of chemical, a machete or hand hoe, and improved seed.

In these smaller plots, farmers use mulch and cover crops for nutrients, so little commercial fertilizer is used, at least in these early stages. (That may come along later as farming methods intensify and more income can be reinvested in synthetic fertilizer.)

No-till provides continuous cover to protect the soil, improve soil health, retain moisture and reduce soil erosion.

INFORMATION PROVIDED BY A GRANT FROM THE HOWARD G. BUFFETT FOUNDATION

With this approach farmers are building soil organic matter so they can improve degraded lands. This means land that is environmentally sensitive can be spared as production in farm-friendly soils ramps up.

This is not no-till as Americans might broadly define the practice. Frankly, it's better. It's a truly sustainable, systems approach where no resource is wasted, no tillage is used. The ground is consistently covered, and while herbicides and synthetic fertilizer can be applied, we have found less of both is required compared to conventional farming. If done right, the practices immediately double or triple production from the old slash-and-burn methods.

His attitude about farming is different now, too. "After I started no-till it motivated me," he says. "Eventually people will stop slashing and burning," he adds. "This type of farming (no-till) will multiply. This is the future."

That's what 27-year-old David Owusu discovered shortly after he began using no-till on his corn, plantain and cacao farm that he manages for his uncle Akwasi. Before using no-till, he would slash and burn corn residue after harvest. His first year in no-till was not easy; he kept the old crop stalks but found it difficult to plant through them. He learned to chop the stalks into smaller pieces for faster degradation and began planting corn in 40-inch rows.

His crops are sold by 110-kilogram bags (242 pounds), and his yield the first year doubled from two to four bags on a quarter acre plot. Yields jumped to six bags of corn last year. When he got his second no-till crop in the ground last October, he only had to spray once for weeds, so he reduced his weed control costs by about a third.

"No-till gave me more experience and ideas," he says. *"With the cover crop mulch and no-till, soils are softer now and hold more nutrients. I don't think I'll need to buy fertilizer because the soil gets nutrients organically through the biomass and mulch."*

David has seen higher profits from no-till as well. About five years ago he was making about 60 Cedis (\$16.20) a year from the farm, after costs. *"When crops came I sold them for whatever I could get, but I didn't know if I was making a profit,"* he says. With no-till he invested 150 Cedis (\$40.50) in the farm and profit came to about 400 Cedis (\$108). He's hoping to increase that to 800 Cedis (\$216) this year as he expands. *"With two acres I hope to yield 20 bags, and that will make a profit of 4,000 Cedis (\$1,080),"* he says.

His attitude about farming is different now, too. *"After I started no-till it motivated me,"* he says. *"Eventually people will stop slashing and burning,"* he adds. *"This type of farming (no-till) will multiply. This is the future."*

It is encouraging when you consider the very idea of millions of smallholder farmers doubling and tripling food production as they adopt these methods.

If enough African farmers learn this approach, you can be sure there will be exciting news coming from the world's biggest, most food-insecure continent.

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Farmers in Mozambique use a homemade roller crimper to prepare for planting. This technique keeps permanent cover on the fields.

We're treating soil like

DIRT.

It's a fatal mistake.



With no cover, soil dries out faster. The effects of drought are intensified.

WRITTEN BY GEORGE MONBIOT

George Monbiot's editorial, adapted and reprinted below with permission from the author, highlights the importance of protecting, restoring and investing in soil health to meet our growing global food demands and ensure our collective survival. It is also a reminder why conservation practices like no-till, cover crops and crop rotation must be at the center of any smart policy on agricultural development, not relegated to the sidelines. A version of this article first appeared in the United Kingdom in The Guardian.

War, disease, even climate change, are small problems by comparison. Destroy the soil and we all starve.

Imagine a wonderful world, a planet on which there was no threat of climate breakdown, no loss of freshwater, no antibiotic resistance, no obesity crisis, no terrorism, no war. Surely, then, we would be out of major danger? Sorry. Even if everything else were miraculously fixed, we're finished if we don't address an issue considered so marginal and irrelevant that you can go for months without seeing it in a newspaper.

It's literally and – it seems – metaphorically, beneath us. To judge by its absence from the media, most journalists treat it as unworthy of consideration. But all human life depends on it. We knew this long ago, but somehow it has been forgotten. As a Sanskrit text written in about 1500BC noted: *“Upon this handful of soil our survival depends. Husband it and it will grow our food, our fuel and our shelter and surround us with beauty. Abuse it and the soil will collapse and die, taking humanity with it.”*

The issue hasn't changed, but we have. Landowners around the world are now engaged in an orgy of soil destruction so intense that, according to the UN's Food and Agriculture Organization, the world on average has just 60 more years of growing crops.



Tillage of soil on slopes is a recipe for disaster, causing the soil to lose production capacity and value.

To keep up with global food demand, the UN estimates, 6 million hectares (14.8 million acres) of new farmland will be needed every year. Instead, 12 million hectares (29.6 million acres) a year are lost through soil degradation. We wreck it, then move on, trashing rainforests and other precious habitats as we go. Soil is an almost magical substance, a living system that transforms the materials it encounters, making them available to plants. That handful the Vedic master showed his disciples contains more micro-organisms than all the people who have ever lived on Earth. Yet we treat it like, well, dirt.

The techniques that were supposed to feed the world threaten us with starvation. A paper just published in the journal *Anthropocene* analyzes the undisturbed sediments in an 11th-century French lake. It reveals that the intensification of farming over the past century has increased the rate of soil erosion sixtyfold.

Another paper, by researchers in the UK, shows that soil in leased gardens – the small patches in towns and cities that people cultivate by hand – contains a third more organic carbon than agricultural soil and 25 percent more nitrogen. This is one of the reasons why gardeners produce between four and 11 times more food per hectare than do farmers.

“This is the International Year of Soils, but you wouldn't know it. War and pestilence might kill large numbers of people, but in most cases the population recovers. But lose the soil and everything goes with it. This is what topples civilizations.”

Whenever I mention this issue, people ask: *“But surely farmers have an interest in looking after their soil?”* They do, and there are many excellent farmers who seek to keep their soil on the land. There are also some terrible farmers, often absentees, who allow contractors to rip their fields to shreds for the sake of a quick profit. Even the good ones are hampered by an economic and political system that could scarcely be better designed to frustrate them.

This is the International Year of Soils, but you wouldn't know it. War and pestilence might kill large numbers of people, but in most cases the population recovers. But lose the soil and everything goes with it. This is what topples civilizations.

Almost all other issues are superficial by comparison. What appear to be great crises are slight and evanescent when held up against the steady trickling away of our subsistence.

The avoidance of this issue is perhaps the greatest social silence of all. Our insulation from the forces of nature has encouraged a belief in the dematerialization of our lives, as if we no longer subsist on food and water, but on bits and bytes. This is a belief that can be entertained only by people who have never experienced serious hardship, and who are therefore unaware of the contingency of existence.

It's not as if we are short of solutions. While it now seems that plowing of any kind is incompatible with the protection of the soil, there are plenty of means of farming without it. Independently, in several parts of the world, farmers have been experimenting with zero-tillage (also known as conservation agriculture), often with extraordinary results.

There are dozens of ways of doing it: we need never see bare soil again.

But, though every year governments spend billions of dollars on agricultural research and development – much of it on techniques that wreck our soils – there is little mention of conservation agriculture.

The macho commitment to destructive short-termism appears to resist all evidence and all logic. Never mind life on Earth; we'll plow on regardless.



Slash-and-burn is used in many countries throughout Central America and Africa. It has a devastating impact on the environment.

One farmer's story of

CONSERVATION AGRICULTURE

INFORMATION PROVIDED BY CATHOLIC RELIEF SERVICES

HITTING PAYDIRT IN THE SOIL

Tomás Cruz has farmed maize and tomatoes for most of his life. Since the only extension support that he had received over the years was from local input providers, Tomás focused on applying synthetic fertilizers and pesticides in order to ensure yields. In recent years, however, he had been facing declining yields and profits. That was until a water-smart agriculture program called ProSoil exposed him to an alternative set of farming solutions. When it came to soil management, Tomás learned how he could increase his yields and profit through the restoration of his soil by eliminating tillage, maintaining continuous ground cover, and rotating his crops. These principals of conservation agriculture are the foundation of the ProSoil program.

After just 18 months, Tomás can already see for himself that this new focus on his soil leads to results. He has achieved both increased yields and production savings by decreasing fertilizers, input, and labor costs. By eliminating tillage, he has also saved time and effort.

"I saw that the plot's yield was good and that the cost of production went down. The first thing is to see to it that you do not move the soil around too much or turn it over. The average yield here is about 3.9 MT/ha, and we have achieved approximately 6.6 MT/ha applying these new agricultural practices. On top of that, using cover crops helped me to get certified by the Ministry of Agriculture as a farmer with Good Agricultural Practices (GAP), which will help me sell my products on the market."

Lowering input costs while increasing yields as a result of implementing conservation agriculture practices resulted in an impressive net income increase. On the land where he used conventional practices he netted \$5,800/ha, while on the area where he applied conservation agriculture practices he was able to net up to \$20,000/ha.

"Lowering input costs while increasing yields as a result of implementing conservation agriculture practices resulted in an impressive net income increase."

SOIL AND WATER MANAGEMENT

The integration of good soil management practices has helped Tomás manage his farm as a productive system in which he can optimize the use of inputs such as fertilizers. Cover cropping, for example, has helped him with weed control, while integrated pest management practices have helped him to minimize his use of pesticides. Moreover, he now limits the use of supplementary irrigation water by using a drip system only when soil moisture is low and only in the specific areas of the field that need it.

"I have now put the irrigation equipment away since the plants are greener than before. Wherever the crop coverage is greater, it stays moist. We used to use plastic to cover the soil for moisture and pest control—this practice allows us to produce 8,500 lbs. of tomatoes per hectare more than with conservation practices (without plastic). But the cost of plastic for a conventional system costs us \$680 per hectare, and that is usually worth much more than the small loss in tomato yield, not to mention the time it takes to lay the plastic! So we come out winning. We have also reduced fungicide applications from 70 times per crop cycle to 20."

Tomás's successful use of water resources on his farm is particularly noteworthy considering that his farm is located in the Department of Madriz, one of the most drought-prone regions of Nicaragua.

FARMER TO FARMER AND A NEW GENERATION

Tomás has begun renting out his farm to his son, but not before setting down some clear conditions.

Tomás does not want to go back to conventional agriculture. *"My son wanted to drive a tractor through, but I told him he couldn't."* Tomás cannot bear the thought of watching more soil erode from his farm.

Neighboring farm families, having seen Tomás's success first hand, have also started to implement better farm management practices. *"Everybody used to plant all at once,"* Tomás says.

"This farmer over here planted tomato, and the other one next to him did the same at the same time. This meant that we were flooding the market with tomatoes at the same time, lowering prices. We can avoid this by planning the succession of our crop rotations better. The rotations also reduce problems related to pests and diseases. With diversity, we have more stability in our farming systems."

Tomás believes that water-smart agriculture practices will spread quickly in his community and beyond. *"There are other farmers in neighboring communities who are already talking about adopting these practices. It really changes the way they see things when you show them how the soil quality has improved."*

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Clearing land in Central America by hand is difficult work. Establishing permanent cover and planting into it rather than hoeing is better for the soils and reduces labor hours.



WHAT DOES A \$100 BILLION ASSET MANAGER
SAY FARMERS SHOULD INVEST IN?

Soil.

WRITTEN BY HOWARD G. BUFFETT

JEREMY GRANTHAM, CO-FOUNDER AND CHIEF INVESTMENT STRATEGIST OF GRANTHAM, MAYO, VAN OTTERLOO & CO. LLC, manages one of the world's largest investment funds. Recently, he described soil degradation as one of the largest threats facing humanity.

As farmers, we think we know a lot about soil, and we probably do in terms of our own farms. However, when viewing soil quality and productivity on a global basis, there is a rude awakening.

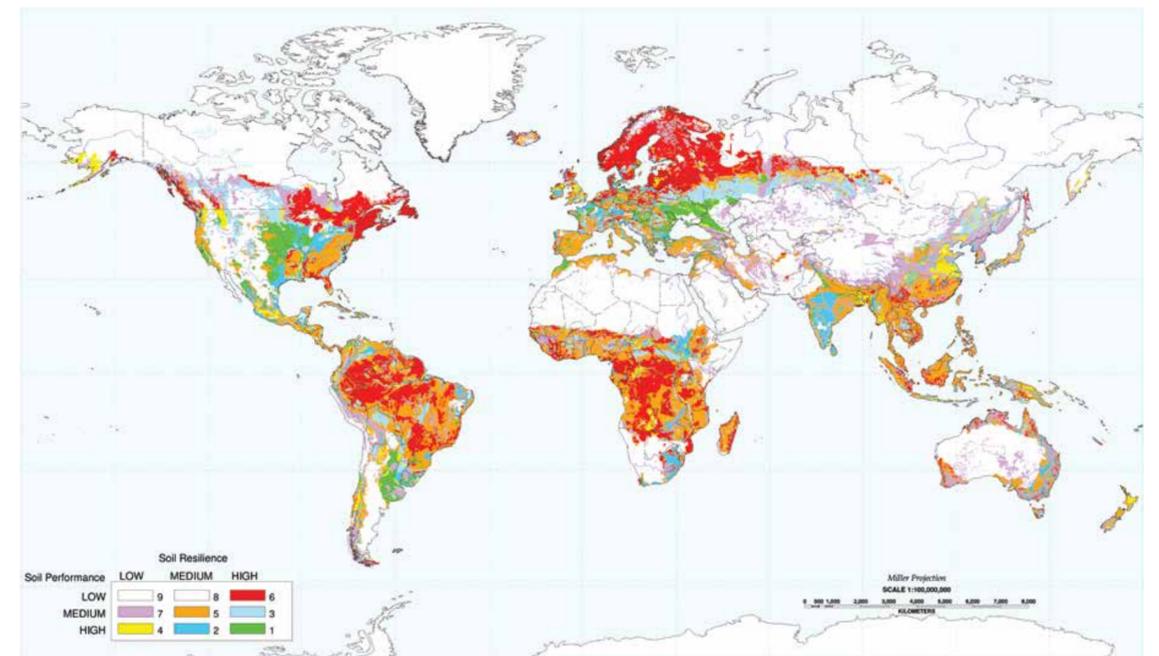
In the graphic below, an assessment of world land quality provides a clear picture of the challenges we face in meeting global food security—after all, soil characteristics such as water-holding capacity and fertility are the beginning and the end of successful food production.

What is the first thing a farmer considers when purchasing land? Productivity.

Productivity is based on the soil. In the United States, soils are placed into capability classification systems that describe their suitability for use in crop production. When I describe our farms in Nebraska and Illinois, the first thing I say is that they are mostly Class I soils. So, what do soil capability classes mean if we are concerned about global food security? A lot!

There are nine major classifications of soil quality, Class I having the most favorable attributes for crop production, and Class IX possessing the least desirable. Soils that have high capability in their native or virgin conditions can easily deteriorate into lower categories if they are abused or poorly farmed.

INHERENT LAND QUALITY ASSESSMENT



Source: U.S. Department of Agriculture, Natural Resources Conservation Service, Soil Survey Division, World Soil Resources, 1998

Soil degradation translates into a huge challenge for the world's farmers. Soil is like a bank account—if we keep withdrawing, we will eventually face agronomic bankruptcy. Soil is a complex biological ecosystem. Soil health is a lot like human health—we do not always understand what is happening, and we do not always know how to solve the problem when something goes wrong.

Therefore, the best starting point is to take care of what we have. The Brown Revolution is an educational campaign to increase awareness of the importance of soil and the risks associated with failing to safeguard this critical asset. In addition to our campaign, our Foundation is supporting efforts to provide new ideas and technical information to protect our soil.

ESTIMATE OF POPULATION IN DESIGNATED LAND QUALITY CLASSES

LAND QUALITY CLASS (LQC)	LAND AREA		POPULATION	
	MILLION KM ²	PERCENT	MILLIONS	PERCENT
I	4.09	3.2	337	5.9
II	6.53	5.0	789	13.7
III	5.89	4.5	266	4.6
IV	5.11	3.9	654	11.4
V	21.35	16.3	1,651	28.8
VI	17.22	13.2	675	11.8
VII	11.65	8.9	639	11.1
VIII	36.96	28.3	103	1.8
IX	21.78	16.7	625	10.9
GLOBAL	130.6	100.0	5,759	100.0

Left: The best agricultural soils (Class I, II and III) are confined almost exclusively to the temperate zone. Class IV, V and VI occur mainly in the inter-tropical areas. Class VII, VIII and IX are in fragile ecosystems and include tundra and desert regions. Only a quarter of the world's population lives on land with a big potential for grain production. Roughly half of the global population inhabits land with significant agricultural constraints, including long periods of soil moisture stress. And a quarter of the world's people must survive on lands that are considered unsuitable for grain production.

ABOUT THE AUTHOR

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**BROWN
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SAVE OUR SOILS, SAVE OUR FUTURE

LOSING

the Farm



Farm ground that is tilled loses nutrients, fertilizer, organic matter and soil. Eventually, the sediment creates water-quality problems.

As farmers, our most important asset is our soil. Improved seeds, synthetic fertilizer and herbicides are all important to increasing productivity, but they cannot rebuild soil. They cannot replace the biological activity destroyed by poor farming practices.

JOIN THE BROWN REVOLUTION.

Protect our soils and save our future.

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In 1935, the United States lost an estimated 850 million tons of topsoil.¹ Since the 1970s, the United States has been losing an estimated four billion tons of topsoil a year—a nearly five-fold increase in lost topsoil compared to the worst year of the 1930s Dust Bowl period.² This erosion also means nutrients are lost, fertilizers contaminate water sources and organic matter is reduced. Globally, an estimated 75 billion metric tons of soil is eroded from the world's ecosystems, the majority from farms.³ In Africa, the rate of soil loss has increased 20-fold over the past 30 years.⁴



Drought affects crop productivity in many ways. The fracture and cracking of soil damages soil structure and renders soil less productive. Soil surfaces can crust and harden, affecting permeability, as well as crop absorption of nitrogen, phosphorus, potash, sulfur, boron and other critical nutrients, diminishing crop yields. Eliminating tillage, using cover crops and agroforestry (where appropriate) can help mitigate the negative effects of drought.



Sedimentation has a significant negative impact on streams, rivers, ports and entire ecosystems. Accelerated erosion from human use of land accounts for 70 percent of sedimentation.⁵ Cornell University reports that about 60 percent of soil that is washed away ends up in rivers, streams and lakes, making waterways more prone to flooding and to contamination from fertilizers and pesticides. In the United States, sedimentation is the second main cause of impairment to rivers and streams, affecting almost 120,000 miles of water.⁶

¹ Source: World History In Context Web Site

² Source: Page 173, *Dirt: The Erosions of Civilizations*

³ Source: USDA

⁴ Source: World Watch

⁵ Source: U.S. Environmental Protection Agency

⁶ Source: U.S. Environmental Protection Agency

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ASSESSING AFRICA'S REAL *Potential for Agriculture*



How practical and political barriers limit food production.

WRITTEN BY HOWARD G. BUFFETT

Africa is a vast continent with more diversity in agricultural production than likely any other continent in the world. It is also a continent that was shortchanged on soil fertility during the periods of soil formation.

As a result, less than 10 percent of Africa has what is considered high-quality soils, including the lower third of West Africa; parts of East Africa; and areas within several countries in southern Africa including Zambia, Zimbabwe, South Africa and Mozambique.¹

Africa has unique ecosystems such as the savannah of the Mara and Serengeti, the volcanoes of Virunga, and the Afromontane and coastal forests from western to eastern Africa. It has vast wildlife corridors traversing multiple countries, oftentimes combining significant national parks.

These areas need continued protection against misuse, improper exploitation and unsustainable agricultural expansion. The Food and Agriculture Organization (FAO) estimates that 65 percent of agricultural land throughout Africa has been degraded by human activity.² The Montpellier Panel – a prominent group of agriculture, ecology and trade experts from Africa and Europe – estimates that these degraded soils are too damaged to sustain viable food production.

A number of organizations and institutions have analyzed Africa's potential for agriculture using different methodologies and assumptions. The actual amount of available and appropriate arable land and its potential productivity is critical to Africa's food security interests and the question of whether Africa can feed itself in the future.

But land availability is only part of Africa's food security story. We set out to understand how the practical barriers farmers face in their daily operations, as well as the political barriers that affect achieving change at scale, undermine Africa's real potential for agriculture.

¹ USDA Natural Resources Conservation Service, World Soil Resources, Soil Survey Division, 1996.

² Turning the tides of soil degradation in Africa: capturing the reality and exploring opportunities. July 10, 2003. FAO



As a farmer, I am regularly amazed at how frequently non-farmers are charged with producing analyses and recommending solutions that will have tremendous influence on the issues farmers face. It is the equivalent of asking a non-medical person to perform surgery. Just as trained doctors are best equipped to perform medical procedures, farmers are best equipped to understand the issues farmers face, and they are best equipped to participate in developing practical solutions that work in the real world, not in hypothetical situations. When hypothetical solutions drive policy, it is a recipe for failure.

Therefore, we present this analysis to challenge current assumptions and to be realistic about the challenges we face to accomplish a goal we all want to achieve: an African continent with strong, vibrant agriculture. It will require smallholder farmers as part of the solution and a continent that embraces a Brown Revolution to rebuild its soils.

Current commitments by governments and donors are not enough. If we do not treat African soils with more practical and sustainable approaches and base African policy on serious commitments to address and overcome existing barriers, then we will fail farmers.

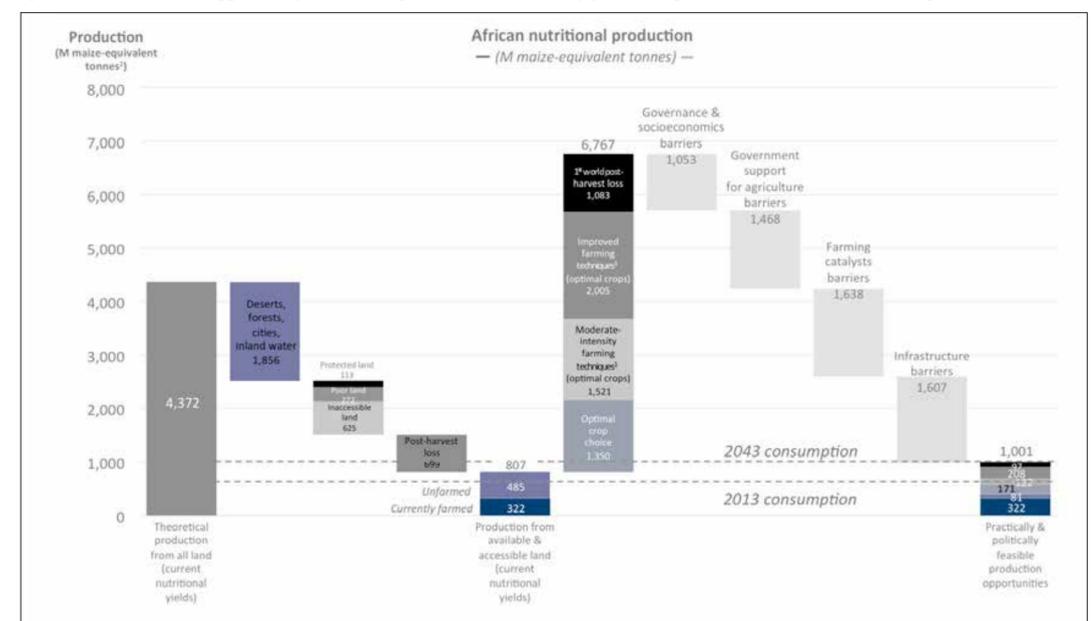
To view the complete *Africa's Potential for Agriculture* study, visit <http://brownrevolution.org/>.

ABOUT THE AUTHOR

Howard G. Buffett is a farmer and Chairman and CEO of the Howard G. Buffett Foundation. He has farmed for over thirty-five years, and the Foundation has invested over \$150 million in research to improve agriculture and an additional \$350 million in agriculture-related programs globally.

OVERVIEW: THEORETICAL OPPORTUNITY & HEADWINDS

Africa has a theoretical opportunity to increase production over twenty-fold, though real-world headwinds limit growth.

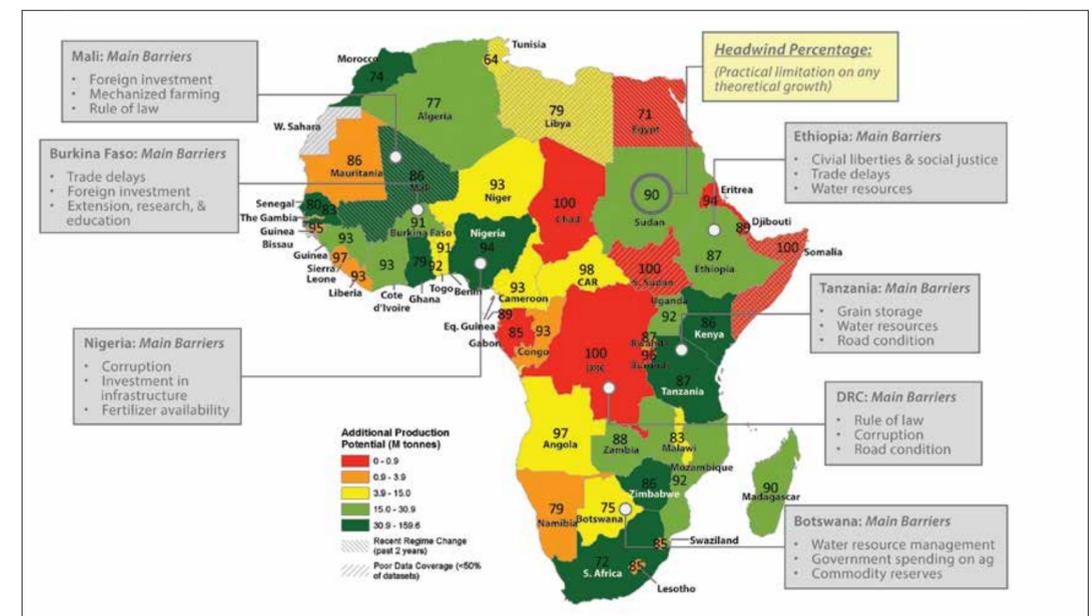


¹ Defined as moderate and high use of fertilizer, improved varieties of crops, mechanized tools, use of pesticides and herbicides, soil erosion mitigation, nutrient maintenance and fallow year requirements

² Maize-equivalent tonnes describe tonnes of all major crops that we weighted by calorie and protein content relative to maize
Source: FAOSTAT, GAEZ, Lake Partners analysis

POTENTIAL PRODUCTION AND CURRENT BARRIERS TO GROWTH

Each country experiences unique barriers to significant agricultural growth.



Source: Lake Partners analysis