

African agriculture

A green evolution, Mar 12th 2016

The farms of Africa are prospering at last thanks to persistence, technology and decent government



NOT so long ago Jean Pierre Nzabahimana planted his fields on a hillside in western Rwanda by scattering seed held back from the last harvest. The seedlings grew up in clumps: Mr Nzabahimana, a lean, muscular man, uses his hands to convey a vaguely bushy shape. Harvesting them was not too difficult, since they did not produce much.

This year the field nearest to his house has been cultivated with military precision. In February he harvested a good crop of maize (corn, to Americans) from plants that grew in disciplined lines, separated by precise distances which Mr Nzabahimana can recite. He then planted climbing beans in the same field. On this and on four other fields that add up to about half a hectare (one and a quarter acres) Mr Nzabahimana now grows enough to enable him to afford meat twice a month. He owns a cow and has about 180,000 Rwandan francs (\$230) in the bank. Although he remains poor by any measure, he has entered the class of poor dreamers. Perhaps he will build a shop in the village, he says. Hopefully one of his four children will become a driver or a mechanic.

According to the UN Food and Agriculture Organisation, Rwanda's farmers produced 792,000 tonnes of grain in 2014—more than three times as much as in 2000. Production of maize, a vital crop in east Africa, jumped sevenfold. Agricultural statistics can be dicey, African ones especially so. But Rwanda's plunging poverty rate makes these plausible, and so does the view from Gitega. Another farmer, Dative Mukandayisenga, says most of her neighbours are getting much more from their land. Perhaps only one in five persists with the old, scattershot "broadcast" sowing—and most of the holdouts are old people.

Rwanda is exceptional. But in this respect it is not all that exceptional. Cereal production tripled in Ethiopia between 2000 and 2014, although a severe drought associated with the current El Niño made for a poor harvest last year. The value of crops grown in Cameroon, Ghana and Zambia has risen by at least 50% in the past decade; Kenya has done almost as well.

Millions of African farmers like Mr Nzabahimana have become more secure and better-fed as a result of better-managed, better-fertilised crops grown from hybrid seeds. They are demonstrating that small farmers can benefit from improved techniques. Despite some big, much-publicised land sales to foreign investors, almost two-thirds of African farms are less than a hectare in their extent, so this is good news. Progress need not mean turfing millions of smallholders off the land, as some had feared—though by making them richer it may yet give them and their children the means to move, should they wish.

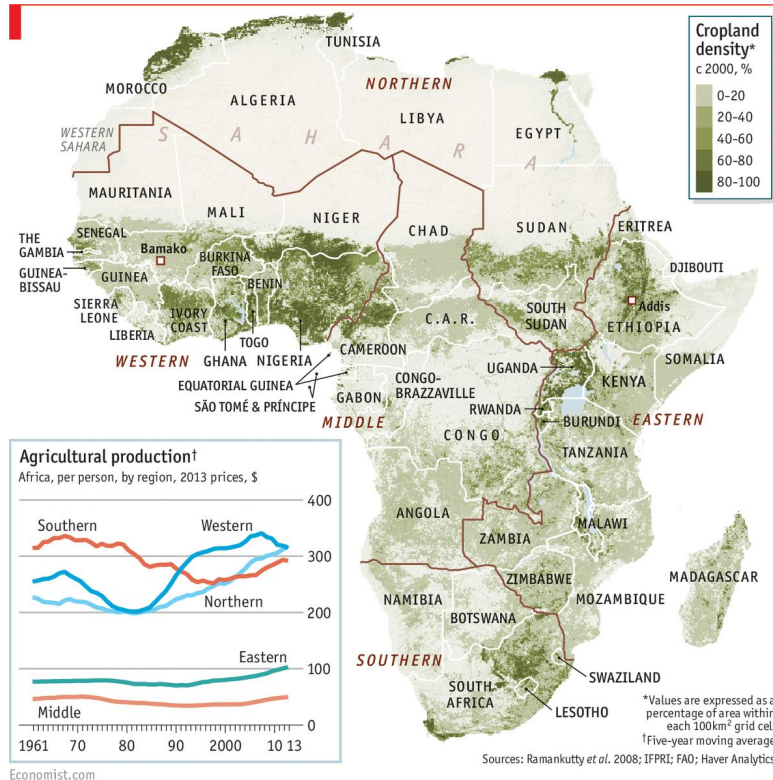
For the time being, though, more than half of the adult workers south of the Sahara are employed in agriculture; in Rwanda, about four-fifths are. With so many farmers and not much heavy industry, boosting agricultural productivity is among the best ways of raising living standards across the continent. And there is a long way to go. Sub-Saharan Africa's farms remain far less productive than Latin American and Asian ones. The continent as a whole exports less farm produce than Thailand.

The revolution will not be broadcast

Since 1961 the total value of all agricultural production in Africa has risen fourfold. This is almost exactly the improvement seen in India, which sounds encouraging; after all, India had a “green revolution” during that time. But whereas Indian farmers got far higher grain yields per hectare, in Africa much of the new production just came from new land. In the early 1960s sub-Saharan Africa had 1.5m square kilometres given over to arable farming; now it uses 800,000 square kilometres more.

Another thing African farming had more of was people. Even today, when population growth has slowed in rural Asia and Latin America, in rural Africa it is still 2%. More people meant more workers, which can mean more yield from a farm in absolute terms. But it also meant more mouths to feed. Africa's population grew more steeply than India's, and as a result production per person fell in much of the continent during the late 20th century.

The explanations for Africa's difficulties begin with geology. Much African bedrock is ancient, dating back to before the continent's time at the heart of a huge land mass known as Gondwanaland. For hundreds of millions of years Africa has seen little of the tectonic activity that provides fresh rock for the wind and rain to grind into fertile soils. There is some naturally fertile land in the south and around the East African Rift, which runs through Rwanda. But much of the interior is barely worth farming (see map).



Only about 4% of arable land south of the Sahara is irrigated, so local weather patterns determine what can be grown. Those patterns vary a lot from time to time and place to place. Variations in time make farmers more inclined to stick with hardy but low-yielding varieties of crop. Variations in space mean that crops and diets differ a lot across the continent. In Rwanda, white maize and beans are the staple foods. In other places millet, teff, sorghum, cassava or sweet potatoes are more important. Asia's green revolution was a comparatively simple matter, says Donald Larson of the World Bank, because Asia has only two

crucial crops: rice and wheat. Provide high-yield varieties of both and much of the technical work is done. African agriculture is so heterogeneous that no leap forward in the farming of a single crop could transform it. The continent needs a dozen green revolutions.

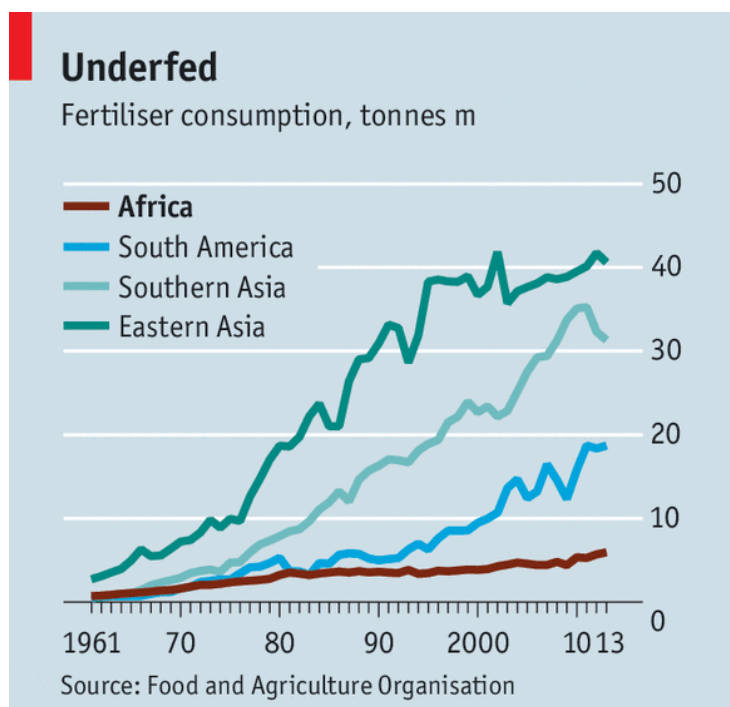
Humans have added to these handicaps in all sorts of ways. Beginning in the 1960s, Africa's newly independent nations—often, thanks to colonial borders, small and landlocked—taxed farm produce heavily to finance industrial ventures which often failed. They did little to improve the colonial era's scant and inappropriate infrastructure, which tended to concentrate on railways from mines to ports. Africa still has a thin road network; in rural areas the roads are often primitive and impassable after a heavy shower.

Governments frequently imposed price controls, reducing what farmers could earn. And in some places, such as Ethiopia, farmers were subjected to oppressive command-and-control regimes that sapped their will to work. "We lost two and a half to three decades," says Ousmane Badiane of the International Food Policy Research Institute (IFPRI).

The sorry history of fertiliser subsidies shows the cost of official ineptitude. Worldwide, about 124kg of artificial fertiliser is used per hectare of farmland per year. Many would argue that this is too high. But the 15kg per hectare in sub-Saharan Africa is definitely too low (see chart). Some countries, like Ghana and Malawi, have thrown money at fertiliser subsidies in flush years only to cut back when budgets tighten.

Subsidised fertiliser intended for smallholders has often been resold at market rates with middlemen pocketing the profit. Nigeria's system became so corrupt that in 2012 the agriculture minister, Akinwumi Adesina, estimated that as little as 11% of subsidised fertiliser was actually getting to small farmers at the subsidised price.

Like the clumps of earth that African farmers whack with their hand hoes, these natural and human



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obstacles are stubborn and hard to break down.

But bit by bit they can be worn away. African agriculture is improving not because of any single scientific or political breakthrough, but because the things that have retarded productivity for decades, both on the farm and off, are being assailed from many sides.

For farmers, perhaps the most potent symbol of change is hybrid seed, often dyed a bright colour and usually burdened with an unlovely name, such as SC719. Joe DeVries of the Alliance for a Green Revolution in Africa, based in Kenya, says that by raising the prospect of higher yields, these seeds persuade farmers to spend money and time on fertiliser, weeding and pesticides. Today AGRA collaborates with more

than 100 seed companies, representing about a third of the market. They produced about 125,000 tonnes of improved seed last year—up from 26,000 tonnes in 2010.

Many of these seeds are being developed in Africa for Africans. N'Tji Coulibaly of the Institut d'Economie Rurale in Mali has developed six hybrid maize varieties. Because these tolerate drought well, they can be planted north and east of the capital, Bamako, in fields where sorghum is now the dominant crop. As though in retaliation, another nearby team has created a variety of sorghum that yields about 40% more than the indigenous kind even without additional fertiliser.

Governments and charities are rushing to teach farmers how to plant the new seeds. In Rwanda, One Acre Fund, a charity, provides its clients seeds, fertiliser, know-how and, crucially, credit. To upgrade to hybrids

means changing to a system where new seed has to be bought every year, because the plants that grow from hybrid seed do not produce seed of the same sort. And small farmers are usually starved of credit—one large survey for the World Bank found that only 1% of Nigerian farmers borrowed to buy fertiliser.

Last year One Acre Fund's large network of instructors, farmers themselves, taught some 305,000 more east African smallholders skills such as carefully spacing seeds so as to maximise productivity and measuring fertiliser using bottle caps. Mr Nzabahimana is a client, as are about a third of the farmers thereabouts. In parts of Kenya where One Acre Fund has been operating for at least four years, even the farmers who are not clients get about 10% more maize per hectare than similar farmers in areas where the charity recently arrived. Know-how spreads.

Too few trucks, too many tariffs

Untouched, if marginal, land used to be plentiful in Africa. Today it is rare, so farmers must work out how to grow more on each plot. And even countries with plenty of land have little to spare near their growing cities; given the difficulties of moving fresh produce over long distances that makes intensification near the big markets particularly attractive. These urban markets can also change what farmers grow. Farmers close to Addis Ababa, Ethiopia's capital, are switching from red teff to fancier white teff because that is what city folk increasingly want. White teff is harder to grow, so the farmers are using more fertiliser and improved seed. Elsewhere, urban hunger for meat and eggs is persuading more farmers to keep cows and chickens.

Poor roads are not the only reason it is hard to move farm produce long distances. In 2013 the UN estimated that African businesses that exported goods to other African countries faced average tariffs of 8.7%, compared with 2.5% for those that exported goods beyond Africa. But the tariffs and barriers are gradually coming down. Maximo Torero, an analyst at IFPRI, points out that 31% of the food calories exported from African countries went to other African countries in the mid-2000s—a low proportion, but an improvement on the 14% rate ten years earlier. The El Niño droughts of the last few months in Ethiopia and southern Africa have not yet led to widespread bans on food exports.

Reform has been slower in another area. African farmers often have few or no rights over the land they work. Insecure farmers tend not to invest much, either because they do not see the point or because they cannot get credit. These problems can be particularly bad for women. One study in Ghana found that women farmers were less likely to let their land lie fallow (a simple way of increasing its fertility). They seem to have feared losing it if they did not plant it continuously.

Well-intentioned attempts to entitle farmers have sometimes made things worse for women: as customary rights are replaced with legal ones, men tend to assert control. Still, things are improving in a few countries.

In Ethiopia, where land is formally owned by the state, farmers' rights to cultivate it and rent it out have been clarified. That reform, combined with a change to family law, seems to have increased women's control. The Rwandan government has changed inheritance law to give women more rights.

Few of these benign changes would have taken place without a rash of superior government. Sub-Saharan Africa still has some awful regimes in Equatorial Guinea and Zimbabwe (where agricultural productivity is dropping). It has some failed states such as the Central African Republic, South Sudan and Somalia. Yet some terrible rulers have gone and border wars are rare.



In part as a result, the region is more placid than it was. The Centre for Systemic Peace, an American think-tank, tallies civil and ethnic conflicts, assigning them a seriousness score of one to ten. Between 1998 and 2014 the total conflict score in sub-Saharan Africa fell from 55 to 30. More peaceful land is more productive. So is land where the people are healthier. The World Health Organisation estimates that 395,000 Africans died from malaria in 2015, compared with 764,000 in 2000. New HIV infections are down by about two-fifths in the same period.

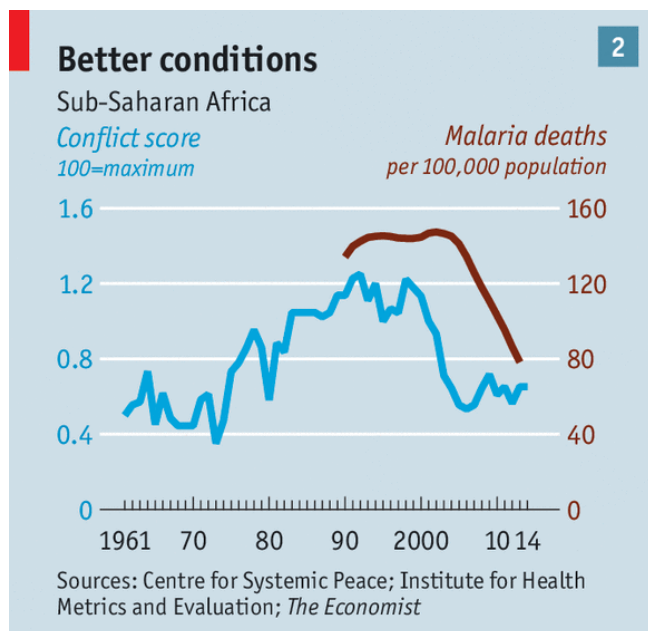
There is still much to do. When Mr Nzabahimana wants to sell food, he simply hawks it around the village or hires a woman to carry it on her head to Rubengera, a tiny market town a few miles away. He does not know in advance what price his crops will fetch. As Africa's fields grow more productive, such thin, fragmented markets are becoming a bigger problem. Too few agricultural buyers reach villages, and the ones that make it can often dictate prices. "The traders have all the information—they pay the farmers what they want," says Mr Adesina, who is now head of the African Development Bank.

Technology can help, to an extent: in Kenya, where mobile phones are ubiquitous, farmers can subscribe to services that give them price data. But rural roads will have to improve, as well as rural phones, if smallholders are to obtain better prices. So will the ability to store crops somewhere other than in their houses, where the weevils get them. Processing foods near farms, something Mr Adesina is keen on, would help reduce such waste and provide decent paying jobs.

A lack of clouds on the horizon

Another boost would come from better livestock. Far more of Africa is grazed than is planted, and demand for animal products is rising. Yet there are few meaty analogues to hybrid seeds. African cows are increasingly crossbred with European breeds to create tough animals that produce lots of milk; fodder yields

are improving, just like yields of other crops. But animal vaccines remain expensive and are often unavailable, since they need to be kept cold. A pastoral revolution remains in the future.



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which will do some of its damage just by making peak temperatures even hotter, remains to be seen. Some crops may become impossible to grow in the places where they are grown today.

As with hoes and hard soils, there are no easy breakthroughs to be had. But for a long time Mr Adesina's idea of African agriculture as a business to build up would have seemed alien inside the continent and fantastical beyond it. That it no longer does is as strong a basis for hope as any.

From the print edition: Briefing

Mr Adesina likes to say that African agriculture is not a way of life or a development activity; it is a business, and it is as a business that it will grow, through investment and access to markets. That said, it will remain a risky business, one in which a vital input, rain, cannot be controlled—as millions of farmers are regretting at the moment.

One way to face that risk is to encourage irrigation, especially water-hoarding drip-irrigation. Another is to offer some sort of crop insurance that pays out in particularly bad seasons, as Ethiopia is trying to do. Both are good options. How much they can do in the face of increasing climate change, which is likely to render the dry parts of the continent drier still, and