

Innovative use of fertilisers revives hope for Africa's Green Revolution

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Phillip Tshuma is a happy farmer. Despite one of the worst droughts ever to hit his country, Zimbabwe, Tshuma's maize and small grains harvests this year are 50% more than they were in 2015, thanks to micro-dosing, the targeted application of small quantities of fertiliser in a field. Using the micro-dosing method, farmers apply about 8 kg to 10 kg of nitrogen fertiliser per hectare, approximately a fifth of the recommended application rates.



[Image Source: AfricaRenewal](#) - Simmai and Phillip Tshuma, smallholder farmers from Hwange, Zimbabwe, show off their sorghum crop planted using fertilizers. Photo: Busani Bafana

Last season Tshuma made about \$350 in profits from his harvests, a decent amount in a country where most survive on less than \$1.25 per day. He plans to spend a third of that on nitrogen fertiliser for use in the next season. If things go as anticipated, he will make more profit each season from his farm in the Hwange District in Southern Zimbabwe.

It was only a decade ago that African leaders adopted, at a special summit in Abuja, Nigeria, a 12-point resolution on the use of fertiliser as part of efforts to achieve an African "Green Revolution." They acknowledged that inorganic fertiliser alone could not lift agricultural output, and requested countries to commit to increasing fertiliser use from an average of 8 kg of fertilizer per hectare in 2005 to 50 kg per hectare by 2015.

Both organic and inorganic fertilisers provide plants with the nutrients they need to grow healthy and strong. Organic fertilisers contain only plant- or animal-based materials, such as manures, leaves, and compost that are either by-products or end products of naturally occurring processes. Inorganic fertiliser, also referred to as synthetic fertiliser, is manufactured artificially and contains synthetic chemicals.

Organic fertiliser releases nutrients only when the soil is warm and moist, while inorganic fertiliser provides this nutrition in a plant-ready form immediately.

With a Green Revolution, Africa would be following in the footsteps of Asia and Latin America, where effective policies, new farming methods, improved inputs and high-yield seed varieties have improved harvests and reduced poverty. Although no country has met the target for 2015, Rhoda Peace Tumusiime, the African Union commissioner for rural economy and agriculture, says there is no need to despair and that countries should instead continue to invest in improving access to fertiliser for smallholder farmers.

Increasing demand

Richard Mkandawire, the vice president of the African Fertilizer and Agribusiness Partnership (AFAP) — an organisation that promotes investment in commercial fertiliser in Africa — says that despite failing to meet the target, some countries made significant progress in increasing their use of fertiliser.

A World Bank report notes that between 2005 and 2015, Ethiopia recorded the highest proportional increase of fertiliser use per hectare, from 11 kg to 24 kg. Within the same period, Ghana's fertiliser use increased from 20 kg to 35 kg per hectare and Kenya's from 33 kg to 44 kg. As a result of the increase in fertiliser usage over the 10-year period, the countries recorded growth in farm yields and in the agriculture sector generally, with Ghana notching a 4.6% growth in 2014, according to the Ghana Statistical Service. In Kenya, there was a 56% increase in smallholder fertiliser use, and maize yields increased by 18% between 1997 and 2007, according to data from a nationwide household survey.

A bit of fertiliser goes a long way

In March 2016, Amit Roy, a former president of the International Fertilizer Development Center, told the Food and Agriculture Organization (FAO) regional conference for Africa in Côte d'Ivoire that while Africa had not achieved the fertiliser use targets set under the Abuja Declaration, it was on course to reach at an average of at least 17 kg per hectare by 2018. Although this will still represent a modest improvement, it will be double what it used to be when the declaration was made.

According to the International Fertilizer Industry Association, a global trading body representing over 500 fertiliser producers and distributors, the average fertiliser use in many countries in Africa today is still as low as 12 kg per hectare, compared to Asian countries like Malaysia, where usage averages 1,570 kg per hectare, Hong Kong (1,297 kg per hectare) and Bangladesh (278 kg per hectare).

Nevertheless, fertiliser demand in Africa has been rising since 2008, particularly in Sub-Saharan Africa, where usage has increased by 130%, says the International Fertilizer Development Center, a group that seeks to increase agricultural productivity by promoting crop nutrition and agribusiness skills. Roy reckons fertiliser demand will reach seven million metric tons by 2018, although this figure will represent a mere 2% of global consumption. Brazil, China, India, and the US drive global fertiliser consumption collectively, accounting for 55% of global demand.

The evidence that micro-dosing could be a breakthrough method in increasing fertiliser use in Africa is demonstrated by Tshuma, who is one of the 170,000 households in Zimbabwe giving it a try. His cereal production, which has since doubled, has significantly improved his family's food security. By promoting micro-dosing, Zimbabwe is already saving \$7 million in food imports annually, according to the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).

The cost of micro-dosing

Micro-dosing is affordable and, when adopted by smallholder farmers, enhances fertiliser use, says ICRISAT, adding that the returns on investment are still higher than before.

Tshuma maintains that the small amounts of fertiliser he uses in micro-dosing yield bigger returns without much money. He would need to spend over \$300 per season on fertiliser alone if he applied the 50 kg per hectare that African leaders set as a threshold.

In Zimbabwe, ICRISAT used crop models to study the cost of micro-dosing and how the practice works. The study found that, contrary to conventional wisdom, even small amounts of fertiliser can increase yields significantly. Using micro-dosing, farmers apply about 8 kg to 10 kg of nitrogen per hectare, approximately a fifth of the recommended application rates.

Martin Moyo, a scientist at ICRISAT, says that despite obvious benefits, not many Zimbabwean smallholder farmers practice micro-dosing due to lack of knowledge, as well as difficulties with availability and affordability. There are also cultural and traditional beliefs that discourage farmers from the practice, such as the belief that fertilisers “burn” crops.

Dealing with soil infertility

A decline in soil fertility resulting from mono-cropping, degraded soils, and other factors, often blamed for the drop in crop yields across Africa, ought to encourage African smallholder farmers to use fertilisers.

Fertiliser use supports soil quality and also helps mitigate the effects of soil erosion and nutrient depletion. A 2015 FAO report titled [The Status of the World's Soil Resources](#) urges countries to encourage farmers to return crop residues and other organic material to the soil, employ crop rotation with nitrogen-fixing crops and carefully use organic and mineral fertilisers.

“Fertiliser is key to Africa’s food security and we need to keep pushing private-sector involvement in its development,” said Tumusiime.

To boost agricultural productivity, African countries must embark on mechanised agriculture and increase fertiliser use, says Grace Akello, Uganda’s ambassador to Italy and also representative to the FAO and the UN World Food Programme, adding, “We have to raise productivity of our agriculture by improving the health of our soils and increase fertiliser use because we are aware of the poor conditions of soils in many parts of Africa.”

Financing fertiliser

There is a need for Africa to accelerate sustainable soil management practices and capitalise on the Africa Fertilizer Financial Mechanism set up by the AU at its Africa Fertilizer Summit in 2006 to promote fertiliser use, advises Roy. Last July, a meeting organised by AFAP and the International Food Policy Research Institute (IFPRI), a global agricultural research centre, to review progress on fertiliser use in the region concluded that while several regional economic communities have established successful regional fertiliser markets, they still face poor infrastructure and distribution networks, as well as problems with storage and local blending facilities.

Smallholder farmers will increase their fertiliser use if they can get affordable access, said Mkandawire. “Limited fertiliser access leads to prohibitively high costs, resulting in smallholder farmers using less or not at all. This ultimately leads to the low-level productivity trap. In such a trap, constraints such as lack of fertiliser investment incentives and a stagnant rural economy reinforce each other,” Mkandawire said. Most smallholder farmers are already stuck in a low soil fertility - poverty trap, making it impossible for them to afford inputs needed to increase productivity and end hunger, Mkandawire explains.

Experts agree that micro-dosing, increased fertiliser use, private-sector investment, improved access to credit, reduction in import costs, smart subsidy programmes and accelerated sustainable soil practices will help Africa realise its Green Revolution dream. The challenge is for countries to work with the experts and follow through.

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