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"Unsustainable extensification": donors deepen hunger with the Green Revolution in Africa

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Green Revolution initiatives in Africa promise "sustainable intensification", productivity improvements to grow more food on the same land. In fact, according to Timothy A. Wise, donors to such initiatives need to reconsider such investments and instead promote agroecology and other low-input forms of diverse crop production.

Private philanthropies and bilateral donors have claimed for nearly two decades that the solutions to Africa's persistent food insecurity lie in agricultural development schemes that promote "sustainable intensification", raising productivity on existing croplands. Their promotion of commercial seeds, synthetic fertilisers and other chemical inputs through donor initiatives such as the Alliance for a Green Revolution in Africa (AGRA) have been underwritten by the Bill and Melinda Gates Foundation, the Rockefeller Foundation and bilateral donors from the United States (US), the United Kingdom and Germany among others.

That strategy has failed to produce results, as both independent[1] and donor-sponsored evaluations[2] have shown. As I will document, not only has productivity lagged in supported crops such as maize and rice, it has declined for other key staples such as millet and sorghum. Food insecurity has increased by 50%. Evidence shows that the incentives for supported crops have significantly increased land devoted to those crops rather than increasing productivity on existing lands, causing unsustainable extensification rather than the promised sustainable intensification.

A significant share of global agriculture's contribution to climate change comes from "land-use change", a neutral expression for the often-destructive expansion of agriculture onto new land. That sort of "extensification" of agriculture can have serious environmental consequences – deforestation, soil erosion, unsustainable water use, etc. Those in turn have important implications for climate change, as a recent United Nations (UN) report highlighted. Land-use changes due to agricultural expansion increase carbon emissions from land clearing, eliminate carbon-dioxide-absorbing plants

[1] Timothy A. Wise, *Failing Africa's Farmers: An Impact Assessment of the Alliance for a Green Revolution in Africa*, Global Development and Environment Institute, Tufts University, Working Paper, no. 20-01, July 2020, https://sites.tufts.edu/gdae/files/2020/07/20-01_Wise_FailureToYield.pdf

[2] AGRA, *PIATA Final Evaluation Report, Volume 1*, 28 February 2022, https://agra.org/archive/piata-final-evaluation-volume-i

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such as rainforests and prairies and generate greenhouse gases with modern farming methods. According to the UN, they account for about 30% of agriculture-related emissions.[3]

A simplistic neo-Malthusian perspective attributes extensification to growing populations exerting pressure on scarce natural resources. An equally simplistic response is the Green Revolution for Africa.

The failing Green Revolution model

In 2006, AGRA offered a coherent strategy and admirably ambitious goals. Its aggressive promotion of commercial seeds and synthetic fertilisers would catalyse a virtuous cycle of agricultural development. AGRA's self-proclaimed "theory of change" held that rising yields would feed the hungry and stimulate further investments in productivity-enhancing farm technologies.

In 2020 I carried out a comprehensive assessment of the impacts of Green Revolution programmes in AGRA's thirteen focus countries.[4] The evidence shows that AGRA's theory of change was flawed at every turn. Those seeds and fertilisers did not produce a productivity revolution. Maize yields grew only 29% despite billions of dollars in government subsidies to allow farmers to buy – and corporations to sell – the inputs. Meanwhile, more nutritious and climate-resilient traditional crops such as millet and sorghum saw yields stagnate or decline as farmers planted more subsidised maize. According to my more comprehensive Staple Yield Index for a basket of food crops, yields rose only 18% over fourteen years, barely faster than before the new Green Revolution push.[5]

With limited yield improvements, farmers didn't see more food or higher incomes from sales of their promised new surplus production. They saw a losing proposition, with the costs of seeds and fertilisers outpacing the expected returns from crop sales. When subsidies are cut as government budgets are eventually squeezed, farmers stop buying the seeds and fertilisers and go back to their old seeds, if they managed to save any. Many find themselves in debt after input purchases fail to pay off after one bad harvest.

Many now farm land that is less fertile than before, the nutrients drained by monocultures of maize. The fertilisers fed the maize, not the soil, which continued to lose fertility, starved for the organic matter provided by more ecological methods such as intercropping – planting leguminous crops alongside maize – and expanded applications of animal manure for fertilisation.[6]

So no one should be surprised to find hunger on the rise. Farmers were not growing much more food. What food they were growing – mostly starchy staples like maize and rice – was less nutritious than the mix of crops they used to grow. And they had little new cash income to purchase more food, never mind a diverse and nutritious diet. Many had less cash as they tried to pay off debts from their failed investments in commercial seeds and fertilisers. Those who became reliant on

[3] Intergovernmental Panel On Climate Change, *Climate Change and Land: An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems*, 2019, https://www.ipcc.ch/srccl Also published by Cambridge University Press, November 2022.
[4] Timothy A. Wise, *Failing Africa's Farmers…, op. cit.*
[5] Author's calculations from data from FAO, as presented in Timothy A. Wise, *Failing Africa's Farmers…, op. cit.*
[6] Stephen Greenberg, Gareth Jones and Blessings Chinsinga, *Running to Stand Still: Small-scale farmers and the Green Revolution in Malawi*, African Centre for Biosafety, October 2014, https://acbio.org.za/wp-content/uploads/2022/04/Malawi-report.pdf

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synthetic fertilizers often found that they needed to purchase increasing quantities just to maintain the same yield.

The UN has recorded a 50% increase in the number of severely undernourished people in Sub-Saharan Africa since 2006.[7] The number of chronically "undernourished" people in AGRA's thirteen focus countries has increased nearly 50%, not decreased, according to recent hunger data from the UN.[8] Underlying that deprivation is a model of agricultural development that is encouraging unsustainable land use and undermining crop and diet diversity.

Extensification, not intensification

The data also revealed that Green Revolution initiatives were not only failing to achieve sustainable intensification, they were promoting the opposite. Between 2006 and 2018 maize productivity rose only 29% while the area planted to maize increased 45% in AGRA's thirteen focus countries. Overall, production increased 87%, but mainly because of extensification rather than intensification. Meanwhile, land planted to other staples such as millet and sorghum declined or stagnated, as did yields.[9]

This outcome will come as no surprise to those living in AGRA countries where incentives are heavily concentrated on maize. In most AGRA countries, governments provide large subsidies to farmers to buy and use commercial maize seeds and fertilisers. AGRA itself spent one billion dollars in its first fourteen years of work, but African governments have been spending up to one billion dollars *per year* on such Farm Input Subsidy Programmes (FISPs).[10] Some governments also pay above-market prices to farmers for their maize to maintain public grain reserves.

As any agricultural economist can attest, land and investments flow to crops that are subsidised or otherwise supported. That has been true in the US for decades. In Africa, maize has received the lion's share of the support in most AGRA countries, so land and investment have moved more heavily into maize production. Farmers are incentivised to switch out of existing crops like millet, which has seen an alarming 24% decline in production and a 21% drop in yields, and into maize. Hence the decline in crop diversity under Green Revolution programmes.

Farmers with access to land are also incentivised to bring new land into production, which allows them to reap the benefits of government support programmes. Hence the extensification of production. Across AGRA countries, there was a 13% increase in land under cultivation from 2006 to 2018, the majority of it in AGRA's two principal supported crops: maize and rice. More than 7.4 million more hectares of land were planted in maize in 2018 than in 2006. Another 3.5 million more hectares were

[7] FAO, IFAD, UNICEF, WFP and WHO, *The State of Food Security and Nutrition in the World 2023. Urbanization, agrifood systems transformation and healthy diets across the rural–urban continuum*, FAO, 2023, https://www.fao.org/3/cc3017en/cc3017en.pdf

[8] Data presented in Timothy A. Wise, "Digging Africa Deeper into Hunger: Annual Green Revolution forum ignores widespread failure of its push for industrialized agriculture", *Inter Press Service*, 2023, https://www.ipsnews.net/2023/08/digging-africa-deeper-hungerannual-green-revolution-forum-ignores-widespread-failure-push-industrialized-agriculture

[9] All data cited here, unless otherwise indicated, is from the UN, cited in my Working Paper: Timothy A. Wise, *Failing Africa's Farmers…*, *op. cit.*

[10] Thomas S. Jayne and Shahidur Rashid, "Input subsidy programs in sub-Saharan Africa: a synthesis of recent evidence", *Agricultural Economics*, vol. 44, no. 6, September 2013, pp. 547–562.

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planted in rice. Those 10.9 million hectares accounted for nearly all of the expansion in land planted to cereal crops in that time period. In Nigeria, land planted to maize and rice jumped 64% and 83% respectively, while millet and sorghum land declined 52% and 14%. In Ghana, another supposed AGRA success story, maize and rice land increased 35% and 113% at the expense of millet and sorghum, which lost 10% and 21% of planted area.[11]

It is hard to argue that Green Revolution programmes did not contribute significantly to this problem of agricultural extensification. That is especially problematic when such input-intensive agriculture is failing to generate the promised productivity gains or reductions in hunger.

Zambia illustrates the ways in which Green Revolution incentives have led to undesirable outcomes. Zambia was one of AGRA's focus countries until a few years ago. It left the alliance but has rejoined recently. Zambia provides extensive subsidies for maize production and also buys maize at supported prices for its food reserve programme. As a result, it has the highest levels of fertiliser use among AGRA countries. Between 2006 and 2018, Zambia increased maize production by 150%, making it an apparent Green Revolution success story.

But only a small share of the added maize came from productivity growth. Yields grew just 27% while the area planted to maize doubled. Millet and sorghum production and yields declined and farmers moved land out of those traditional staples into maize in response to Green Revolution incentives. Two-thirds of Zambia's 32% increase in land planted to crops was attributable to new land planted to maize. Staple yields overall increased just 20% in that twelve-year period. And all that maize failed to stem hunger or reduce poverty. The number of undernourished Zambians increased 29% while extreme rural poverty remained at 78%.

This evidence has yet to convince donors or African governments to change course. As support for AGRA has waned amid a chorus of calls from African civil society groups,[12] the African Development Bank (AfDB) is now doubling down on the failed Green Revolution strategy. Its Feed Africa programme commits 50 billion dollars to promote agribusiness development across forty African countries.[13] At the centre of that strategy are plans for 100,000-hectare "agro-poles" to jumpstart commercial agricultural production both for export and for growing urban markets. According to a forthcoming analysis of the forty country development plans, such efforts will dramatically worsen Africa's land-use problems.[14]

Data on proposed land use from just nineteen of the forty country programmes suggest that much of that new development will be on uncultivated or "underutilised" land.[15] For the nineteen countries with land-use estimates, they total a stunning 22 million hectares, an area nearly the size of Ghana. The AfDB plan for Rwanda somehow envisions one million hectares of the country's estimated 1.4

[11] Author's calculations from data from FAO, as presented in Timothy A. Wise, *Failing Africa's Farmers…, op. cit.*
[12] Recent calls for change are listed at: *Beyond Africa's Green Revolution: Time for donors to shift funding to agroecology*, Institute for Agriculture and Trade Policy, https://www.iatp.org/beyond-africas-green-revolution-time-donors-shift-funding-agroecology
[13] African Development Bank, *Feed Africa. The high 5 for transforming Africa*, 2019, https://www.afdb.org/en/the-high-5/feed-africa
[14] Alliance for Food Sovereignty in Africa, *The Costs To Smallholders Of AfDB's Feed Africa Initiative: A Closer Look At The 40 Country Compacts,* February 2024, https://afsafrica.org/the-costs-to-smallholders-of-afdbs-feed-africa-initiative-a-closer-look-at-the-40-country-compacts
[15] African Development Bank, *Compacts*, 2023, https://www.afdb.org/en/dakar-2-summit-feed-africa-food-sovereignty-and-resilience/compacts

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million hectares of arable land being converted to intensive agro-industrial production.[16] The scheme smacks of "land-grabbing" and clearly threatens the small-scale farmers who are already cultivating that land.

"Time to change course"

The Alliance for Food Sovereignty in Africa, the continent's largest civil society organisation, with millions of members all over Africa, has repeatedly argued that it is "time to change course: the future is in agroecology".[17]

It is a myth that the only way to increase productivity on existing agricultural lands is through Green Revolution seeds and fertilisers. Examples abound across Africa of farming communities that are increasing both the diversity and productivity of their fields using farmer-saved seeds.[18] In Africa and other developing countries, some 15 million small-scale farmers interplant so-called green-manure cover-crops alongside their food crops to fix nitrogen in the soil, reduce weeding, add another food or forage crop to their fields and increase carbon sequestered in the soil. Scientists recommend appropriate cultivars from a range of more than 100 proven cover crops.[19]

Such approaches are documented in a recent UN report from its High Level Panel of Experts on food security and nutrition.[20] Farmers are getting far better results, growing more food on existing land in sustainable ways that increase soil fertility over time. One University of Essex study surveyed nearly 300 large ecological agriculture projects across more than fifty developing countries and documented an average 79% increase in productivity with decreasing costs and rising incomes.[21] This is far higher than AGRA's 18% yield growth in staple crops.

Agroecological farming can also achieve sustainable extensification. With the support of some governments, West African farmers are expanding onto uncultivated lands but in a way that builds rather than compromises the environment. In long-term land rehabilitation projects in the drylands of West Africa, farmers in Burkina Faso, Senegal, Ghana and Niger are leading what they call "another kind of green revolution". They regenerate tree growth on deforested lands then diversify production as part of agro-forestry initiatives increasingly supported by national governments. This restores soil fertility, increases water retention and has been shown to increase yields 40%-100% within five years while increasing farmer incomes and food security.[22]

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[16] African Development Bank, *Rwanda: Country Food and Agriculture Delivery Compact*, 20 February 2023, https://www.afdb.org/en/documents/rwanda-country-food-and-agriculture-delivery-compact
[17] Josephine Atangana and Bridget Mugambe, "Time to change course: The future is in agroecology", *African Arguments*, 19 October 2021, https://africanarguments.org/2021/10/time-to-change-course-the-future-is-in-agroecology
[18] Alliance for Food Sovereignty in Africa, *Case studies of seed*, 2023, https://afsafrica.org/case-studies-seed
[19] Roland Bunch, *Restoring the Soil: How to use green manure/cover crops to fertilize the soil and overcome droughts – Second Edition*, ECHO Incorporated, 2019, https://www.echocommunity.org/resources/aba0ef91-ceea-4f06-8ca7-e9518288345e
[20] HLPE, *Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition*, FAO, July 2019, p. 163, http://www.fao.org/3/ca5602en/ca5602en.pdf
[21] Jules N. Pretty, Andrews D. Noble, Deborah Ann Bossio *et al.*, "Resource-Conserving Agriculture Increases Yields in Developing Countries", *Environmental Science and Technology*, vol. 40, no. 4, 15 February 2006, pp. 1114–1119.
[22] Chris Reu, Gary Tappan and Melinda Smale, *Agroenvironmental transformation in the Sahel: Another kind of "Green Revolution"*, IFPRI Discussion Paper, 2009, https://www.ifpri.org/publication/agroenvironmental-transformation-sahel

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Land reclamation is a desirable form of extensification, avoiding the negative environmental impacts of input-intensive farming of monocultures of Green Revolution crops. Similarly, agroecology programmes intensify the production of diverse food crops on existing lands in ways that rebuild soil fertility and resilience to climate change.

Such strategies stand in stark contrast to Green Revolution programmes that fail to help solve Africa's unsustainable land-use issues. In fact, they make them worse.

Biography

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