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Small-scale agriculture holds big promise for Africa

Supporting smallholder irrigation through finance and technical assistance could significantly improve productivity and incomes

Caspar van Vark

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Farmers tend a field near Yelwa, Nigeria. Photograph: Jacob Silberberg/Getty Images

The recent discovery of a [large aquifer in Kenya](#) is a reminder that far from being dry, [Africa](#) has abundant water resources. The problem for farmers is access: only around 6% of cultivated land is equipped for irrigation, leaving millions dependent on rain-fed [agriculture](#). How might more of them be helped to access water that could raise their productivity?

Large-scale, government-funded irrigation systems have long attempted to address this, with varying degrees of success. Those systems have a place, but research by the [International Water Management Institute](#) (IWMI) has found that many smallholders are themselves taking the lead and investing in their own low-cost, small-scale irrigation systems.

Surveys carried out by IWMI as part of its [AgWater Solutions project](#) revealed a growing trend for individual and community-owned agricultural water management systems. In Ghana, for instance, small private irrigation schemes were found to cover 25 times more land than public irrigation schemes.

"Small-scale agricultural water management dominates the landscape in south Asia but it's really becoming quite a feature also in sub-Saharan Africa now," says Meredith Giordano, principal researcher at IWMI.

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"When we looked and added up the numbers it was much more than was recognised. So this is happening in Africa, and it's important to recognise that, because it hasn't been widely documented."

The findings of the AgWater Solutions project – carried out with partners including [FAO](#) and [Stockholm Environment Institute](#), and funded by the [Bill and Melinda Gates Foundation](#) – suggest that supporting smallholder irrigation could have a significant impact on productivity and incomes.

In Zambia, for example, it found that smallholders who were able to cultivate vegetables in the dry season earned 35% more than those who do not. The systems used for small-scale irrigation, such as pumps and on-farm ponds, are relatively cheap, and being freed from rain dependence can allow farmers to grow crops year-round, and to grow more high-value crops.

Research from the [International Food Policy Research Institute](#) (IFPRI) also backs this up: its [report](#) into the irrigation potential of Africa calculated much greater returns from investing in small-scale agriculture than in large-scale, dam-based systems. The internal rate of return (IRR) for large irrigation projects was found to be 7%, but 28% for small-scale irrigation because there is still so much unirrigated arable land located away from any large irrigation infrastructure.

"With small-scale irrigation the initial cost is lower," explains Liangzhi You, senior scientist at IFPRI and co-author of the report.

"And if you can grow one more crop in the dry season, that can mean you can then make a profit. A lot of government agencies and even donor communities like big projects, but if you look at the returns, small-scale actually gives higher returns, and from my own research I think small scale irrigation is the future in the African context."

The treadle pump is one of the low-cost technologies used by farmers to irrigate land. A human-powered pump, it requires users to step up and down on treadles which drive pistons, drawing groundwater up to the surface.

The spread of the treadle pump, which costs around \$20 to \$100, has been driven by the NGO [iDE](#) which first began to promote the [technology](#) in Bangladesh in the 1980s. The pumps have been introduced into sub-Saharan Africa too in more recent years, with iDE supporting the development of supply chains through its programmes in Burkina Faso, Ethiopia, Ghana, Mozambique, and Zambia.

The challenge in sub-Saharan Africa is that farmer-driven investment in small-scale irrigation is spreading without much governmental support in creating an enabling environment where farmers have information on the various systems, financial services to help them invest, and market access to sell produce.

"It's important that we recognise that this particular kind of private smallholder investment falls through institutional cracks," says Giordano. "A lot of it is happening organically, and we need to identify opportunities to help support that, so that farmers will have better information."

Motorised pumps, for example, are also becoming popular but are usually imported, which can make them expensive and present practical challenges if the instructions come in languages not understood by users, or if spare parts are difficult to find. Simply providing translated instructions is one way of providing support.

Another constraint is the lack of detailed hydro-geological mapping for Africa as a whole. Treadle pumps can only reach a certain depth – around 7 metres, depending on the type of pump – so won't be useful if water resources are deeper. Successful rainwater harvesting in on-farm ponds can depend on soil type and rainfall patterns, and works best on moderately sloping land.

"It's critical to know where the water is, and recharge rates and depths, to plan these kinds of systems," says Jennifer Burney, an assistant professor at the University of California, San Diego and co-author of a [recent study](#) on the benefits of local irrigation systems in developing countries.

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"Finding a way to do mapping with some economies of scale and making the information public or available to smallholders would change the landscape and economics entirely."

Finance is also a key constraint: a motorised pump of \$250 may be relatively 'low cost' but is still unaffordable to many farmers. [Microfinance](#) services are either unavailable in rural areas or have been unwilling to provide agricultural loans, though some are now more supportive.

"There is some change there," says Burney. "For example, the direct lending site [Kiva](#) is starting to look into new loans of this scale for farmer groups. Capital is the number one constraint for adoption, so this is urgent in so much as it will unblock the system."

The need for upfront investment has in fact led to a rental market emerging in sub-Saharan Africa, where entrepreneurs either rent out pumps to farmers by the day or season, or even provide an irrigation service themselves. Monitoring developments such as this provides points of entry for donors and NGOs to help create an enabling environment in ways other than simply providing pumps.

"The important point is that this is something that farmers are already doing themselves," says Giordano. "They're investing their own money in these opportunities, but within that there are still constraints that they face, so it's about how to expand that potential and help them reduce risks."

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