

In a changing climate, erratic rainfall poses growing threat to rural poor, new report says

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Against a backdrop of extreme weather wreaking havoc around the world, a new report warns that increasingly erratic rainfall related to climate change will pose a major threat to food security and economic growth, especially in Africa and Asia, requiring increased investment in diverse forms of water storage as an effective remedy.

"Millions of farmers in communities dependent on rainfed agriculture are at risk from decreasing and erratic availability of water," said Colin Chartres, director general of the Sri Lanka-based International Water Management Institute (IWMI), which released the report to coincide with World Water Week in Stockholm. "Climate change will hit these people hard, so we have to invest heavily and quickly in adaptation."

The report argues against overreliance on single solutions like big dams, proposing instead an integrated approach that combines large- and small-scale storage options, including the use of water from natural wetlands, water stored in the soil, groundwater beneath the earth's surface and water collected in ponds, tanks and reservoirs.

"Just as modern consumers diversify their financial holdings to reduce risk, smallholder farmers need a wide array of 'water accounts' to provide a buffer against climate change impacts," said Matthew McCartney, the report's lead author and a hydrologist at IWMI, which is supported by the Consultative Group on International Agricultural Research (CGIAR). "That way, if one water source goes dry, they'll have others to fall back on."

"For millions of people dependent on rainfed agriculture, reliable access to water can make all the difference between chronic hunger and steady progress toward food security," McCartney added. "Even small amounts of stored water, by enabling crops and livestock to survive dry periods, can produce large gains in agricultural productivity and in the well-being of rural people."

IWMI and its research partners estimate that up to 499 million people in Africa and India can benefit from improved agricultural water management.

In Asia, where irrigation was greatly expanded in recent decades, rainfed agriculture is still extensive, accounting for 66 percent of the total cropped area, the IWMI study notes. In sub-Saharan Africa, the proportion is far greater at 94 percent. Yet, these are precisely the regions where water storage infrastructure is least developed.

"Unless we can reduce crippling uncertainty in rainfed agriculture through better water storage, many farmers in developing countries will face a losing battle with a more hostile and unpredictable climate."

In response to increased demand for food and power supplies, the governments of developing countries with fast-growing economies have invested heavily in large dams during the current decade, ending a 10-year lull in their construction. Many of the 50,000 large dams built worldwide since the 1950s are intended to store water for irrigation.

The positive effects of such infrastructure development, in terms of flood control and improved agricultural productivity, are well documented, the IWMI report explains. But so are the adverse social and environmental impacts, including displacement of up to 80 million people from their homes and disruption of the livelihoods of some 470 million people living downstream from dams as a result of altered river

flows. As acrimonious debate about large dams continues, IWMI's advice for governments is to do a better job of analyzing the potential benefits for economic development and poverty reduction and to pay more serious attention to the social and environmental consequences.

But the IWMI study also advocates giving more weight to a continuum of small-scale storage options, citing strong evidence that when such measures are well planned, they can contribute importantly to local food security and economic growth.

Field studies in various semi-arid environments, for example, have proven the effectiveness of using small planting basins to "harvest" water, together with targeted application of organic or inorganic fertilizer. In Zimbabwe, such basins have been shown to boost maize yields, whether rainfall is abundant or scarce, while in Niger, they have permitted three- or four-fold increases in millet yields.

In the northeast of India's Rajasthan State, the construction of about 10,000 water harvesting structures—intended mainly to recharge groundwater—has made it possible to irrigate about 14,000 hectares, benefiting some 70,000 people. Whereas previously, farmers barely had enough water to produce grains, now they can also grow vegetables and other cash crops. Similarly, the construction of more than 90,000 underground water storage tanks in China is benefiting a million farmers.

Case studies suggest that combinations of different storage options can be particularly effective. In southern Sri Lanka, for example, the construction of a large water storage reservoir, which was then linked to five previously created small reservoirs brought about a 400 percent increase in crop production.

But in some places, the results of major water storage initiatives have

been uneven. In Ethiopia, for example, one study showed that groundwater wells and small dams reduced poverty by 25 to 50 percent. But another analysis in the country's Amhara region found that most of the approximately 4,000 water harvesting ponds constructed from 2003 to 2008 were no longer functioning, mainly because of poor site selection, technical failures and weak community involvement in maintenance.

"None of these options is a panacea," said McCartney. "They all have pros and cons, which depend on their inherent characteristics, on the way they are planned and managed, and on the conditions at specific sites."

A further hazard with any water storage option, the IWMI report notes, is that the practice itself will be subject to climate change impacts. In arid regions, for example, soil moisture may decline so rapidly as to reduce the effectiveness of practices like planting basins. Likewise, decreased rainfall could limit groundwater recharge, while rising sea levels will increase the risk of salt water intruding on coastal aquifers.

Another danger is that badly planned storage will not only waste money but actually worsen the negative affects of climate change, for example, by providing extra breeding habitats for malaria-infected mosquitoes.

To guard against such hazards, the report argues, governments need to assume greater responsibility for more integrated planning of water storage systems. In the past, storage schemes were often conceived in a piecemeal fashion at the local level, based more on political expediency than on evidence. An integrated approach would take into account the wide range of hydrological, economic, social and environmental factors that determine costs and benefits and would consider various storage options in combination. Well-planned water storage can help lift people out of poverty and provide them with an effective way to cope with climate change.

"The more we study climate change, the more we realize that [water](#) is the principal medium by which its impacts will be manifested in agriculture," said Chartres. "We may not know exactly what those impacts will be, but we can be sure they will include greater rainfall variability. [Water storage](#) in all its forms offers a better way to manage risks during these times of increasingly uncertain weather.

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