WAHARA Policy Note 03

Check Dams:
Managing silt to keep groundwater recharge going

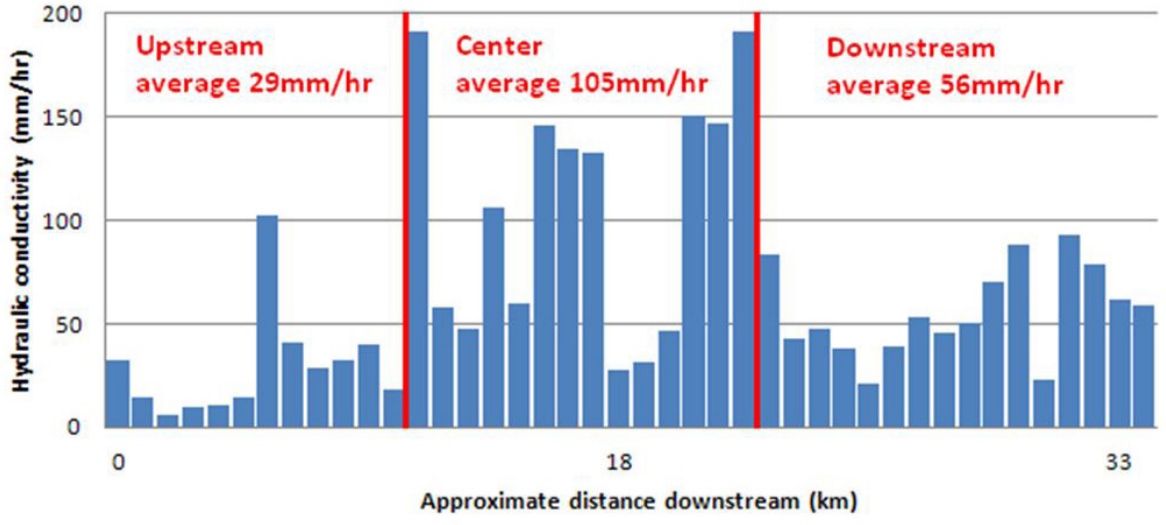
In southeast Tunisia, siltation is driving down the capacity of gabion check dams to harvest floods and recharge groundwater. To keep them efficient, the focus should shift from constructing new structures to maintaining existing ones.

The Zeuss-Koutine region in Tunisia's southeast is a water-stressed part of the country. The annual rainfall is a paltry 170 mm. Groundwater, a key water source, is extracted much faster than it is recharged. This has led to continuous lowering of the water table and salinization of groundwater.

To combat this problem, a national government program has supported the construction of over 300 small gabion check dams in the region, since 1990. The check dams are constructed in wadi beds (riverbeds) perpendicular to flow of ephemeral rivers. They are between 0.6 and 2.6 metres in height depending upon local hydrological conditions. The check dams block riverflow, slowing down its speed and retaining the water in their retention basins/reservoirs. Additionally, about 10 recharge wells have been dug over the years to recharge aquifers directly using floodwater harvested by the check dams.

However, floodwaters are always charged with silt which accumulates in the retention basins/reservoirs (upstream) as well as downstream. This diminishes both the capacity of the check dams to store water, as well as the rate at which the water infiltrates

A gabion check dam with a recharge well, Medenine. *(Image courtesy: Mohammed Ouessar, IRA)*



Differences in hydraulic conductivity between the upstream, middlestream and downstream of the wadi bed in Zeuss-Koutine.

down into the aquifers.

Research and Evidence

Under the EU-funded WAHARA (Water Harvesting in Rainfed Africa) project, 62 check dams in the region were studied for the hydraulic conductivity of the soil in their reservoirs-- or the ease with which water can infiltrate through the soil, down into the aquifer, and recharge groundwater. The evidence collected establishes that siltation has brought down infiltration rates significantly, especially in the upstream part of the 33-kilometre wadi course. This is because of higher levels of siltation upstream. The figure above shows that the rate of infiltration of water in the upstream section can be as low as a fourth of the average rate in the midstream, and half of that in the downstream. Overall, this paints a picture of the checkdams operating sub-optimally, and groundwater sources in the region recharging at much lower rates than they could.

Conclusions and Recommendations

Based on these findings, the next steps should include:

- Maintaining existing check dams rather than building new ones: With many of the check dams operating below their capacity, much impact can be made by simply investing in their maintenance through measures like de-silting of the reservoirs and de-clogging of gravel filters.

- Developing more recharge wells: Recharge wells are used to recharge the aquifers directly. They supplement the recharge that takes place through water infiltrating down to the aquifers through the soil layers. Developing more of them in addition to the current 10 will help achieve higher recharge rates in the short/medium term.

- Encouraging farmers to farm upon the highly silted patches: The silt contains sediments that can be nutritional to plants. This should be taken advantage of. Farmers can be encouraged to grow short-cycle varieties of high value crops, to earn extra income that can serve as a buffer during dry spells.

Desertification is continuing to unfold in the Zeuss-Koutine region. A combination of rapid population growth and urbanization are only increasing the stress on its groundwater resources. Timely action to rejuvenate its depleting aquifers will be critical to helping its communities, and will hold important lessons for some of the other parts of the country grappling with water scarcity.

The WAHARA Project

The WAHARA (Water Harvesting in Rainfed Africa) project aims to contribute to a better understanding of the possibilities presented by Water Harvesting by identifying and field-testing promising technologies; assessing the potential of their biophysical, socio-economic and political uptake; and outlining a strategy to promote their scaling-up. While the research project's activities are located in four countries-- Tunisia, Ethiopia, Zambia and Burkina Faso-- the findings and deliverables are pertinent to the broader context of Africa. This has been ensured through the choice of research questions and design of the research methodology.

WAHARA analysed the options and enabling conditions for the spread of WHTs in Africa by identifying key WHTs in each of the four countries and tracing the pathways of their spread. It identified good ideas and bad ideas, effective interventions and unsuccessful projects, various stakeholders and their roles. The picture that emerges reveals upscaling as a multi-level process that takes place horizontally (geographical spreading among one stakeholder group), as wells as vertically (spreading across various levels of stakeholder groups). WAHARA research also highlights that the process of upscaling of WHTs is often not driven by governments or NGOs who consider it their responsibility to do extension unto farmers, but unfolds organically through the agency of farmers who constantly try to innovate in an effort to increase their productivity. This document is informed heavily by these two key findings.

WAHARA has a pan-Africa focus, in keeping with the pan-Africa relevance of water harvesting. However, key variables such as biophysical conditions, governance structures, extension systems, technical capacity, and socio-economy vary greatly from country to country. WAHARA research was carried out in Tunisia, Ethiopia, Zambia, and Burkina Faso. An overarching objective behind the framing of research questions and design of research methodologies was to identify biophysical and social elements of water harvesting that are also applicable over the broader region (Africa).

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