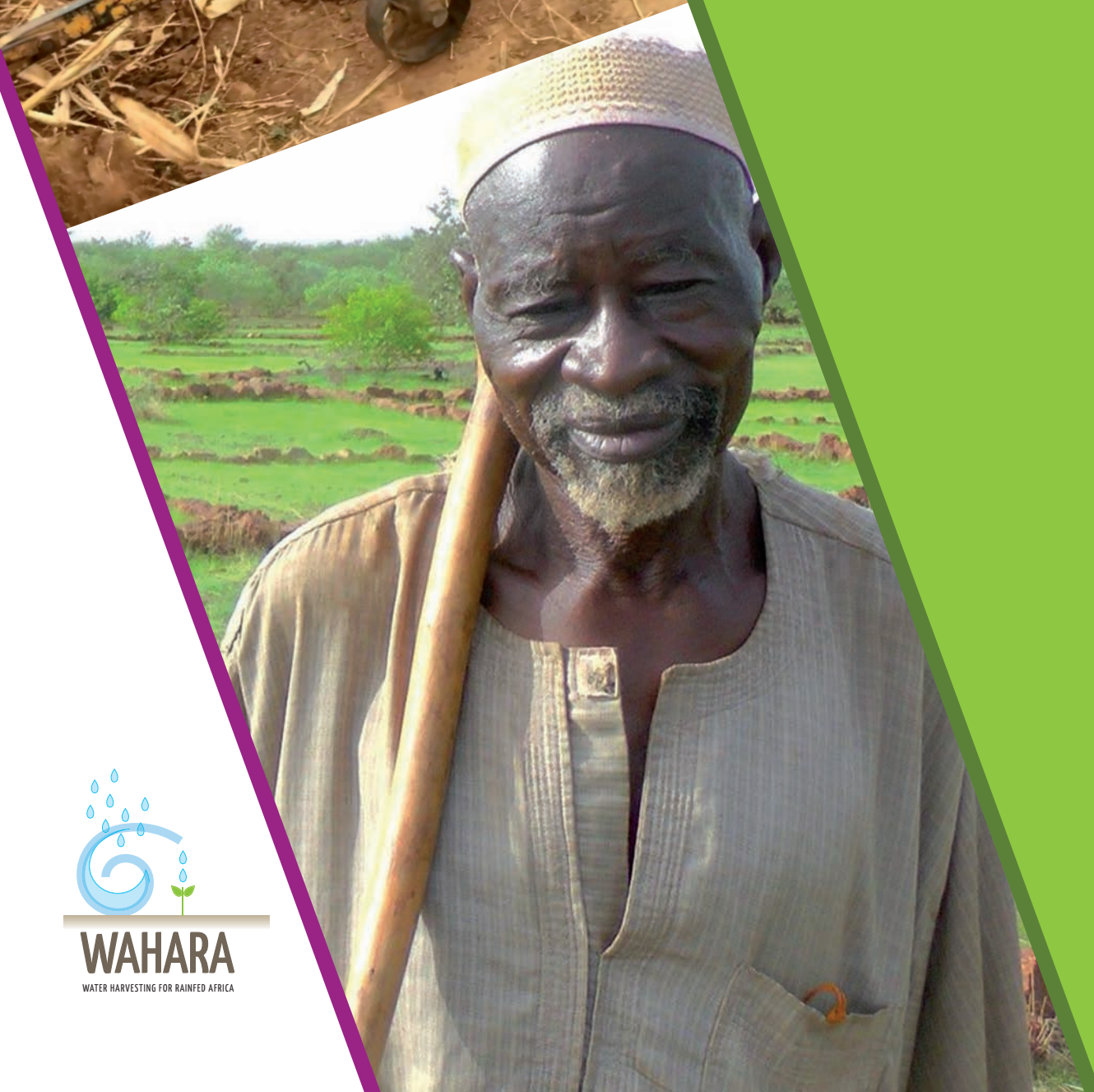

Vision for Water Harvesting in Africa

WAHARA

WATER HARVESTING FOR RAINFED AFRICA

A Vision for Water Harvesting in Africa

Africa has been identified as a global 'hotspot' for water-constrained, rain-fed agriculture. The continent is home to 100 million people living in such environments, with most of them concentrated in a band running through Senegal, Mali, Burkina Faso, Niger, Nigeria, Chad, Sudan, Ethiopia, Somalia, Kenya, Tanzania, Zambia, Malawi, Mozambique, Zimbabwe and South Africa.[1]

This situation lends itself to water harvesting (WH) being a logical coping strategy. Moreover, given that Africa's largely rain-fed agriculture is its single most important economic driver[2], WH provides the opportunity to turn these 'hotspots' into 'hope-spots'[3] that will lead the way to **agriculture-led development**, a key aim that the African Union is trying to realize through its Comprehensive Africa Agriculture Development Programme (CAADP)[4].

In many of the hotspots, WH has been identified as the most appropriate way to replenish and nourish the natural resource base and **reverse desertification**[5]. By supporting sustainable development and poverty reduction, WH will be an important instrument for achieving resilience and, by extension, for achieving **Disaster Risk Reduction**. This has been demonstrated in Burkina Faso's northern Yatenga province, where smallholder farmers revived an ancient field-level WHT called *Zai* pits to plant trees and reclaim land affected by desertification. Their efforts at reforestation have proven to be much more effective than government/NGO-led tree planting campaigns in the past. This shows how WHTs can spread through the agency of rural communities.

Thus, a vision for Water Harvesting in Africa is that of a continent where countries are harnessing the proven potential of WHTs to capitalise on their vast natural resources for sustainable development, peace, and prosperity. This vision guides the recommendations made by this document.

Upscaling of WHTs: The Process

In the context of WHTs, upscaling in general refers to achieving their increased diffusion and implementation. The end objective is on-the-ground implementation over a large area by a large number of land users. There are different routes to take concerning upscaling, as explained in box 1.

Those concerned with upscaling of WHTs would do well to recognize that the process can be driven in several different ways by several different actors. So while the

Transforming landscape at scale in short time span (photo credit: Tigray Bureau of Agriculture and Rural Development)

Box: Different ways of upscaling

To be effective, efforts to upscale need to aim at different routes. Uptake among a large number of land users over a large area (visualized as 'horizontal' upscaling) is also facilitated by a large number of stakeholders operating in the agriculture and water sectors such as NGOs, extension workers, private companies, etc. (visualized as 'vertical' upscaling[6]). (figure A).

This is because of how the two interact. Horizontal upscaling—or geographical spreading of WHT—has limits which vertical upscaling helps it cross over and go beyond. An example is the spread of Zai pits in Burkina Faso through farmer-to-farmer learning. Impressive as it is, it is confined to the northern part of the country. However, over the years there has been a massive uptake of the technology among government agencies and NGOs. They are now trying to adapt it and spread it among farmers in the south as well[7].

Regarding the upscaling of techniques there are 3 routes to consider (figure B). **Replication** of one single technology is beneficial in areas where one particular useful technique is applied in large numbers. **A variety** of WHT is promising in areas with various water uses/users and a variety of physical characteristics or where water resources protection and development is combined. In other cases, managing the entire landscape **at one go** with one or several large interventions could be beneficial.

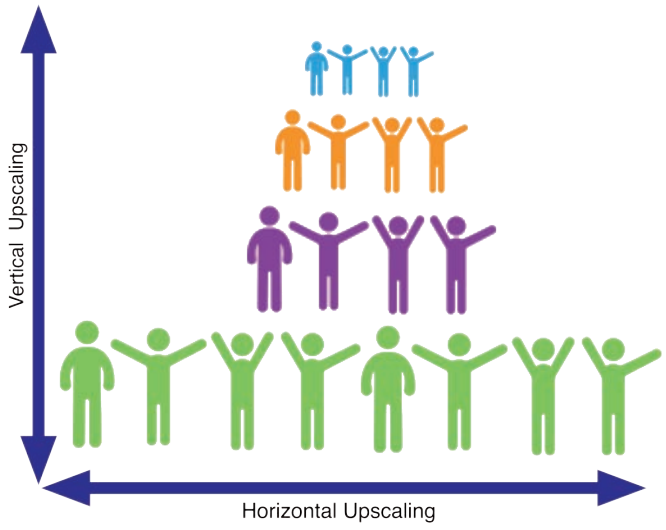

Figure A (left): Horizontal versus vertical upscaling

Figure B (below): Several routes of reaching scale

government played the central role in large-scale Soil and Water Conservation efforts in Ethiopia, the spread of Zai Pits in northern Burkina Faso was down to some motivated farmers taking the initiative to experiment with the ancient technique and teaching their neighbouring farmers. In Zambia, Conservation Farming was introduced by the private sector agro-businesses, who continue to spread it among smallholder farmers who supply them cotton and maize. The Zambian and Burkina examples show how upscaling of WHTs need not always be a planned intervention, but can also be an organic process that unfolds through the agency of farmers. In such cases, upscaling requires recognising these processes and facilitating them.

Options and Enabling Conditions

Based on research of WAHARA (see box 2) carried out in Ethiopia, Zambia, Burkina Faso, and Zambia, the options and enabling conditions for the spread of WHTs in Africa were identified by identifying key WHTs in each country and tracing the pathways of their spread[8]. They can be classified as pertaining to one of six key areas: Governance, Participation of Stakeholders, Attitudes and Behaviour, Technology, Communication, and Education.

Governance

Coordination of Efforts: In all four countries, WH and agriculture fall within the purview of multiple actors. It is important that policies and initiatives of the various actors achieve a certain degree of coordination and harmonization. In Zambia, this has helped the upscaling of Conservation Farming. In northern Ethiopia, this helped scale up a bouquet of Soil and Water Conservation (SWC) techniques to an extent that degraded lands could be restored to their healthiest state in 145 years.

Zambia and Ethiopia present two different approaches to coordinating the various WHT initiatives. In Ethiopia, the government assumed a more central role. It has taken the lead in mobilizing communities to take part in large-scale SWC activities, with national and international NGOs capitalizing on this mobilization. The government also led efforts to develop a set of guidelines on "Community Based Participatory Watershed Development" in partnership with key research institutes and NGOs[9]. It lays down steps to be followed, interventions and technologies to be implemented, and standard impact assessment tools while carrying out watershed development activities of which WHTs are a large part.

On the other hand, in Zambia the key role in coordination of Conservation Farming-related efforts have been played by the Zambia National Farmers Union, an organisation representing 600,000 small farmers, 1500 commercial farmers, 43 agri-businesses; and best described as belonging to the private sector. To its credit, the government did declare Conservation farming as an official national policy in 2000 and did establish a National Conservation Farming Steering Committee in 2001[10]. However, ZNFU led the introduction of Conservation Farming in Zambia in the 1980s and has ever since continued to bring diverse stakeholders (many of which are represented among its members) around the topic. Its emphasis on lobbying and influencing government policy helps further the cause of harmonization.

Multiplicity of actors and the need to coordinate/harmonize their efforts are true for several other countries in Africa and, indeed, worldwide. Ethiopia and Zambia present some options as to how that can be managed to turn into an enabling condition for the spread of WHTs.

Land Rights: Yacouba Sawadogo[11], a farmer from Yatenga province, Burkina Faso, led the farmer-farmer spreading of the Zai pits technology by growing trees on 15 hectares that had been considered lost to desertification. However, he might end up losing a big part of the land he helped regenerate, as the government goes ahead with plans to repossess it for urban development [12,13]. He had acquired the land through a transaction within the traditional land rights system and does not have a title deed. The only way he can get back his land is by buying it back from the government, something he can definitely not afford. What's more, the government plans for his land involve dividing his father's grave into two.

It has been amply demonstrated how land rights and tenure security are key incentives for the farmer to invest in land improvement measures such as WHTs[14]. Yacouba's is an inspiring story, but the threat to his land will do much to discourage other farmers in Burkina Faso from investing in WHTs and trying to reclaim the land from desertification. Ethiopia, too, views land as public property and prohibits sale or transfer[15,16]. Though uncommon, government sponsored periodic redistribution of land is provided for by the constitution[17]. The lack of property rights and lack of transferability of land have restricted access to credit and hampered investment in land improvement[18].

Insecure land rights are an issue across Africa and discourage investments in land improvement just as they do in Burkina Faso and Ethiopia. Addressing it will be key to stimulating upscaling of WHTs. A 1975 position paper from The World Bank proposed three

Yacouba Sawadogo, a farmer from Gourga village (Burkina Faso), rehabilitated his land with modified Zaï pits. He shares his knowledge with other farmers and students very actively. (photo credit: MetaMeta)

basic principles that should inform land policy reform: (a) owner-operated family farms were efficient and thus desirable, (b) there should be freely operating land markets to permit land transfers to more efficient and productive users, and (c) there was a need for a more equitable distribution of assets[19]. To this list, B. Nega et al (2003) add the following conditions: (a) a recognition, under certain circumstances, that communal tenure could be a cost-effective mechanism for land allocation compared with formal titling; and (b) that formal titling, when desirable, should be evaluated in terms of both its potential efficiency benefits and its implications for equity and the significance of expanded land rental markets on productivity and agrarian developments in general.[20]

Participation of Stakeholders

Agency: With enough resources, it is possible to demonstrate WHTs to a large number of farmers. However, beyond that point it is up to the farmer to adopt them. Subsidies and coercion can only go so far, as spread of WHTs requires farmers to innovate and adapt them to their biophysical condition and socio-economic capacity[21]. To do this, it is important to appeal to farmers' sense of 'agency' (defined as the ability of individuals think and act in their own interest, as opposed to relying on intervention by others)[22]; to address them as entrepreneurs rather than beneficiaries of subsidy. In Burkina Faso, Yacouba Sawadogo's efforts to spread Zaï and related WHTs among farmers are based on convincing them about the returns in terms of higher yields and incomes. Several of his students have been innovators in their own rights, developing methods of land restoration through tree plantations using WHTs.[23] The Zambia National Farmers Union counts smallholders as belonging to the private sector, as key parts of the maize and cotton value chains. In Ethiopia, young farmer entrepreneurs are playing a key role in applying and spreading innovative practices in WHTs as well as irrigation.[24]

Harnessing the agency of farmers requires that governments, NGOs, and businesses acquire the right attitude and outlook towards them. Besides, concrete steps that can be taken, such as carrying out WHT experiments on-farm wherever possible and investing in the dissemination of field-level WHTs. This is relevant to countries across Africa, where smallholder farmers have developed many effective innovations over the years.[25]

Farmer-to-farmer learning: Related to the idea of agency are examples of how effective farmer-to-farmer learning can be. In WAHARA this was observed in flagship examples like that of Yacouba Sawadogo in Burkina Faso, as well as near-universal arrangement of rural societies in Zambia, Ethiopia, and Tunisia where the most credible sources of information are fellow farmers and elders. While the idea of farmer-to-farmer learning is widely recognised, there is less of a consensus on what are ideal modalities to support such learning systems. Based on findings from WAHARA in Burkina Faso some

specific suggestions are provided such as financial support, support to exchange visits, improving linkages with research and formal education, and investing in farmer-relevant learning material. Another example is a radio program in Tunisia that enabled farmer-to-farmer learning as well as helped connect formal education and research sectors to farmer learning systems. One or more of these suggestions are applicable in most contexts in Africa and beyond.

Supporting champion farmers: In all the four countries, individual farmers could be identified who were exceptional due to their innovations and/or dedication to sharing their knowledge with other farmers. They were sources of inspiration to other farmers as well as key partners of governmental and non-governmental agencies in their efforts. While these individuals are usually highly motivated, it is worth considering how they can be supported so their efforts continue and help the spread of WHTs. WAHARA studies present some suggestions.

- **Telling their stories**: When a number of Burkinabe farmers were asked why they went that extra mile to experiment with different WHTs and invest in training other farmers, their answers suggested that the key reasons were gaining respectability, responsibility, and popularity in their communities.[26] In Tunisia, under the Indigenous Soil Water Conservation (ISWC) programme, a radio program was set up which broadcast innovative ideas and experiments being carried out by farmers. Apart from helping formal research and education plug into farmer learning systems, the program encouraged farmer innovators by featuring them. This highlights the scope for mass media and local broadcast media to be put to similar use in other countries.
- **Awards and Recognition**: Conferring awards and recognitions upon champion farmers is quite common. It goes a long way towards motivating them for reasons similar to those stated above.
- **Training**: Ali Ouedrogo from Gourcy, Zandoma province in Burkina Faso, was trained by an Oxfam project in the layout and construction of stone bunds in 1986. He soon discovered that trees start growing along the bunds as they trapped the seeds washed up by runoff. Since then he has rehabilitated 12 hectares of land, and trained 12 farmers between 1993 and 2002 who went on to teach many other farmers how to make Zaï pits and construct stone lines.[27] Ali is an example that illustrates how training highly motivated champions can have a ripple effect with respect to spread of knowledge, and therefore investment in training them has high returns.
- **Financial Support**: The ability to innovate can at times come down to availability of financial means. It is for this reason that large, commercial farmers are often looked at as a source of innovation in Zambia. This is also illustrated in how special credit lines are helping young farm entrepreneurs experiment with and adopt modern irrigation practices in Ethiopia.[28]

Joe Aka from Magoye, Zambia is a farmer but also a "fabricator and service provider to my fellow farmers," as he says himself. Together with Piet Stevens from GART he developed the 'Magoye Ripper,' an ox-driven ripping implement. (photo credit: MetaMeta)

Willingness to invest

The WHTs employed across successful initiatives in Ethiopia, Tunisia, Burkina Faso, and Zambia are not hi-tech. In many cases (such as Zaï pits in Burkina Faso and Jessour in Tunisia) they are traditional technology that just needs to be retooled to match current needs. This is true for many of the WHTs that were selected for WAHARA and proved to be effective. Even recently developed technologies such as the Magoye Ripper and Gabion cages are simple in design and relatively easy to fabricate. This is, in fact, an advantage as it makes it cheap and low-risk to experiment with WHTs, fail, learn, and

Jessour: a water harvesting system comprising of small basins, terraces, and dykes - used for collecting runoff from long slopes. In the mountainous areas in Tunisia this technique is used in agriculture. (photo credit: www.douiret.net)

improve. Besides, the simple nature of WHTs makes it possible for farmers to engage in their development and adapt them according to their needs.

All these factors highlight that spread and upscale of WHTs should be intrinsically simple. This also means that the limiting factor is often the willingness to invest in the technology, rather than the size of the investment. What inhibits the willingness to invest? Examples from Burkina Faso show that with all their good intentions, the natural inclination of the government and NGOs was towards technology-intensive, large-scale measures such as catchment-wide earth bunds. Zaï Pits and Stone Lines were only recognised as worthwhile investments when scientists and policymakers took notice of how innovative farmers were using them to reclaim unproductive land. A lesson this holds is that willingness to invest in WHTs can be cultivated, and facilitating regular exchanges between farmers and other stakeholders is one of the ways. This is also an argument in favour of Participatory Technology Development for agriculture to ensure that research is sufficiently informed by farmers' needs as well as contributions.

Technology: Level of Application

WHTs include solutions for treating landscapes, such as check dams, bunds, storage structures; as well as field-level measures to retain and improve soil moisture in-situ-- such as Zaï pits, half-moons, stone lines, ripping, etc. In Ethiopia, landscape-level application of WHTs has been carried out with much success.[29] On the contrary, there is greater emphasis on field-level technologies in Zambia and Burkina Faso. This reflects different biophysical conditions, different needs, and different priorities across different countries.

The general point to be made here is that both sets of technologies and approaches perform complementary functions and there is usually a simultaneous need for both. As mentioned under the previous point ('Willingness to Invest') for a long time governments, NGOs, and researchers have shown a preference for landscape-level WH. However, as the Burkina and Zambia cases show, promoting field-level WHTs can go a long way towards reclaiming land and increasing farm productivity.

Communication

Radio programs in Tunisia and *La Voix du Paysan* in Burkina Faso[30] represent attempts to creatively use radio to facilitate transfer of agricultural knowledge. At the core of the utility offered by the audiovisual medium is their accessibility to those with low literacy levels (as a large number of farmers across Africa have).

Another way of managing the literacy barrier is a less-discussed area of intervention with great potential of impact - developing learning material tailored to farmers' needs. Using language-neutral graphics, video and audio mediums, it is possible to generate instructional manuals and learning material that are useful to farmers. A global review of extension methods and aids highlight the large potential of innovative media tools such as participatory video.[31] Digital Green, which is based in Ethiopia, is one example.[32]

At the same time, the traditional rural media such as folk theatre should be harnessed as is being done in Burkina Faso. Outreach efforts of government agencies, research organisations, and NGOs, however so far, seldom utilise them.

Education

A common refrain across the four WAHARA countries was that there is an acute shortage of good quality data and rigorous studies on the impact of WHTs, for example in Burkina Faso.[33] Research institutions stand

Radio station La Voix du Paysan in Burkina Faso uses their channel to facilitate share agricultural knowledge.

to gain much in terms of filling these gaps by collaborating more closely with individual farmers, farmer organisations, and farmer-to-farmer learning systems. Farmers, in return, can also benefit from good quality data informing their decision-making.

In particular, there is a great need to increase linkages between farmers and educational institutions such as universities, colleges and vocational training centres. "Many do their PhD research on Water Harvesting. Many Masters programs discuss WHTs. And this is great," says Douglas Moono, Director, GART. "However, there is a great need to discuss these topics more at the undergraduate level and vocational schools. It is these schools that cater to those engaged in extension work; those who work with farmers at the grassroots level," he says.

Call to Action

It is a cliched expression, but the core ideas extracted from experiences in Tunisia, Ethiopia, Zambia, and Burkina Faso point to one thing: what works is putting the farmer at the centre of it all, respecting his agency, treating him as a client rather than a beneficiary. The spread of WHTs among farmers should essentially be a process of pitching WHTs to them. When farmers are convinced about their benefits to productivity and income, they will take them up, innovate and adapt them to their specific needs. That's when WHTs truly spread. This core process can be supported by securing farmers' land rights, facilitating farmer-to-farmer learning systems and linking them with formal education & research systems.

All this requires investments, and it is essential that there is willingness to make those investments. The evidence base of the impact and potential of WHTs is robust. The need of the hour is to translate it into investments, which requires reaching it out to more and more farmers, governments, NGOs, students, academics and getting their buy-in.

Box2: WAHARA Research

The WAHARA (Water Harvesting in Rainfed Africa) project contributes towards 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 were 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[34]. 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).

The same objective guides the contents of this strategy document as well. Typically, a strategy contains targets, action plans, tasks, and assignment of responsibilities. However, recognising the context-specific nature of WHTs and their applicability, it confines itself to:

1. Outlining a vision for the role of Water Harvesting in Africa's development
2. Presenting a framework illustrating the dynamics of the process of upscaling of WHTs
3. Discussing options and enabling conditions that facilitate the upscaling of WHTs

Combining these elements, this document aims to provide insight that can inform region/country-specific strategies to upscale WHTs in Africa.

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2016, MetaMeta. Main author of this publication is Abraham Abhishek with significant contributions from Simon Chevalking and Luwieke Bosma. Visualization and Design is carried out by Lenneke Knoop.

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