PROJECT FINAL REPORT

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4.1 WHaTeR Final Publishable Summary Report

Executive summary

One of the major challenges for Africa is to address the vicious cycle of poverty and food insecurity by promoting agricultural growth in general and increasing productivity per unit area in particular. Recent water management assessments reveal that farmed areas solely dependent on rainfall offer a significant potential for improving agricultural productivity. This is especially the case in rural arid and semi-arid areas of Sub-Saharan Africa. At present, productivity is however constrained by a highly variable rainfall and frequent dry spells, making rainfed farming a risky undertaking. An estimated 70-85% of the rainfall on Sub-Saharan dryland farms is lost through non-productive evaporation, surface runoff and deep percolation. Water harvesting technologies (WHTs) represent a key intervention to strengthen productivity of rainfed agriculture. Traditionally, rainwater harvesting technologies have been used throughout Sub-Saharan Africa. Yet these need to evolve with the times, taking into account environmental, economic and demographic change.

WHaTeR, an EU-funded project (2011- 2015), was set up to contribute to the development of water harvesting technologies that are sustainable and strengthen rainfed agriculture, rural livelihoods, food production, food and water security in Sub-Saharan Africa. Using environmental sustainability, technology and livelihood improvements, and uptake and upscaling as common themes for cross-countries research, the project resulted in: 1) a better understanding of the potential and sustainability of rainfed agriculture using the traditional and adapted water harvesting technologies investigated in the four case study countries (Burkina Faso, Ethiopia, South Africa and Tanzania); 2) upscaling of water harvesting technologies with good potential, namely those addressing people's needs and acceptable to them, through capacity building and knowledge sharing; and 3) a better assessment of the resilience and sustainability of rural livelihoods, also from a gender perspective, under dynamic local to regional pressure.

This final report synthesises the project objectives, the research results and the lessons learned from the four case study countries (Burkina Faso, Ethiopia, South Africa and Tanzania) as well as the main dissemination activities and their impacts.

Regarding ***water harvesting technologies, productivity and livelihood improvement at household and community levels***, the project concluded that uptake of WHTs cannot be looked at as an all or nothing situation. There are examples of modified, partial use, and improvement of existing techniques as well as the introduction of new technologies. This makes it difficult to attribute costs or benefits to comparative situations. This does however open opportunities for exploring how technologies may be better modified or 'translated to fit with specific local needs. In Burkina Faso, Ethiopia, South Africa and Tanzania water harvesting technologies have the potential to improve food security. In Burkina Faso and Ethiopia this is mainly through the quantity of food available rather than the quality. Water harvesting technologies in Tanzania support the growth of cash crops which provide income to improve quality of diet and livelihood security as well as food security. In South Africa, water harvesting and storage tanks provide a supplementary water-supply solution for watering nearby vegetable farms or gardens and for livestock, contributing to increased food quality security as well. In better off household water harvesting technologies can contribute to improved livelihood security but there is no evidence that they do in the majority of households.

In relation to ***sustainability and uptake and upscaling at catchment leve***l, water harvesting technologies generally have a minor impact on downstream water availability and a positive local effect. A downstream impact is however possible at the onset of the wet season and in drier than normal periods, when contributions to catchment runoff from soil water and groundwater are diminished. All country case studies further showed that the use of a more holistic, or systems, approach to water harvesting systems will improve the implementation of water harvesting technologies. A systems approach will increase understanding of why and how farmers upstream and downstream integrate the technologies (or not) into their farming and livelihood systems. The sustainability of water-harvesting technology interventions are further assured if a participatory approach is used in designing and implementing these interventions. Farmers in both upstream and downstream areas need to be engaged in the process and give their contribution to feel ownership and avoid conflicts.

Project context and objectives

One of the European Commission's major strategies for Africa is to address poverty and hunger by promoting agricultural growth and increasing productivity. Recent water management assessments reveal that farmed areas in Sub-Saharan Africa that solely depend on rainfall offer great potential for improving agricultural productivity. At present, agricultural productivity is however constrained by highly variable rainfall, frequent dry spells and detrimental water loss, making rainfed farming a risky undertaking. An estimated 70-85% of the rainfall on Sub-Saharan dryland farms is lost through non-productive evaporation, surface runoff and drainage. Innovative Water Harvesting Technologies (WHTs) represent a key intervention to strengthen productivity of rainfed agriculture. They can help the rural poor develop their subsistence farming as well as grow higher value market crops such as vegetables and fruits, ultimately assisting in moving the rural poor out of poverty and hunger. Traditionally, water harvesting technologies have been used throughout Sub-Saharan Africa. Yet these need to evolve with the times, taking into account environmental, economic and demographic change.

To address the productivity challenge in rainfed agriculture, WHaTeR, an EU-funded project (2011- 2015), was set up with the ***overall aim to contribute to the development of appropriate and innovative water harvesting techniques that are sustainable under dynamic global and regional pressures so as to strengthen rainfed agriculture, improve rural livelihood and increase food production and security in Sub-Saharan Africa***. In order to address this complex and multi-facet goal, the WHaTeR consortium developed an iterative learning cycle for partners and stakeholders involving a set of inter-linked action research and dissemination activities. The learning cycle was organised in three Phases as presented in the figure below.

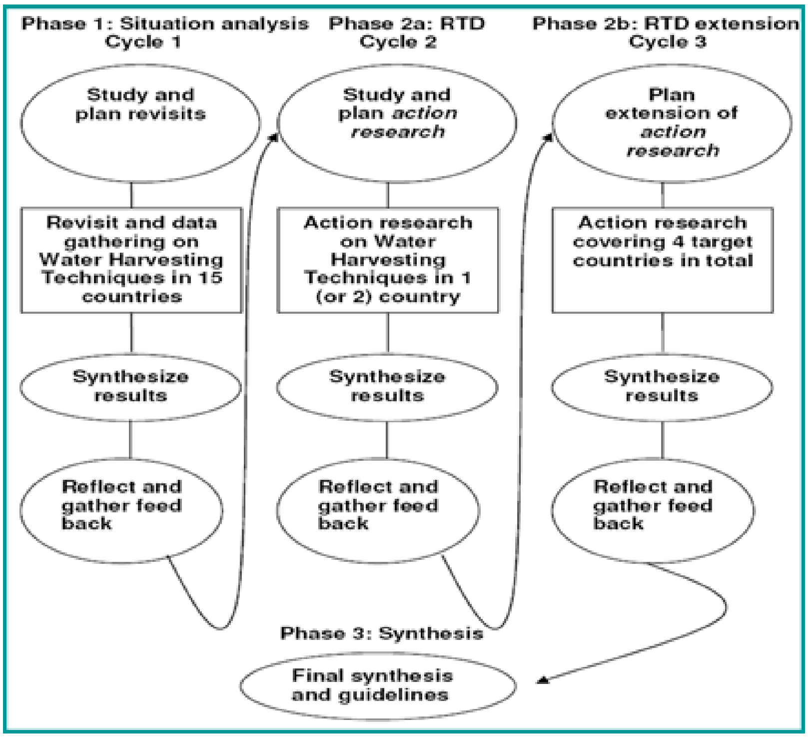

Figure 1. WHaTeR project learning cycle

- **Phase 1** (month 1-16): Revisits and situation analysis of WHTs in Sub-Saharan Africa;
- **Phase 2** (month 14-48):Thematic and country-based RTD activities for in-depth assessment, testing and refining of WHT-aspects in the four target countries: Burkina Faso, Ethiopia, South Africa and Tanzania. In this phase, the project studied upstream-downstream relationships with a focus on optimising interactions between water supply and harvesting areas; defined criteria for designing WHTs

that are adoptable and lead to improved livelihoods; and helped remove barriers to uptake in different climatic, environmental and economic situations. The project further examined communication channels to improve the interaction between WH stakeholders;

- **Phase 3** (month 48-54): Synthesis of project results including policy recommendations to facilitate uptake of WHTs and guidelines for sharing knowledge on WHT (improvements) leading to upscaling.

Throughout the three project phases, the implementation was steered towards the realisation of the following six specific objectives:

1. To identify and analyse changes in WHT implementation, benefits and constraints by rapid comparative assessment of WHT sites in 15 countries investigated by consortium partners in the past;

2. To conduct farm-level assessments of appropriate WHTs for selected hydrological, biological and socio-economic settings in four selected case study countries by testing technological improvements and assessing WHT impacts on environmental sustainability, livelihood improvement and food security, and enabling conditions for uptake and upscaling;

3. To conduct a catchment-level assessment of the potential synergies and/or trade-offs of WHTs and their impact on the quality and quantity of water and water-dependent ecosystem services through upstream-downstream interactions in the four selected case study countries;

4. To assess the potential impact of prominent global and regional drivers of change on WHTs and WHTs' ability to absorb change, or need for adaptation, using methods of modelling and scenario analysis at a continental scale;

5. To develop criteria and guidelines for appropriate WHTs based on the in-depth assessment and multiple-scale analysis referred to in 2, 3 and 4 and generate a general strategic framework for stakeholder interaction and communication to facilitate WHT uptake and upscaling;

6. To disseminate and communicate project results effectively to relevant stakeholders through multi-stakeholder workshops, an interactive project website, project publications and policy briefs outlining strategies for sustainable integration of WHTs into existing regional policies and development plans and more generic EU strategies for (support to) WHT upscaling in Sub-Saharan Africa.

The first sub-objective was addressed by Work Package 2 during Phase 1 (see 1st periodic report: 1-1-2011 to 30-6-2012). This objective was achieved through a systematic programme of revisits to water harvesting sites previously studied (10 – 20 years ago) in 10 Sub-Saharan Africa countries. These revisits entailed a situation analysis and comparison of the "before and after" conditions at the selected sites. The results of the revisit study, published in the book "Water Harvesting in Sub-Saharan Africa (edited by Critchley and Gowing, 2012), contributed towards a more comprehensive and up to date assessment of the state-of -the –art in the field of water harvesting. The results were also used to identify knowledge gaps and needs for in-depth research in the four case study countries (Burkina Faso, Ethiopia, South Africa and Tanzania).

Sub-objectives two to four and six (concerning WHT assessments at farm-level and catchment-levels, assessments of potential impact of prominent global and regional drivers of change, and means of stakeholder communication and dissemination) were addressed by Work Packages 4 to 12. They were achieved during Phase 2 and results documented in the synthesis reports produced by all Work Packages involved in RTD activities (see 2nd periodic report; 1-7-2012 to 31-12-2013; and 3rd periodic report: 1-1-2014 to 30-06-2015).

Sub-objective five concerning the development of criteria and guidelines for appropriate WHTs was addressed by Work Packages 9 up to 12 in the four case study countries. Work Packages 3 and 14 (in collaboration with WP1) worked, respectively, on the general strategic framework for stakeholder interaction to facilitate WHT uptake and upscaling (sub-objective 5) and the dissemination and communication of project results and outputs, including the policy briefs (sub-objective 6).

Main S&T results and foregrounds

A summary of the main results achieved through WHaTeR RTD activities is presented below. However, this selection does not encompass the full breath of results documented in the WPs deliverables and synthesis reports.

Water harvesting technologies, productivity and livelihood improvement at household and community levels

Uptake of WHTs cannot be looked at as an all or nothing situation. There are examples of modified, partial use, and improvement of existing techniques as well as the introduction of new technologies. This makes it difficult to attribute costs or benefits to comparative situations. This does however open opportunities for exploring how technologies may be better modified or 'translated to fit with specific local needs.

In Burkina Faso, Ethiopia, South Africa and Tanzania water harvesting technologies have the potential to improve food security. In Burkina Faso and Ethiopia this is mainly through the quantity of food available rather than the quality. Water harvesting technologies in Tanzania support the growth of cash crops which provide income to improve quality of diet and livelihood security as well as food security. In South Africa, water harvesting and storage tanks provide a supplementary water-supply solution for watering nearby vegetable farms or gardens and for livestock, contributing to increased food quality security as well. In better off household water harvesting technologies can contribute to improved livelihood security but there is no evidence that they do in the majority of households.

The gender studies in Burkina Faso, Ethiopia and Tanzania showed clear differences between men and women in terms of the opportunities to use water harvesting technologies and the size and distribution of benefits that they could achieve from them.

Ethiopia

Household ponds can provide a means to enhance food security and improve livelihood for communities living in areas with recurrent dry spells like the Ethiopian case study of Alaba. At this study site, households with a concrete household pond proved to be able to produce for the market whereas those without household pond could only produce for household consumption. However, not all ponds were constructed with concrete lining material: the majority of the respondents (61 percent) had an earthen pond, while the rest had concrete ponds (37 percent) or geo-membrane ponds (2 percent). An additional advantage for households using and managing household ponds proved to be the saving of noticeable labour costs due to easy access to water (no need to fetch water from distant sources).

Nevertheless, the Ethiopian case study revealed that many ponds were not in service, or functioning far below full capacity. Almost all of the earthen ponds were not functioning at the time of study, with many earthen ponds being transformed into cultivated land or household garbage pit. In addition, the seepage and evaporation losses of functioning ponds, all constructed with a storage capacity of $60m^3$, were high. The concrete and the geo-membrane lined ponds performed best and had higher storage efficiency (84-10 percent) compared to ponds lined with termite mound soil or cow dung (storage efficiency: 19-28 percent). The latter showed cumulative seepage and evaporation losses that were respectively up to 16 times and 4 times higher than the respective losses measured for ponds with concrete or geo-membrane linings. The main reasons why many ponds were not in service, or functioning far below full capacity, proved to be related to a number of factors, including poor pond construction and location, inadequate water abstraction devices, lack of coverage and maintenance, and no or limited community involvement in pond construction programs. There is a high need to enhance the water harvesting and storage capacities of these ponds. However, the costs for reconstructing storage-efficient ponds using the commercial lining materials (of up to €350 and €550 per m^3 for concrete or geo-membrane ponds respectively) form a major constraint for poor households, explaining why the majority turned to constructing earthen ponds using locally available lining materials (costing up to €20 - €25 per m^3). Yet, most farmers (89 percent of 150 respondents) were willing to enter into a contract agreement, preferably provided by the regional government rather than a NGO, to invest in improved household ponds and proved to be willing to pay € 41 for an increase in pond size from 8

m^3 to 27 m^3 and € 10 for a private pond with cover compared to that without cover. Besides the factors related to costs and pond quality (in terms of lining material and maintenance), other inter-related factors that are significant in explaining the uptake of household ponds include farmer's perception of technology (a pond reduces crop loss), location near road (affecting maintenance level and use of lining material) and perceived access to market.

Tanzania

The majaruba water harvesting system studied in Tanzania had the great advantage of enabling farmers to obtain acceptable yields, even in times of poor local rainfall, by providing for the exploitation of water for irrigation from areas outside the immediate locality. It further allowed for the cultivation of previously unproductive land, maximizing the productivity of household assets and the improvement of rural livelihoods. The majaruba system has steadily expanded over vast areas by spontaneous adoption. Important criteria for the system's spontaneous uptake and expansion proved to be an enabling environment, comprising profitable markets and the availability of unproductive land for cultivation.

Microdams (ndivas) and associated conveyance canals can help in providing water for supplemental irrigation in areas with frequent dry spells, resulting in yields that are higher than those depending on direct rainfall only. However, the case study of ndivas in the Makanya catchment in Tanzania showed that the microdams and associated canals suffered from capacity constraints, being unable to serve all population in need. The main constraining factors relate to methods of dam and canal construction and materials; water losses from the reservoirs and the unlined conveyance canals; lack of financial recourses to support microdam rehabilitation and improvement; and poor management of catchment areas resulting in reservoir siltation.

Some of these constraints were addressed by the study of canal innovation, i.e., the lining of conveyance canals by constructing a stone pavement around an unlined earthen canal. The study revealed that that as much as 70 percent of the water released from a microdam reached the end of a 400 m innovated canal, while this was only 22 percent for a 400 m canal that had not been innovated. Furthermore where canals had been innovated, water running from the micro-dam to the fields reached its destination six times faster than before. While a farmer with a field along the lined canal had to wait for less than one second for the water front to reach his/her field (with a flow velocity of 1.459m/s), counting from the time it was only one meter away, a farmer with a field along the unlined canal had to wait for more than 4 seconds (flow velocity in unlined canal: 0.238 m/s). In other words, compared to the unlined canals, the lined canals allowed farmers to irrigate larger field areas for a given time allocation and also more distant fields located further away from the microdam, while using the same amount of water stored in the microdam.

The canal innovation will help farmers to increase their harvests, with benefits being relatively larger for those with distant fields where water failed to reach when canals were still unlined. The livelihood study confirmed that ndiva water harvesting contributed indeed to improved food security and well-being from year to year, among farmers with fields that were reached by the water from the ndiva systems. However, contributions to sustainable livelihoods on a more long-term basis appeared limited, as the unreliability of the rain and associated variation in annual crop yields, despite the use of the ndiva water harvesting systems, made it difficult for households to plan ahead and properly budget the use of their harvest.

Women, as a member of the household, did benefit from any increased food security resulting from good yields in family fields with water harvesting systems. Yet, they generally received a lower proportion of the benefits from water harvesting techniques than men because their husbands generally controlled their access to the harvest. Most women benefits were primarily by deception, i.e., by theft of small harvest portions to be given to a friend to store for later consumption, or for sale to acquire cash to meet household or personal needs. In view of non-food needs, women benefit was in general lower due to the lack of ability to sell agricultural produce when in need. Hence, casual labour (e.g., on sisal plantations) and savings groups often contributed more significantly towards livelihood outcomes than agriculture.

Criteria for designing innovations and promoting ndiva uptake include an enabling environment, high level of organisation of water allocation favouring equity and technology uptake, use of canal irrigation systems giving farmers much larger yields compared to rainfed cultivation. Institutions did not appear to influence the adoption of water harvesting techniques, but had a marked influence on the benefits obtained. Canal and Ndiva Management Committees in Makanya and Bangalala respectively proved to be responsible for managing the system infrastructure and supervising irrigation in farmers' fields ensuring equitable water allocation and therefore benefits.

South Africa

Water harvesting technologies related to roof and small-catchment collection and storage in water tanks can play a valuable role in extending water supply for various uses in South Africa, under both present and projected climate conditions. However, the below-standard quality of harvested water proved to be a major constraint. The study on water storage tanks in South Africa revealed that the samples of harvested water often exceeded the guidelines values recommended by the WHO and DWAF, for both drinking water and irrigation of food crops. This was true for the total levels of coliforms and *Eschericia coli* in the ground harvested water samples collected from catchments where livestock or household animals roamed around. Likewise, levels of iron (Fe) in ground harvested water from catchments suffering from soil erosion exceeded the recommended guideline values of the WHO and DWAF throughout the year. The trace metal concentrations (iron and zinc) in roof harvested water also exceeded WHO and DWAF guidelines, for drinking water. Factors controlling the quality of the harvested water as well as its suitability for certain purposes include wet-season collection of water, roof material and condition, catchment activity and soil type, maintenance of catchment area.

The greatest benefit of these water harvesting systems with storage in tanks may be in the collection of water for *non- potable use* such as mining and irrigation (even for small urban gardens). Instead of using potable water, which has been purified at a high cost, investment in domestic water harvesting technologies to supply water at the local scale for non-potable use may be more economic and relieve the pressure of conventional water supply systems. In a seasonal climate, however, water harvesting and storage in household tanks solely provide a supplementary water-supply solution in wet seasons but, given the limitations of available storage within the tanks, *other water sources are needed for dry seasons as the tanks will be empty up to half the year* even in the most suitable areas in the east of South Africa.

Burkina Faso

For both the center and western regions of Burkina Faso, the use of adapted water harvesting technologies, including mixed micro-reservoir and in-soil storage of rain and runoff water in combination with soil fertility management, improved soil chemical properties, crop yields and farmers' incomes. The Burkinabe study showed a positive impact on soil quality. This resulted in increased yields: mechanized zaï in combination with stone bunds and fertilization gave a 250 percent increase in sorghum yield at the *Boukou site*, whereas mechanized zaï in combination with grass strips gave a 83 percent increase in maize yield at the *Péni site*, as compared to the control in both cases. Moreover at Boukou, all tested combinations of water harvesting technologies and fertilization proved to be profitable for the plot size used in the study (0.25 ha = 2,500 m^2). The combination of stone row + mechanized zaï + compost + NPK + urea was the most profitable in sorghum cropping, starting for an area of only 832 m^2. At Péni, all farm plots resulted positive financial margin with the exception of the control field which recorded a loss of 265 F CFA (0.40 €). Zaï pits in combination with grass strip and the use of compost was profitable on a minimum area of 1,613 m^2 (0.161 ha). Each 100 F CFA invested in this field gained a production value of 120 F CFA with a profit margin of 20 F CFA.

However, the probability of achieving 83 to 250 percent increases in yield is rather limited, when accounting for rainfall-related crop risk based on long-term rainfall records. The results of a quantitative risk analysis, extended with those of the crop simulation model, suggest that *only a 22 percent probability of achieving a sorghum yield increment of at least 50 percent* in the drier zone of Boukou and Malgretenga where risks of 5-day and 10-day dry spells are very high (up to 100 percent) and substantial (77-94 percent).

Factors other than intra-seasonal dry spells, that pose a great risk to crop production and household food security across all types of household include soil fertility, labour and land tenure. Reduction in rainfall-related crop risk provided by water harvesting technologies was not considered sufficient to warrant the technologies' adoption by farmers without first having secured access to a range of other agricultural assets. Crop gains related to water harvesting technologies helped to reduce the length of the lean season each year, contributing primarily towards increased food security – in terms of increased quantities of food or calorific value- rather than increased income, improvements in wealth or any other livelihood. Most households using water harvesting technologies were unable to meet their food needs every year through crop production alone.

Gender relations formed an important factor in the adoption and use of water harvesting technologies, as men and women had not the same opportunities to adopt and benefit from them.
Women were disadvantaged due to male control over outputs from family fields and household assets including their own labour. The latter is even true in some female-headed households. Women's lack of access to assets, needed for the implementation of water harvesting and soil fertilization technologies, reduced in this way their ability and incentive to adopt these technologies. Women in male-headed households began using water harvesting technologies in their fields only as a result of their husband's decision to adopt and use them in family fields. The extent of water-harvesting-technology adoption in female-headed households was significantly lower than in male-headed households. There is evidence of high labour demand associated with the adoption of water harvesting technologies overburdening women with work even more, reducing their level of well-being. For male-headed households, in which women are disadvantaged, there is evidence that livelihood improvements due to use of water harvesting technologies beyond any aggregate increase in household food security, are limited. For female-headed households, generally the poorest in a community, the potential for such technologies to improve livelihoods is even more limited.

In conclusion, the Burkinabe study shows that water harvesting technologies do not provide an 'entry point' for livelihood and food security risk reduction. A supporting package of inputs and a supportive institutional structure is required before farmers commit to these technologies. Food security and poverty are both multi-dimensional concepts and hence increased crop production does not necessarily equate directly to increased food security or reductions in poverty. The way in which farmers made choices over the use of their crops clearly depended on a range of factors such as nature of asset endowment, activities engaged in and market access. These findings not only place doubt over claims of the potential for water harvesting technologies to increase food, income and improve the livelihoods in the poorest households, but also provided further evidence that the use of these technologies increases social inequality in communities. The over-arching influence of institutions, organisations and social norms on farming and livelihood systems implied that water harvesting technologies may have limited capacity to bring about meaningful improvements to crop production and livelihoods on their own. Returns from water harvesting technologies for most households proved to be too small for crop production alone to lift the poorest households out of poverty.

Water harvesting technologies, sustainability and uptake and upscaling at catchment level

Water harvesting technologies generally have a minor impact on downstream water availability and a positive local effect. A downstream impact is however possible at the onset of the wet season and in drier than normal periods, when contributions to catchment runoff from soil water and groundwater are diminished. All country case studies further showed that the use of a more holistic, or systems, approach to water harvesting systems will improve the implementation of water harvesting technologies. A systems approach will increase understanding of why and how farmers upstream and downstream integrate the technologies (or not) into their farming and livelihood systems. The sustainability of water-harvesting technology interventions are further assured if a participatory approach is used in designing and implementing these interventions. Farmers in both upstream and downstream areas need to be engaged in the process and give their contribution to feel ownership and avoid conflicts.

Spate irrigation in Ethiopia and Tanzania

In Ethiopia, where water has to be managed as a resource in common, the institutional structure has to be in place before technical improvements will be taken up. Population growth, land segmentation, and increasing occupational class differences affect the institutional environment in a way that they inhibit uptake of water harvesting technologies. Disagreements about management and water use in command areas of spate irrigation systems can lead to conflicts among villages, and with local government, hampering further uptake. Yet farmers proved to be creative in reducing risk associated with increasing land pressure and variations in seasonal climate and land quality. They spread their farm plots, and divide labour accordingly, across both the highlands and the lowlands and establish fields along different unimproved and improved intakes along nearby rivers. In better off household spate irrigation can contribute to improved livelihood security but there is no evidence that they do in the majority of households.

In Tanzania, there were no disagreements anymore about water use between households in upstream and downstream areas: farmers had found a solution in a time-based approach of water sharing leading to an equitable distribution of water between upstream and downstream users. Yet, a main challenge here is the unreliability of runoff from the uplands, in terms of both the timing and the (too large or too small) volumes of water reaching the lowland fields or not reaching some fields at all. Crop damage due to periodic flooding alternated with periodic water shortage seriously affects households. Project interventions have been aimed at the improvement of water diversion structures and unlined canals in order to facilitate equal distribution of water among beneficiaries and prevent the breaching of canals and diversion structures during flash floods, avoiding crop and soil losses and allowing more runoff water reaching, even the furthest, fields. This has resulted in enhanced overall crop growth in the catchment.

In both Tanzania and Ethiopia there further was strong evidence of market pull on the growth and variety of commercial crops grown.

Land use change and water harvesting uptake in Tanzania and Burkina Faso

The results of water harvesting studies and their implications on both hydrology and ecosystem services are not easily transferrable between scales and sites, and are seriously hampered by lack of landscape level empirical evidence. The two land-use change studies of the meso-scale catchments in Burkina Faso and Tanzania do suggest that water harvesting (both in-situ and ex-situ) appears to have regenerated degraded land and correlated with ‘re-greening’ at landscape or meso-scale level, despite constant rainfall over 20 years (Tanzania) and a general decrease of rainfall (Burkina Faso). Hence, water-harvesting technology implementation does not reduce biomass production at landscape scale, but appears to correlate with an increase in both random and systematic biomass production on and off –farm. The increase in biomass and vegetation recovery may be related to the trapping of sediments and improvement of soil water holding capacities by the water harvesting technologies, as evidenced by many studies.

The Tanzania study shows a systematic conversion of dense bushland to forest in the highland, i.e., indicating that ecosystem services are improving in terms of tree and animal diversity, timber and non-timber forest products and soil recovery. The systematic conversion from dense bushland to cropland is a positive contribution to food security, poverty reduction and to the livelihood in the region. In lowland, the systematic conversion from degraded land to sparse bushland and from sparse bushland to dense bushland is also an indication of ecosystem services improvement as these land cover classes provide grazing land, wood and grass for energy and housing. Although remaining in a low yielding agro-ecological state, the catchment shows a systematic constant vegetation increase. However, the study also reveals that incomes for livelihoods more and more depend on non-agricultural incomes (from small commerce, mining and casual labour in plantations).

The Burkinabe study not necessarily proves that *in-situ* water harvesting has a ‘transformative capacity’ as the bridging of dry spells longer than 10 days severely affects final yield. Correlation of yield with uptake of water harvesting structures at landscape scale does not show clear increase in yield that can be attributed to water harvesting technology uptake. It is further suggested that water harvesting in the Burkinabe study is actually implemented in order to enhance existing agricultural land production capacity (sustainable intensification) rather than (attempting) to re-generate degraded (barren) land, as appears to be the case in the case study of Makanya, Tanzania. However more research is needed to further explain the outputs of the image analysis and clarify the causalities.

Upstream water harvesting and downstream water availability in South Africa

The study comparing recommended identifier values used in current guidelines, to determine potential landscape locations for water harvesting systems, with those of existing and successful water harvesting sites showed that the recommended values are often too restrictive. A new set of guidelines has been designed, separately, for in-situ and ex-situ water harvesting sites, with recommendations for optimal as well as “suboptimal” or “suitable” water harvesting positioning conditions. The use of total evaporation (ET) as an indicator of water harvesting sites was examined based on the premise that a site irrigated with harvested water would evaporate much more than the non-irrigated surroundings. The study showed that ET, calculated from (medium-resolution of 30m) Landsat images, proves to be a reliable identifier for large scale systems such as spate irrigation in Tanzania or where small scale technologies are undertaken over a large area like Zaï micro-reservoirs in Burkina Faso. Ground truthing or expert knowledge is needed for confirming outcomes.

In addition, the potential impacts of upscaling water harvesting technologies on downstream water availability were modelled for the Potshini catchment in South Africa. Results reveal a gradual, if not negligible, decrease in streamflow over a season, with reductions being more noticeable in low-flow months as rainfall is very low. In high-flow months, the model shows that more water is captured and stored, making more available for use in adjoining catchments. A study quantifying the relative streamflow contributions from different water compartments showed that the greatest contributions to stream flow came from subsurface flows, with average contributions of 47 and 57 percent determined for drainage areas of respectively 0.23 km^2 and 1.20 km^2. Contributions from surface water is limited, i.e., maximum 25 percent on average for 0.23 km^2.

Global and regional drivers of change

Literature review provided little evidence of water harvesting as transformational path out of rural poverty in soil degraded areas with high rainfall variability, i.e. the very same areas usually promoted as potential water harvesting uptake areas. A review of drivers of change and their impact on water-harvesting technology adoption (Karpouzoglou and Barron 2014) showed a change in the overall discourse of agricultural development for poverty alleviation. There has been a shifting away from a high productivity ideology focusing on food production and supply towards increasing recognition of multi-level processes and multiple food security dimensions. The multi-level processes of change include, aside from the shifting ideology, the scope of investments in agriculture science and technology at global level; emergent actors shaping development assistance at regional and sub-regional global levels; and changing patterns of farmer mobility and communication access at regional and sub-regional levels. In Burkina Faso and Tanzania, the literature-based reviews were compared to stakeholders' perceptions of multi-level processes of change that influence the adoption of water harvesting technologies. The stakeholders identified soil degradation and rainfall variability as key drivers of change, both having a mostly negative influence on the adoption of water harvesting technologies, from a short-term perspective. Population growth, extreme weather events and off-farm employment were perceived as key drivers of change from a long-term perspective, with a mostly positive, a positive or negative or a mostly negative influence respectively.

The rate of change in the complex systems that influences water-harvesting technology adoption is extremely high. We are yet to establish strong evidence of causality between drivers and adoption, and such relations need to go far beyond individual adoption processes to see responses to scale. For example, Morris and Barron (2014) found weak trends in the correlation between regional yield increase and uptake of in situ soil-water conservation structures in north and central Burkina Faso.

The study of the role of NGOs and policy stakeholders in water harvesting technology uptake in Tanzania suggests an increased shift of responsibilities related to policy implementation towards NGOs, without a similar shift in resource allocation for policy setting or and review processes. More research is needed to fully understand the underlying reasons and consequences for such a shift.

Finally, the study of changes in rainfall patterns and their impact on long-term sustainability of proposed suitable water harvesting sites in South Africa revealed a great potential for the domestic technology of water harvesting from roofs using 3000 l storage tanks in South Africa: at least a portion of daily household water requirements can be met, increasing household water security and reducing pressure on municipal water supply.

Potential impact, dissemination activities and exploitation of results

Project impacts

The WHaTeR project, through a combination of capacity building, research, intervention and dissemination activities, contributed towards the achievement of the FP7- AFRICA call (ENV.2010.3.11-4) impacts, namely:

a) The potential and sustainability of rainfed agriculture in Africa strengthened through a direct focus on developing (traditional and project introduced) water harvesting technologies across Sub-Saharan Africa;
b) Food production and security improved by ensuring that the improved WHTs are those that will address people's needs and be acceptable to them in the various settings. Upscaling mechanisms were developed so that knowledge shall be shared - and thus these benefits will not be isolated;
c) Livelihoods of rural communities better secured through strengthened, more resilient, farming systems; thus allowing farm families to diversify livelihoods from a basis of more dependable agriculture in a changing environment.

In order to make WHaTeR's contribution to the above-mentioned areas more tangible, a set of specific expected impacts was identified and monitored throughout the project. Table 1 provides examples of WHaTeR's specific impacts through capacity building, research, intervention and dissemination activities at various level (from local to regional).

Table 1. Overview of impacts and examples of WHaTeR's contribution

	Impact through:	***Capacity building activities***	***Research activities***	***Intervention activities***	***Dissemination/ Networking activities***
1.	***Strengthening of the sustainability and potential of rainfed agriculture in Africa***		The information on what RTD interventions worked in the past and what did not work allowed the project team to select priority interventions in collaboration with the beneficiaries (WP9, 10, 11, 12) Contributed to the overall discourse of agricultural development for poverty alleviation through to a dedicated study on global-regional drivers as means for adoption and adaptation of WHT in four Sub-Saharan African countries (WP8)	Research collaboration with the Global water Initiative East Africa (GWI-EA) implemented by CARE International in Tanzania, Uganda and Ethiopia. GWI project was able to use the WHaTeR research findings in furthering the RTD interventions (horizontal scaling-out) in other villages within the Makanya Catchment (WP12)	Knowledge and project results shared and reviewed; national forums/ networks on WHT established; stakeholders recommendations on WHTs to scale up received and used to develop related WHTs guidelines; policy recommendations discussed and integrated in policy briefs (ALL WPs)
2.	***Increased food production and household food security in rainfed farming regions of Africa***	Improved farmers' knowledge on fertility management through on-farm trainings on pit and pile composting techniques in BF (WP9)	Evidence that the use of appropriate WH significantly increases crop production and can make drinking water available, given its quality will meet standards, at fairly reasonable prices (WP7);		Awareness raised through video documentation on the linkages between Agriculture, Water and Climate Change in Africa and future opportunities (WHaTeR project in collaboration the EU-FP7 AFRICA call cluster)
3.	***Improved livelihoods of rural communities in rainfed farming***		Improved understanding of livelihood and gender implications: potential		

	Impact through:	Capacity building activities	Research activities	Intervention activities	Dissemination/ Networking activities
	regions of Africa		impact of WH on crop production and livelihoods cannot be assessed using studies that isolate WH use from the rest of the farming or livelihood system (WP5).		
4.	***Technology support for African farmers by producing guidelines with decision support system on WHT technology improvement and innovations***		Developed a set of technical and methodological guidelines to support the improvement and uptake of sustainable WHTs (WP9, 10, 11, 12); Evidence that existing guidelines, used to determine suitable locations for WH, assume optimal conditions. A new set of guidelines taking into account upper and lower limits of suitability was developed (WP11)		WH guidelines distributed through national networks and used by some target groups for WHT implementation and the development of handbooks (e.g. sourcebook on water smart agriculture in Tanzania) (WP9, 10, 11, 12);
5.	***Policy support for integrated water management in Sub-Saharan Africa to promote EU and African strategies and policy measures on strengthening rainfed agriculture, food security and livelihoods***		With the results on the effects of WHTs (increased water availability and crop production), WHaTeR advocated the allocation of Sustainable Development Goals funding to WHT implementation (WP7); Informed policy decision making in SA based on evidence that, under present and projected climate conditions, WHTs can play a valuable role in extending water supply for various uses. However, the seasonal climate means that WHT's can only be seen as a supplementary water supply solution (WP11)		Policy briefs distributed through the WHaTeR consortium network and presented to policy makers at national level to influence funding allocations (e.g. WH embedded in CAADP investment plans) (WP14 in collaboration with the other WPs)
6.	***Effective stakeholder WHT communication networks developed***				Registration of a National Rainwater Harvesting Assoc. in SA lead by the WRC in progress (WP3); Strengthened role of the Rainwater Harvesting Assoc. of TZ (RHAT) at national/ regional level (WP3); Worked on the strengthening of existing WH network in ET (WP3);

	Impact through:	Capacity building activities	Research activities	Intervention activities	Dissemination/ Networking activities
					WH stakeholders in BF agreed to establish a national forum for WHT promotion (WP3)
7.	***Increased awareness and motivation for WHT implementation among farmers and other stakeholders***	Increased farmer knowledge on WHT implementation through feedback workshops to reflect on work in progress and share research findings (WP12)	Informed decisions by farmers on the usage of water for potable/non-potable uses based on the water quality (SA study on water storage tanks - WP11) Lessons learnt and documented about the success of the 'majaruba' external catchment systems (WP6)	Decisions made on WHT development, priority and areas of interventions and, beneficiaries through participatory workshops with stakeholders at village level, catchment, local government and national level (WP12)	Multi-stakeholder workshops and stakeholder consultations were organized in each case study country to allow for knowledge sharing and awareness raising (WP9, WP10, WP11, WP12, W14)
8.	***Innovative and appropriate WHT structures in famers' fields***	Farmers' training for construction of ponds in ET (WP10)	Evidence of the on-farm experiments in BF used for promoting the integration of soil, water and nutrient management techniques to enhance agricultural productivity and mitigate environmental challenges (WP9)	Improved performance of WH ponds in ET by testing different and more appropriate lining and shading materials that reduce seepage and evaporation losses (WP10); Improved microdams and canals (ndivas) in the semi-arid uplands and midlands and spate irrigation in the semi-arid lowlands of TZ (WP12)	Awareness raised on innovative and appropriate WHTs among a broader audience through the video documentation and broadcasting on national TV of WHaTeR project on-farm testing, WHTs development and improvement in Tanzania (WP12 and WP14)
9.	***Improved knowledge on WHTs among NGOs, GOs, private sector and government through publications, mass media***		Up to date assessment of the state-of -the –art in the field of water harvesting through revisit study (WP2) Various studies lead to increased knowledge of WHTs in the 4 case study countries		Project results presented and reviewed by the scientific community; lessons learnt from other research groups integrated in WHaTeR RTD; several WH sites across Africa visited and compared; publication widely distributed and presented at national and international conferences (ALL WPs); 2016 International Conference by the International Rainwater

	Impact through:	***Capacity building activities***	***Research activities***	***Intervention activities***	***Dissemination/ Networking activities***
					Catchment Systems Association will be hosted in SA (WP3, WP11)
10.	***Tools (models) for impact assessment of WHTs and land use planning catchments areas***		A GIS and remote sensing model was developed to identify existing and potential WHT sites. It was shown that currently available satellite data of medium resolution (30 m) using NDVI or simulated ET provide only a low confidence identification of existing sites (WP11) Identified a set of critical macro-scale drivers of change relevant for the upscaling of WH agenda and developed a conceptual framework to better understand the uptake and out-scaling of WH in SSA (WP8)		
11.	***Projections of WHT opportunities and adaptation to climate change for policy makers***		WHTs related to roof and small-catchment collection and storage in water tanks can play a valuable role in extending water supply for various uses in SA, under both present and projected climate conditions (WP11)		

Legend: Burkina Faso (BF); Ethiopia (ET); South Africa (SA) and Tanzania (TZ)

Main dissemination activities and exploitation of results

The Programme Management Office (PMO) at VU-VUmc and the Southern and Eastern Africa Rainwater Network (SEARNET) at ICRAF played a leading role in the dissemination activities of the WHaTeR project. In particular, WP3 (stakeholders interaction and communication) and WP14 (dissemination), with the support of WP1 (project management), identified and analysed the multiple stakeholders involved with WHTs and favoured links with National Rainwater Harvesting Associations, WH fora and other relevant networks, projects and programmes.

However, it should be highlighted that all WHaTeR partners contributed to the dissemination and exploitation of project results through a mix of complementary and mutually-reinforcing activities. The consortium's combined effort resulted in the update of the plan for use and dissemination of the foreground as presented in Table 2. This effort has continued (will continue) past the project end date (e.g. forthcoming publications and joint initiatives to further disseminate and build on WHaTeR's results).

Among the dissemination activities, a special note of attention should be given to the multi-stakeholders' workshops and the other project events that facilitated the interaction with WH stakeholders. As for the exploitation of results, a special note is made for the preparation of WH guidelines and policy briefs.

Stakeholders' consultations

The WHaTeR project organised eleven official consultations with stakeholders in the occasion of the project kick-off workshop (2011), the methodology workshop (2011), the synthesis workshop (2015) but especially the two rounds of multi-stakeholder workshops in the four case study countries. *Ad hoc* consultations with stakeholders at national and international level also occurred in conjunction with conferences and networking events but also the implementation of project activities at community level.

Over the four and a half years of the project, the WHaTeR team facilitated two rounds of multi-stakeholder workshops. The first round took place in 2011/ 2012 and the main objectives were to inform stakeholders from different sectors and government institutions about the WHaTeR project and the results of the WHT revisit study carried out by WP2. The second round of stakeholders' consultations took place in 2014/ 2015. The overall objectives of these workshops were: 1) to conduct stakeholder review, mapping and establishment of national interaction and communication forums/ networks on WHT; 2) to review the results of the RTD activities together with the stakeholders and get their feedback on the WHTs techniques to scale out, the guidelines and recommendations; 3) to conduct field visit to intervention sites together with the stakeholders; 4) to assess impact pathways and dissemination platforms for project results; 5) to prepare a video documentation on stakeholder interaction and RTD results. A diverse group of (external) stakeholders participated in the workshops, including: community representatives, policy and decision makers from government line ministries and support agencies; academia and research organizations; national and local farmer associations, civil society, local media companies, representatives of topic-related projects, donors and the private sector. The workshops were also attended by a number of WHaTeR WP leaders who took the opportunity of these events to gather stakeholders' feedback on specific aspects of the project and explore suitable venues for broader dissemination of results. SEARNET, the partner responsible for stakeholder interaction (WP3) and dissemination (WP14), played a crucial role in coordinating these activities across the four countries. It took responsibility for integrating the country reports in one integrated document that summarises the main highlights and results of the 2nd round of multi-stakeholder workshops (D14.6). It also produced a visual presentation recounting the stakeholder consultation process over the four years of the project (D14.5).

WHaTeR synthesis workshop hosted by ICRAF/ SEARNET in Nairobi in May 2015 offered another excellent opportunity for stakeholders' consultation. The workshop brought together representatives from the consortium partners (VU-VUmc, SUA, AMU, INERA, UNEW and SEARNET), scientists from ICRAF and a selected group of national and regional stakeholders. The main objectives of the workshop were to: 1) discuss, gather feedback and disseminate the project final results to multiple stakeholders; and 2) formulate and integrate policy recommendations into policy briefs consistent with policy objectives of the EU and states of Sub-Saharan Africa. Key outcomes were the constructive and positive feedback gathered from the WH stakeholders attending the workshop on the WHaTeR results and their input on the guidelines and the policy recommendations.

Development of Water Harvesting guidelines

On the basis of the literature review and the revisit study (phase 1) as well as the RTD results from the four case study countries (phase 2 and 3), the WHaTeR partners developed a set of technical and methodological guidelines to support the improvement and uptake of sustainable WHTs. The guidelines were produced for the following technologies (or combination of technologies) and approaches:

Technical guidelines

- Grass strips of Andropogon gayanus in combination with mechanised zaï (Burkina Faso; WP9)
- Contour ploughing in combination with earth bunds (Burkina Faso; WP9)
- Stone bunds in combination with mechanized zaï (Burkina Faso; WP9)
- Community-based spate irrigation (Ethiopia; WP10)
- Household and community ponds (Ethiopia; WP10)
- Modular WH tank system for subsistence agriculture (South Africa; WP11)
- Microdam (ndiva) and lined canals (Tanzania; WP12)

Methodological guidelines

- Methodological approach used in relation to mechanized zaï associated with stone bunds; mechanized zaï associated with grass strips of Andropogon gayanus; contour ploughing associated with earth bunds (Burkina Faso; WP9)
- Household ponds (Ethiopia; WP10)
- Community-based spate irrigation (Ethiopia; WP10)
- Methodological approach for catchment studies (South Africa; WP11)
- Methodological approach for catchment studies (Tanzania; WP12)

Development of policy recommendations

WHaTeR has conducted policy advocacy at national and international level (e.g. Africa Water Week, Stockholm Water Week, World Water Forum) to promote the formulation of policies that help create an enabling environment for WHT uptake. The WHaTeR partners have also produced a number of policy briefs with integrated recommendations drawn from the country Work Packages (WP9 – WP12) and the cross-thematic Work Packages (WPs 4 – 8).

Policy briefs

- Environmental dynamics of WHTs
- Environmental dynamics of spate irrigation
- Increasing sustainability, productivity and adoption of WHTs: What are the options?
- Water harvesting technology uptake and upscaling: opportunities and barriers
- Innovations in WHTs for increasing crop production in semi-arid areas
- Making runoff ponds effective
- Improving livelihoods: capturing rainwater

Table 2. Dissemination and exploitation measures used by the WHaTeR project to reach different target groups and achieve the potential impact

Dissemination and exploitation measures	Examples of activities/ outputs	Responsible partner organization(s)	Target groups	Achieved impact
Organisation of systematic **stakeholders' consultations**	Two rounds of multi-stakeholder workshops in the four case study countries plus consultations during the kick-off workshop, the methodology workshop and the synthesis workshop (eleven official consultations + others at national and international level)	PMO and SEARNET (lead) with AMU, INERA, SUA, UKZN and ad hoc support by the other WHaTeR partners	Local communities, Policy and decision makers from government line ministries and support agencies, academia and research organizations, national and local farmer associations, civil society, local media companies, representatives of topic-related projects, donors and the private sector	Knowledge and project results shared and reviewed; national forums/ networks on WHT established; recommendations on WHTs to scale up received and used to develop related WHTs guidelines; policy recommendations discussed and integrated in policy briefs; video recounting the stakeholder consultation process produced
Production of technical and methodological **guidelines on WHTs**	A set of seven technical guidelines and five methodological guidelines	AMU, INERA, SUA, UKZN (lead); guidelines compiled by PMO	Local communities, government institutes with extension task, NGOs, practitioners	WH guidelines distributed through national networks and used by some target groups for WHT implementation and the development of handbooks (e.g. sourcebook on water smart agriculture in Tanzania)
Production of **policy briefs**	A set of seven policy briefs	AMU, INERA, SRC SUA, UNEW, VU-VUmc (lead); guidelines compiled by SEARNET and PMO	Policy and decision makers from government line ministries and support agencies	Policy briefs distributed through SEARNET/ ICRAF network and WHaTeR website and presented to policy makers at national level to influence funding allocations (e.g. WH embedded in CAADP investment plans)
Link to relevant **networks** *(refer to section 4.2 table A.2 of the*	On-going exchanges with several networks (e.g. AFHRINET: Technology-Transfer Network on Rainwater Harvesting Irrigation Management; International Rainwater Catchment Systems Association (IRCSA); International	SEARNET (lead) and all other partners	NGOs, GOs, POs, research community, private sector, other WH stakeholders	Knowledge and project results shared; access to WH knowledge and information broadened; some collaborations on future activities (follow-up to WHaTeR) established

Dissemination and exploitation measures	Examples of activities/ outputs	Responsible partner organization(s)	Target groups	Achieved impact
WHaTeR final report for a complete overview of links to relevant networks)	Rainwater Harvesting Alliance; SEARNET's National Rainwater Harvesting Associations; ICRAF's Liaison offices in Southern, Eastern and Western Africa; Rainwater Partnership hosted by UNEP; Rainwater Harvesting Implementation Network hosted by Ethiopia Rainwater Harvesting Association in Addis Ababa; RAIN Foundation of Netherlands;Young scientists international network)			
Collaboration with relevant **projects and programmes** *(refer to section 4.2 table A2 of the WHaTeR final report for a complete overview of links to relevant projects and programmes)*	Collaboration with several projects (e.g. EU-FP7 AFRICA call cluster: WAHARA, CLARA, Eau4Food; ADAPTS; AWM Solutions project; ECAW: Enhancing Climate Change Adaptation in Agriculture and Water Resources in the greater Horn of Africa) and programmes (e.g. CPWF: Challenge Programme Water and Food; WOCAT: World Overview of Conservation Approaches and Technologies; GWI: Global Water Initiative)	All WHaTeR partners	Research community, NGOs, GOs, private sector and other WH stakeholders	Project results shared, reviewed and integrated in other projects and programmes for increased synergy and joint lobby for WH
Participation and presentations at **conferences** *(refer to section 4.2 table A.2 of the WHaTeR final report for a complete overview*	WHaTeR's representation at several high-level conferences (e.g. World Water Week; WATERNET annual symposium; International Conference on Global Food Security; SEARNET annual conference; ICRAF Science week; World Water Forum annual conference; International Science and policy Conference on the	All WHaTeR partners	Research community	Project results presented and reviewed by the scientific community; lessons learnt from other research groups integrated in WHaTeR RTD; several WH sites across Africa visited and compared; established relevant academic contacts

Dissemination and exploitation measures	Examples of activities/ outputs	Responsible partner organization(s)	Target groups	Achieved impact
of conferences where WHaTeR presentations were given)	resilience of social & ecological systems; World Water Congress; International conference on Livelihood; WATERBIOTECH conference; European Climate Change Adaptation conference)			
Publication of **papers in conference proceedings** *(refer to section 4.2 table A.1 of the WHaTeR final report for a complete overview of papers presented in conferences)*	**8 papers *already published***	SRC,UNEW, VU-VUmc, SEARNET	Research community	Project results presented and reviewed by the scientific community
Publication of articles for **peer-reviewed journals** *(refer to section 4.2 table A.1 of the WHaTeR final report for a complete overview of peer-reviewed articles already published)*	**7 articles *already published*** *Forthcoming*: 21 articles (as indicated in the 3rd periodic report – list of publications)	VU-VUmc, UKZN, SRC, SUA, UNEW, AMU, INERA	Research community	Project results reviewed and validated by the scientific community
Preparation of academic outputs: **thesis**	**4 PhD thesis** **1 MSc thesis**	VU-VUmc, UKZN, SRC, UNEW UKZN	Research community	Project results reviewed and validated by the scientific community
Production of	Two videos:	SEARNET and	Policy makers in Europe	Increased project visibility, raised

Dissemination and exploitation measures	Examples of activities/ outputs	Responsible partner organization(s)	Target groups	Achieved impact
videos about project activities and specific themes	– Agriculture, Water and Climate Change in Africa (in collaboration the EU-FP7 AFRICA call cluster) – WHT development and stakeholders' consultation	VU-VUmc (lead) in cooperation with SUA, INERA, AMU, UKZN	and Africa, national and local authorities, public / private investors, potential partners, general public	awareness among potential WHT technology users, motivated investors and funding authorities, influenced policy makers
Creation and maintenance of **project website**	http://whater.eu/	VU-VUmc (lead) with input from all WHaTeR partners	General public, NGOs, GOs, politicians, public funding authorities, private sector, scientific community	Increased project visibility, shared and exchanged knowledge and experience
Production of **flagship brochures**, **posters, flyers and factsheets**	5 Posters; 1 Brochure (The Parliament Magazine: Green Week Issue no 348); 1 Flyer; and 2 Factsheets (WHaTeR project and STREAM Research Project Factsheet)	VU-VUmc and SEARNET (lead) input from all WHaTeR partners	Policy makers in Europe and Africa, national and local authorities, investors, potential partners, network members, general public	Project dissemination material distributed at conferences and networking events; target groups informed about project objectives, activities and results
Media briefings	2 Press releases (Lancement du projet WHaTeR: Pour une meilleure productivité des terres; WHTs discussed at the WHaTeR project workshop)	INERA, UKZN,	General public	Press releases on workshops' outcome and milestones helped raising awareness among the general public on the potential and barriers to WH
Publication of articles for **popular newspapers**	1 Article in Dutch (Ontwikkelingssamenwerking in Afrika: sleutelwoord participatie) plus others published in local newspapers	VU-VUmc, SUA, INERA, AMU	General public and other stakeholders	Raised awareness among target groups on project and its relevance
Radio and TV (national, local)	TV clip: WHaTeR project on-farm testing, WHTs development and improvement in Tanzania Radio interview:Science debate programme hosted by Sverieges radio P1 Klotet	SUA, SRC	General and local public	Raised awareness among target groups on project and its relevance

WHaTeR website and partners' contact details

Project public website: http://whater.eu/

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VU University Amsterdam (Coordinator)	VU-VUmc	Netherlands	VU University Amsterdam
Arba Minch University	AMU	Ethiopia	
Institut de l'Environnement et de Recherches Agricoles	INERA	Burkina Faso	INERA
Sokoine University of Agriculture	SUA	Tanzania	
Southern & Eastern Africa Rainwater Network/ International Centre for Research in Agroforestry	SEARNET	Kenya	SearNet
Stockholm Resilience Centre/ Stockholm University	SRC	Sweden	Stockholms universitet
University of Newcastle Upon Tyne	UNEW	United Kingdom	Newcastle University
University of KwaZulu-Natal	UKZN	South Africa	University of KwaZulu-Natal