WADIS-MAR
Water harvesting and Agricultural techniques in Dry lands: an Integrated and Sustainable model in MAghreb Regions

Implementing Partnership
Partenariat de mise en œuvre
اتحاد الشركات المكلفة بالتنفيذ

OBSERVATOIRE DU SAHARA ET DU SAHEL
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Concept Note

1.1. RELEVANCE OF THE ACTION

1.1.1. Relevance to the objectives/sectors/themes/specific priorities of the call for proposals

North Africa arid land of Maghreb, suffer under scarce water conditions. Erratic behaviour of rainfall events over brief intervals often produce short and intense floods events which converge into ephemeral *wadis* beds. Most part of the available superficial waters is thus lost, providing scarce benefits for households living in villages of such semi-desertic areas.

The proposed demonstration Action concerns the realization of an integrated water harvesting and aquifer recharge techniques in two watersheds in Maghreb Region, **Oued Biskra** in Algeria and **Oum Zessar** in Tunisia, characterized by water scarcity, overexploitation of groundwater resources and high vulnerability to climate change risk. The Action, taking into account past local traditional experiences, will implement a sustainable water and agriculture management system based on participative and bottom-up approach and will achieve to enable local communities to manage groundwater resources, starting from a more efficient use of water harvesting techniques (WHT) and from a sustainable agricultural practices application.

The Action will also involve regional, national, local institutions and associations to: safeguard and promote "soft" modern intervention on traditional systems, enhance inter-sectorial coordination and regional cooperation, increase capacity building, create an enabling technical, policy and institutional environment for the promotion of a successful water and agriculture management model. Ensuring up-scaling characteristic of the system, this enabling environment will constitute the basis for an increasing demand for an implementation of the proposed techniques and practices, coming from different institutions, provinces and local communities.

The Action addresses the overall objective of Sustainable Water Integrated Management (SWIM) Programme - Component B which is "*to actively promote the extensive dissemination of sustainable water management policies and practices in the region in the context of increasing water scarcity, combined pressure on water resources from a wide range of users and ongoing desertification processes in connection with climate change*", and specifically **Lot 2 – point 1**, "**Water and Climate Change**" which priority is "*adapting to climate change and enhancing drought and flood management*" giving particular attention to the water-agriculture-food-environment link. Through the implementation of proven climate change adaptation systems in two different *wadi* contexts the Action will lead to: improve traditional water harvesting (i.e. in *Jessour* and Tabias) by applying "soft" modern rehabilitation intervetion and promoting the use of modern techniques (gabions, recharge wells), increase water availability through artificial aquifer recharge and evapotranspiration reduction, enhance water quality by reducing pollution caused by unsustainable farm

practices, manage flood flow, run-off and hence reduce erosion, promote water efficient farming systems and the use of more stress-tolerant crops, use the surplus collected water for irrigation.
The Action's community-based approach will empower local communities to take responsibility for the sustainable management of their local natural resources. Then engagement of different stakeholders (decision makers, technicians, researcher, institutions at different levels) in a variety of participatory assessment and planning activities, will increase the ability of local communities to control their own natural resources and to promote local ownership. Moreover the Action is designed for promoting an enabling environment to mainstream sustainable integrated water and agriculture management into national priorities and national development frameworks and to enhance trans-boundary and South–South cooperation.
To achieve expected results reported in the Call, the Action will adopt a three-pronged approach based to: (1) integrate state of the art knowledge on water resource status and management into government policy and institutional planning; (2) supporting capacity building processes with training activities and supply a Decision Support System tool to decision makers; (3) implement the intervention in demonstration sites and promote innovative and participatory solutions that will be not only suitable for up-scaling in a country, but also replicable across the all Maghreb region in arid watershed contexts; (4) disseminate and share knowledge of Project achievements and results to move away from individual and limited site impact and to reach larger-scale initiatives. According to the propoed strategy the Action will comply the priorities and practices set in the draft **Strategy for Water in the Mediterranean,** in **Horizon 2020 Initiative** and also in **Regional Strategy Paper 2007-2013 for Euro-Mediterranean Partnership**. The proven integrated system implemented in the two selected watershed areas will be widely disseminated at national and regional levels enhancing trans-boundary and South–South cooperation.
The Partnership of the Action meets requirements of the Call. WADIS-MAR consortia is composed by two institutions legally established in the European Union, **NRD-UNISS** Desertification Research Group (Italy) (The Applicant) and **UB** University of Barcellona (Spain) (Partner 1) both with a very strong background in research and EU cooperation in Maghreb region. The partnership will be completed with two national organizations of Nord Africa countries: **IRA,** Institut des Régions Arides (Partner 3) for Tunisia and **ANRH**, Agence Nationale des Ressources Hydrauliques (Partner 4) for Algeria, having the mandate by their Countries to promote and implement the best practices in land and water management, complete the partnership. The international organization **OSS,** Observatorie du Sahara et du Sahel (Partner 2) complete the consortia. Moreover the Action will be supported by other local associations and organizations such as local NGOs and institutions (**CRSTRA**- Centre for Scientific and Technical Research on Arid Regions of Biskra, **DGRE -** General Direction of Water Resources in Tunisia).

1.1.2. Relevance to the particular needs and constraints of the target country/countries, region(s) and/or relevant sectors (including synergy with other EU initiatives and avoidance of duplication)

The priority of the Action is coherent to existing national plans and provides further advancement in areas interested by previous and on-going projects as well as to other initiatives and programs that aim to develop sustainable water and agriculture management systems.
Sustainable development of agriculture became a priority in Algeria in 2000. **The Plan National de Développement Agricole** (**PNDA**) is a policy that advocates the sustainable, integrated development of rural areas by fostering the conservation and rational management of natural resources such as soil and water. The most part of agriculture in Algeria is based on monocultures and involves irrigation using high volume pumps. Consequently, groundwater resources are overexploited. In particular the watershed of Oued Biskra is characterized by a large area of prevalent monoculture (i.e. date palm cultivation).
Environmental protection has been a foundation of Tunisia's long-term development strategy. The Tunisian Government has engaged for the last two decades a vast program for the conservation and mobilization of natural resources: **National Strategies for Soil and Water Conservation**, **Forest and Rangelands Rehabilitation**, **Water Resources**. During the last decades (1990 - 2010), in the south of Tunisia, one of the most arid part of the Country, the Regional Services of Soil and Water Conservation executed these national programs realizing the construction of traditional *Jessour* (657 ha), Tabias (5725 ha) and contour stone ridges (1014 ha). The regional service also installed new modern water recharge systems: 177 groundwater recharge gabion check dams, 21 flood spreading gabion check dams and 8 recharge wells.
However, during the last years, rapid and remarkable evolution of production systems and natural resource exploitation increased in both Countries through the exploitation of both renewable and fossil groundwater for the development of irrigated crops and industry. In parallel, climate changes are putting heavier burdens on local population and specifically on farmers and herders. Moreover the infrequent but heavy rainstorms are causing considerable damages to the already implemented water harvesting systems and much labour must be invested in repairing them. Since farmer are actually migrating searching for better economic opportunities, traditional systems (in particular *Jessours*) are being abandoned. This is causing a progressive weakening and is increasing the need for structural intervention (in particular dams re-building and spillways

rehabilitation). The use of machinery in mountainous terrain is also difficult and costly. Being conscious of the importance of the traditional runoff techniques for the water management and for the improvement of aquifer recharge, the Action will rehabilitate part of existing systems and will implement modern and more efficient ones. Moreover the Action aims to integrate and manage both water and agriculture resources in order to increase water quantity and quality, reducing the demand for water by agriculture and, at the same time, increase yield. The adoption of crop diversification may trigger and ease a rise in the income and hence enhancement of system resilience in a framework of climate change.
The Action will utilize and exploit the existing results of previous researches financed by the **ISWC** (Indigenous Soil and Water Conservation) Tunisia program and conducted by local Regional Centre for Agricultural Development (CRDA) and IRA. The intention of the Action is to intensify the farmer-innovation approach and to expand it not only in different areas of Tunisia but also in other country experiencing similar problems such as the Algeria.
The Action will consider also the achievements and outcomes obtained by: **SUMAMAD** project (Sustainable Management of Marginal Drylands - http://www.inweh.unu.edu/drylands/SUMAMAD.htm) that identified people's adaptation and traditional knowledge in coping with adverse dryland conditions; EC funded **IMAROM** project (Interaction between Migration, Land & Water Management and Resource Exploitation in the Oases of the Maghreb - http://www.heindehaas.com/IMAROM/imarom1.htm) which studied the socio-economic changes on land and water management and resource exploitation in dryland oases.
The Action will be synergic with **Integrated Agriculture Development Project for Kairouan** (Tunisia) financed by the African Development Bank (http://www.afdb.org/en/news-and-events/article/tunisia-integrated-agriculture-development-project-for-kairouan-3564/) to promote sustainable agricultural development by developing agricultural infrastructure, fostering participatory development and building the institutional capacity of government and beneficiary institutions.
Moreover, the Action is consistent with priorities identified in United Nations Convention to Combat Desertification National Action Programme (**UNCCD NAP**) of Tunisia and Algeria that emphasize community participation and public awareness raising, promotion of applied research and integration with indigenous knowledge, institutional framework and planning systems, and strengthening of regional and international collaboration for exchange of experience and best practices. The Action also aim to achieve UN Millennium Development Goals (**MDGs**) in particular: eradicate extreme poverty and hunger (increasing income of poor farmers in marginal area), promote gender equality and empower women (ensuring about 50% of smallholders attending the workshops are women), Ensure environmental sustainability (implementing sustainable water and agricultural management practices).

1.1.3. Describe and define the target groups and final beneficiaries, their needs and constraints and how the action will address these needs

Drought and desertification affect the arid watershed of Oued Biskra and Oum Zessar characterized by unfavorable climatologically and hydrological conditions. Low and erratic rainfall results in frequent periods of serious drought alternating with episodes of floods that cause major damages and soil erosion. During the occasional floods, infiltration through beds of *wadis* is the major source of aquifer recharge. The *wadis* often carry large volumes of water during a flood but most of this water is lost. In addition to these climate constraints, in the last decades, other socio-economic changes are impacting on both environment and rural livelihood systems of these areas: the first is that many farmer and herdsman from mountains migrated to urban centres or Europe to seek employment and more income; the second is the enormous boom in the tourist sector which generated demand not only for labour but also for fresh vegetables and fruit; the third is the descent of sedentary farmers from the mountains into the plains that lead to a progressive abandonment of upstream areas and *Jessour* systems. These changes are causing: in the upstream area a reduction of available water and an increasing of erosion because the traditional harvesting systems needed of a maintenance that isn't anymore guaranteed; in downstream an overexploitation of groundwater that is used to cover increasing needs of rapidly expanding urbanization, as well as agricultural demands.
If intermittent surface water floods are optimally managed they can help respond to the increasing demands for water in arid area. One of the appropriate uses of such water is the recharge of groundwater. Moreover the use of aquifers to store water in arid regions eliminates the disadvantages associated with surface storage, such as evaporation, pollution, siltation, and health hazards.
The aim of the Action is to implement, in these watershed areas, a sustainable integrated water and agricultural management system to ensure partitioning of natural resources between different end users and between upstream and downstream areas trough: improvement of traditional water harvesting in mountains and diversification of the species of trees planted in the *Jessours* to increase income; groundwater recharge with modern techniques (gabion unit and recharge wells) in downstream areas and introduction of sustainable irrigation implants, sustainable agriculture practices and diversification of crop production. Rainfed farming will be promoted, too. **Target groups** of the Action are the households that live in upstream or downstream areas **of Oued Birska (160 km^2)** in Algeria and **Oum Zessar (350 km^2)** in Tunisia in particular **farming households, smallholder irrigation farmers, herdsmen, user of wells**.

In Oum Zessar the total population (**final beneficiaries**) is estimated, according to the last population census of 1994, to **24188 inhabitants** whose 12159 (50.3 %) are male. The household number is 5758 with an average family size of 5.5. In Oued Biskra the total population (**final beneficiaries**), including the main city of Biskra exceed 210,000 inhabitants. From the target groups will be selected **40 households for each watershed** using the following criteria: location in the project area (upstream, downstream); degree of vulnerability to context changes as well as to climate induced stresses; typology of intervention; willingness and commitment to undertake the activity of the groups inside their own land. To emphasise the contribution of female farmers and to encourage equality of gender, attempts will be made to ensure about 50% of smallholders involved are women. Separate women sessions will also be considered to capture women views which may otherwise be missed. These activities are essential to gauge community needs and involve community members as active participants in the Action. In fact target groups will be involved and consulted during all the phases of the implementation of the integrated water and agriculture management system: from the choice of technologies and their design, to the realization and maintenance and management of the system. Moreover sector or cluster at **national and local level** composed by **ministerial institution in charge of water resource management and policy making, NGOs, Universities, existent service units, local water management associations, civil society organizations** will be addressed by the Action and engaged in dissemination and participatory training activities. A Decision Support System will be also created for decision making and water rational planning.

1.1.4. Particular added-value elements

Equality of gender will be addressed by seeking 50% representation of women at stakeholder workshops and participatory activities, and if necessary, organizing separate women meetings. Communication tools (radio and relevant video messages) will be prepared for disabled members of communities (e.g. those with hearing or sight disabilities). Bad agricultural practices and awful water usages which contribute to land and water resource degradation will be discouraged distributing brochures and didactic materials in the schools, The rights of local communities will be respected through dialogue and promotion of culturally compatible technologies and practices.

1.2. DESCRIPTION OF THE ACTION

In arid and semi-arid environments large quantities of superficial waters carried by *wadis* during flood events are often lost. If intermittent surface water floods are optimally managed they can help respond to the increasing demands for water, in particular by agriculture activities, in arid area. One of the appropriate uses of such water is the artificial recharge of the aquifer. The demonstration Action aim at guarantee an answer to the increased water demand in two areas of the Maghreb region. The **specific object** to achieve an integrated, sustainable and participative water harvesting and water & agriculture management in the watershed Oued Biskra (Algeria) and Oum Zessar (Tunisia) for adaptation to climate change condition and drought.

The Partnership is a result of previous cooperation among NRD-UNISS, OSS and IRA. The three partners agreed for design of a new project proposal on groundwater recharge and decided together to add UB for environmental evaluation of water quality and quantity using chemical and isotopic analysis and ANHR (which has previous collaborations with OSS) for the selection of Algerian site and the implementation of the demonstrative action in Algeria. Key stakeholders (in addition to the 5 partners) are the household of villages, formal and informal extension providers, local NGOs, national and local organizations and institutions (CRSTRA, DGRE). Local Partners in Maghreb areas are in regular contact with these stakeholders that have been consulted and have made suggestions regarding scope and activities of the Action. The specific object will be achieve in 36 months (project duration) with the following **expected results**: **R1**. Sustainable water harvest integrated systems, based on aquifer artificial recharge techniques, realized; **R2**. Agricultural practices and rational irrigation techniques improved; **R3.** Capacity building and awareness in local and national institutions improved. The expected results are accomplished carrying out 6 Activities:

Activity 1 - Project Management and coordination. (36 months). This work package aims at setting up technical/administrative arrangements for a correct project management, coordination among project partners, coordination with other initiatives and stakeholders. It includes these sub-activities: *Activity 1.1 - Establishment of steering committee and Project coordination; Activity 1.2 – Administrative and financial setting up and arrangement; Activity 1.3 - – Project website building and launching workshop.*

Activity 2 - Integrated Water and Agricultural Management (IWAM) System design. (10 months). This activity will aim at baseline study of the physical context and filling existing knowledge lacks to gives a range of potential solution and options for improving the situation in the short (immediate needs) and long term (climate change time scale) and to identify the implementation requirements (problem analysis and planning). The involvement of the local community during the final planning of the intervention is foresee to

enrich the acquired knowledge for the finale executive planning. It includes these sub-activities: *A 2.1 - Existing data collection and geodatabase realization; A 2.2 - Field data survey; A2.3 Public Participatory GIS PPGIS; A2.4 Final design. A 2.4.1 - Choice and design of best site for the IWAM system; A 2.4.2 - Definition of best irrigation techniques and better irrigation infrastructure; A 2.4.3 - Definition of best agricultural practices.*

Activity 3 - IWAM System construction. (26 months). Through the activity carried out inside the A3, the proposed solution of Activity 2 will be physically realized making the Action effective and operational ensuring the desired impact (intervention implementation). It includes these sub-activities: *A 3.1 Construction sites and management; A 3.2 Realization of the Artificial Aquifer Recharge interventions; A 3.3 Realization and rehabilitation of existing irrigation infrastructures; A 3.4 Implementation of best agricultural practices.*

Activity 4 - Performance assessment and maintenance phase. (20 months). This activity aims at developing performance assessment and maintenance tools for the realized interventions and solutions and at guarantee through-life capability of such traditional and new engineering systems. The activity A4 will aim to monitor and assess the changes in the situation and the impact of the action (Monitoring/evaluation). It includes these sub-activities: *A 4.1 Evaluation of infrastructure performances and technical sustainability ; A 4.2 Management and Maintenance.*

Activity 5 - Awareness raising and capacity building. (9 months). This activity aims at assisting participant countries representatives and target groups by providing up-to-date knowledge on "soft" technological improvement of traditional and new WHTs as well as on sustainable agricultural practices application in Maghreb. This activity will also give the necessary tools to involved stakeholder o manage an replicate the proposed action in similar or different contexts. It includes these sub-activities: *A 5.1 Capacity building; A 5.2 Interchange experience and South-South transfer results.*

Activity 6 – Dissemination. (3 months). This activity aims at involving the largest community of scientists, professionals and representatives of public institutions, disseminating in relevant national/international forums the Project results and promoting the use of Project WADIS-MAR system as a possible solution of water scarcity and overexploitation, in arid and semiarid areas

http://www.wadismar.eu

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