Guidelines for the market expansion of water and irrigation European companies in Tunisia, Morocco and Egypt

2020

MADFORWATER: Development and application of integrated technological and management solutions for wastewater treatment and efficient reuse in agriculture tailored to the needs of Mediterranean African Countries.

This project has received funds from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 688320

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The aim of the MADFORWATER project was to develop a set of integrated technological and management solutions to enhance wastewater treatment, treated wastewater reuse for irrigation and water efficiency in agriculture in three MACs (Tunisia, Morocco and Egypt).

Within the scope of the MADFORWATER project an exploitation assessment was conducted in which the exploitation potential of the developed MADFORWATER solutions and tools was assessed, resulting in suitable exploitation routes and several business models. Based on this confidential assessment, general guidelines were formulated. This public report summarizes these exploitation guidelines.

MADFORWATER - DEVELOPMENT AND APPLICATION OF INTEGRATED TECHNOLOGICAL AND MANAGEMENT SOLUTIONS FOR WASTEWATER TREATMENT AND EFFICIENT REUSE IN AGRICULTURE TAILORED TO THE NEEDS OF MEDITERRANEAN AFRICAN COUNTRIES

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Based on the insights, practices and knowledge generated by the MADFORWATER project, guidelines for the market expansion of water and irrigation European companies in the target MACs were drafted with the aim of stimulating business potential and opportunities by providing additional guidelines that result from the market research and business modelling. The results of the market research for Egypt, Morocco and Tunisia as performed within the project, defined the areas with the higher need and potential for WW reuse in agriculture. Aligned with the objectives of the MADFORWATER project, the guidelines focus on the combination between reclaimed wastewater, while using it for irrigation purposes.

1) Market opportunities: relevant regions

This section aims at identifying important market characteristics that need to be considered by European companies that target the wastewater treatment and irrigation market in the MACs. In addition, the areas with higher needs are characterized. As documented in MADFORWATER Deliverables 1.2 and 1.4 (see www.madforwater.eu), the water security assessment resulted in the selection of potential river basins that could be targeted by EU companies. River basins represent the minimum scale to identify opportunities for individual measures such as technologies and approaches.

Within the MADFORWATER project high potential areas have been investigated within these selected MACs that could strongly benefit from reclaimed wastewater as well as irrigation technologies due to large areas of suitable agricultural practice. The following regions show great potential for EU companies as target market segments:

- **Northern Nile basin (e.g. Kafr-El Sheikh region) in Egypt:** a region with substantial agricultural practices mainly serviced by the Mesqas – Marwas system that are operated by Water User Associations. Currently only surface irrigation is applied leaving a lot of room for improved water efficiency. The cost of energy paid by the farmers to pump the water represents 1/3 of the total variable cost of cultivation.
- **Souss-Massa basin in Morocco:** considered a leading region in the production of several fruit and vegetable crops like tomato and citrus. 99% of the total area is dedicated to farming, with 30% of the farm's operation over 5 hectares. The farmers in this region have developed cooperative structures that enable them to jointly organize technical consultancy, assistance with irrigation, fertilization and commercialization of their products to the international market. This level of organization provides opportunities to EU companies with irrigation technology to reach a vast number of potential customers without costly single access to these clients. The selection of a distributor (indirect sales) can be made, based on their network and connection to these cooperatives in Morocco.

  Almost all farms are equipped with drip irrigation, showing a more advanced way of cultivating compared to other regions in the MACs. This provides incentives to adopt more innovative technologies, as the willingness to invest in water efficiency exists in this region. Most farms rely on surface water delivered from nearby dams with an average price of 0.15 Euro/m^3. Wastewater treatment in the area is provided by WWTP to a tertiary level using ultraviolet rays, with a treatment cost equal to 0.23 Euro/m^3. Most crops require ammonium nitrate and mono ammonium phosphate as key fertilizer that could be provided by reclaimed wastewater.
- **Cap-Bon and Miliane basin in Tunisia:** a region with a high quantity of farms (representing 16% of the nation's total agricultural production) and industrial enterprise within the value chain. A respectable number of farmers already use treated wastewater for irrigation purposes. The price varies between regions and according to the type of water applied, conventional water price varies between 0,0309 EUR and 0,0410 EUR and treated wastewater price varies between 0,0182 EUR and 0,0212 EUR. Although the price of treated wastewater is cheaper than conventional water, farmers are reluctant to use it. The regard the treated wastewater of less quality reducing the product quality and increasing the risk of causing bacteria and parasite infections. This provides an opportunity for EU companies to implement innovations that could improve the water quality.

Big investments are needed in this region to adopt new technologies, which is a challenge because access to private capital and public funding appears to be difficult. This requires alternative business models compared to direct sales of the equipment. Water prices are accepted by farmers.

Wastewater treatment innovation that enables reclaimed water for irrigation can be of strong local impact to improve the reliability of local water supply, to stimulate technological developments, and to reduce the discharge of pollutants to rivers and the sea. They are of limited effect to improve the water security at the scale of a river basin, so a strong focus on local impact must be made as part of the business strategy.

Furthermore, there are different domains to be considered, such as hydrological circumstances, agronomical aspects, and technological and economical features in treating and reusing wastewater. The more you zoom into the scale, the more relevant it is to identify and to apply the appropriate specific indicators that characterize a particular intervention, the related requirements to realize it and to determine the related possible impact.

2) Adaptation of wastewater treatment and irrigation technology to the market

This section aims at guiding any interested stakeholder in adapting its technology to specific local conditions and properly introducing the different wastewater treatment and irrigation technology to the market. The following guidelines are drafted based on main lessons learned during the MADFORWATER project considering the application of WW treatment and irrigation technologies in the MACs.

- In order to adapt the technology to a specific MENA country or basin, in the first place it is recommended to run preliminary tests in controlled conditions. This could take place in a laboratory or better in a farmer's plot under the supervision of an extension structure's staff. It is advisable to pay particular attention to possible components that may be missing in the raw wastewater, but that are necessary for the process (i.e. in the biological treatments, nitrogen and phosphorous are crucial macro-nutrients).

- Using the experience of the MADFORWATER project, the development of a Pilot phase before the final implementation is highly recommended. Next to insights of the technical details, such pilots facilitate above all to familiarize with the given regulations, permissions required, associated costs from energy supply and operations. Pilots can reveal important experiences into maintenance intervals and other experiences that need to be considered in a full scale. This phase can facilitate the run of preliminary tests to adjust the technology to the local needs.

- It is crucial to test the robustness of the process, i.e. how the process performances change as a result of changes in the operating conditions. This step could include for example an increase in organic volumetric load, due to a higher concentration of a crucial wastewater component, and a reduction in hydraulic retention time (HRT) due to an increase in influent flowrate. Each condition should be tested for either 1 month or 3 HRTs.

- Although the MACs are located in the Mediterranean, it is necessary to take into account the seasonal variations and, in a specific period, intrinsic variability in wastewater quality; definition of typical summer and winter climate conditions of the target country / basin (T, solar radiation if applicable). The compatibility of these climatic conditions with the required operating conditions of the wastewater treatment technology under consideration must be carefully checked. If the winter condition is significantly different from the summer one in the target country, the process performances must be assessed in laboratory conditions mimicking both seasons, for either 1 month or 3 retention times.

- The irrigation management strategies of farmers in their fields most often does not often induce water stress or yield reduction but consumes considerable amounts of water and induces important drainage volumes. Integrating technologies requires a proper understanding of

their added value in addition to water savings. These could be an increased effect on crop yield or savings in terms of fertilizers. These impacts can both have economic and environmental benefits, as they lower production costs and reduce the chemical effects on the local environment.

In general, the reuse of treated wastewater will change the amount of freshwater consumed and fertilizers used, resulting in a positive impact on the cost of cultivation. Try to also incorporate the fact that modernization of irrigation equipment can affect the irrigation system performance in terms of efficiency, uniformity and/or adequacy. This must be but in line with variations in water resource availability and guiding water policies in the target countries.

- Most often the energy required to operate the technologies are the main cause for environmental burden. It is advisable to focus efforts on improving the (pumping) energy efficiency and choose adequate energy sources. Keep in mind that in the MACs the energy mix is strongly dependent on fossil fuels, hence the use of diesel pumps. Despite the fact that these pumps are more common practice, optimization and minimization of the energy requirements of technologies is required.

- In some regions, farmers are not convinced of the added value of using treated wastewater. Even with lower prices compared to freshwater, adoption of this water sources can be limited. Health issues and negative effects on crop yield are major concerns. Try to limit hazardous situations while handling wastewater and limit the potential exposure to pathogens and disrupting micropollutants. Adapt the technologies to the need of farmers and show the robustness and safe operation at all time.

3) Considerations for the market approach and business model

Regarding market introduction it is important to envisage a clear value proposition to the target customers in the MACs, while using the most suitable routes to market. The following guidelines are drafted based on the experience gained during the MADFORWATER implementation with additional feedback from stakeholders. This section aims to provide interested stakeholders specific considerations while drafting their market approach for the MACs.

- It is important to focus efforts on the specific problems/issues of the potential clients the novel wastewater and/or irrigation solution is addressing, who are the ones who feel this problem the most (the users of the solution, the target group of dissemination activities, your "customers"), the unique value proposition (what makes the novel solution much better than current ones, the pivot for messages to be used for the messages to be delivered during dissemination) and to identify how to reach customers/users out (use mode and distribution channels). It is also important to identify the costs of providing target groups with the novel solution how to monitor progresses and how to cover costs incurred (sustainability). A structured and strategic approach with concrete actions is mandatory to be successful in the MAC market.

- Consider your added value provided to potential customers with specific needs. Identify that the biggest environmental and economic impacts and benefits are of the wastewater treatment and/or irrigation technologies. Interact with the selected customer segment and gather relevant information on their needs, issues and boundary conditions related to their freedom to operate (what they can and cannot due based on economic parameters and legislation).

- Keep in mind that WWTP operators and farmers are not always willing to change their systems. The potential benefit must be very distinct and clear without any room for discussion or misinterpretation. The rational for buying a specific solution is not always transparent and often influenced by multiple factors that changes according to the country and regional differences.

- Benchmarking with currently available practice and solutions is advisable. This also includes a determination of the current baseline (e.g. what are the potential customers familiar with and capable of developing). Radical changes to current systems are difficult and incremental

developments are ongoing in the MACs. Monetization (expressing the value of an effect in monetary terms) is important, expressed in the concept of willingness and capability to pay. This can be deduced from market prices and translated in specific factors. EU companies must be aware of the difference in prices compared to domestic markets and limited experience of customers with advanced technologies.

- The competition in the MACs is already established. Large players are active in the market focusing on large to medium WWTP and big farms due to scale benefits and generatable income on a multi-year basis (e.g. BOOT, DBFO contracts). Typical focus is placed on operational efficiency, without looking at the added value of reuse (just complying with the norms). The technologies used are usually proven and often untailored to the needs of the customer (pre-designed systems and solutions).

- Tailored solutions focussed on smaller WWTP and specialized smallholders provide opportunities for EU SMEs. Finding early adopters that are willing to change their system and have a strong sense of sustainable practice is advisable. The regular buyer-supplier relationship should be extended towards a partnership model in which both partners collaborate on implementing the solution at hand. An integrated project that combines the wastewater treatment and irrigation measures to use the reclaimed wastewater are a viable route to explore.

- It is advisable to perform a Cost Benefit Analysis (CBA) for your technology/solution taking the local context into consideration. Quantify the economic costs of the different components and identify the potential benefits at an early stage. Also negative effects are important to map, as these give insights for strategic decision-making regarding marketing efforts and pricing mechanisms. The main costs to be taken into account are the investment costs (incl. transportation, land costs) and operation expenses (incl. energy use, and the use of resources). Try to broaden the generated benefits as much as possible to generate a pallet of benefits that could trigger potential customers. These can include cost savings (e.g. energy, fertilizer, water), additional income (e.g. better crop yield) and indirect effects such as the labour market or tourism. Based on the MADFORWATER results it is key to use as much detailed data as possible to produce useful information for potential clients that are directly linked to their specific situation rather than general statistics.

- Related to the CBAs, the pricing system including policies and strategies adopted in the target MACs are relevant. Pricing is one of the most important economic tools used for water management. Their importance will increase as it takes a paramount role in dealing with the problems related to water scarcity in the forthcoming future. Keep in mind that the water prices are not usually set in market environments and are subject to public intervention in the MACs. Cost recovery is of crucial importance, as it allows prices to signal the actual value of water while promoting efficiency and providing enough resources to protect water resources. The pricing system used in the MACs differ, and changes in water demand for irrigation as a consequence of a change in the price paid is complex and dependent on several factors. Take the following aspects into account for your market approach:

  - The response of farmers to changes in price is limited by the existence of alternative water resources and cropping systems. They often lack room to operate, as prices of their crops are under pressure. Increased production costs can often not be compensated within the market. This mandates additional effects, beyond mere water savings (e.g. increased crop yield)

  - The more modern the (irrigation) technology, the less flexible the water demand and room for technical efficiency improvement. Also consider the technical ability of users that can be limited and needs additional training efforts of the supplier.

  - The more value irrigation adds to crops, the more stable water demand remains when prices change. This also includes the benefits of reclaimed wastewater making additional fertilizers obsolete. An important factor that

could influence decision making. Take into account that the impact of price increase in irrigation water consumption depends on its initial value, the extent of the increase and implementation over time.

Reaching early adopters and potential customers directly can be a challenge for EU companies. Existing structures and market dynamics are often not clear or can only be valued after several years of experience in the market. Relying on complementary partners, while performing indirect sales seems a strategy with potential.

THE MADFORWATER CONSORTIUM

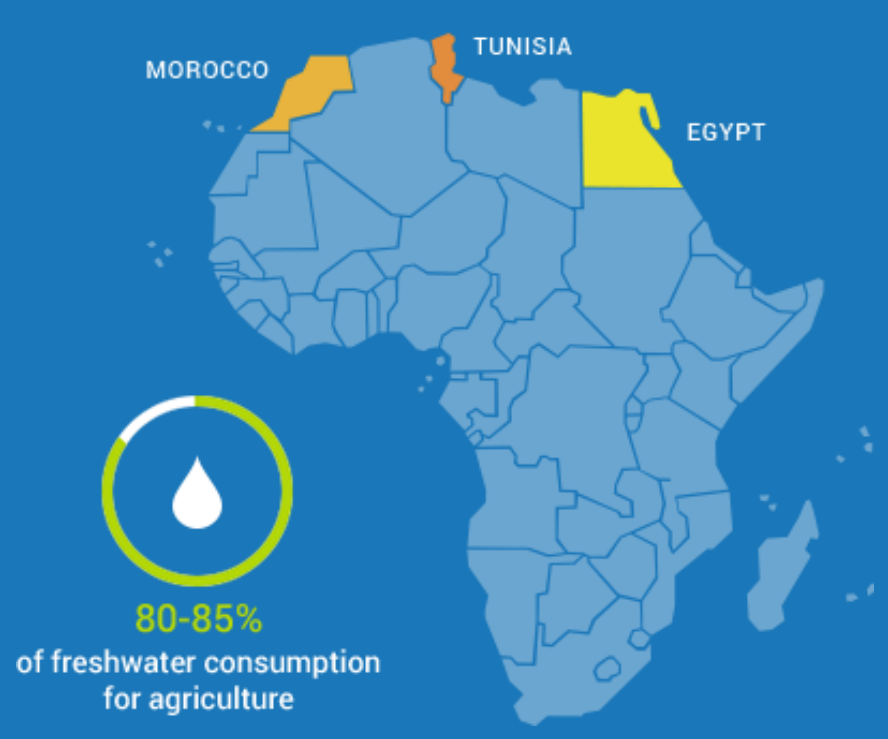
The MADFORWATER consortium consists of 17 partners geographically distributed mainly around the Mediterranean Sea in 7 European countries, 3 MACs and China. It comprises 9 universities, 4 research centres, 1 international non-profit organization (FAO), 1 consultant and SME expert of marketing, business plan development and innovation management and 2 SMEs in the fields of WW treatment and irrigation.

The MADFORWATER partners have a multi-disciplinary expertise that includes wastewater treatment, irrigation, life cycle analysis of technologies, cost benefit analysis of technologies, water vulnerability analysis, stakeholder involvement, integrated water management, capacity building, business plan development.

MADFORWATER Project

DevelopMent AnD application of integrated technological and management solutions FOR wasteWATER treatment and efficient reuse in agriculture tailored to the needs of Mediterranean African Countries

Climate change and population growth are expected to exacerbate the water crisis of Mediterranean African Countries (MACs), where agriculture accounts for 80-85% of freshwater consumption. The aim of the MADFORWATER project was to develop a set of integrated technological and management solutions to enhance wastewater treatment, treated wastewater reuse for irrigation and water efficiency in agriculture in three MACs (Tunisia, Morocco and Egypt)



The MADFORWATER research and innovation project, started in June 2016, and aimed to develop a set of integrated technological and management solutions to enhance wastewater treatment, treated water reuse for irrigation and water efficiency in agriculture in Egypt, Morocco and Tunisia. MADFORWATER focused on municipal, agro-industrial and industrial wastewaters, as well as on the drainage canal waters of the Nile Delta. The development and validation of technologies was combined to the definition of integrated water management strategies, tailored to the local context of selected hydrological basins in Egypt, Morocco and Tunisia.

For more info about the project visit the MADFORWATER website at: www.madforwater.eu or contact us: dario.frascari@unibo.it.

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