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ACCBAT

Adaptation to Climate Change through improved water demand management in irrigated agriculture by introduction of new technologies and best agricultural practices

REGIONE AUTÒNOMA
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The project "Adaptation to Climate Change through Improved Water Demand Management in Irrigated Agriculture by Introduction of New Technologies and Best Agricultural Practices - ACCBAT" is implemented under the ENPI CBC Mediterranean Sea Basin Programme (www.enpicbcmed.eu). Its total budget is 4,998,952.50 Euro and it is financed, for an amount of 4,498,152.50 Euro (90%), by the European Union through the European Neighbourhood and Partnership Instrument.

EuropeAid Development and Cooperation Office http://ec.europa.eu/europeaid/index_en.htm - ENPI CBC Med Programme http://www.enpicbcmed.eu

1. The ACCBAT project: increase in irrigation efficiency and the reuse of wastewater in agriculture

ACCBAT (*Adaptation to Climate Change through improved water demand management in irrigated agriculture by introduction of new technologies and best agricultural practices*) is a strategic project launched by ICU (Institute for University Co-operation Onlus) in December 2012 funded by the European Union (90%) under the programme ENPI CBC-Med 2007-2013 (*European Neighbourhood and Partnership Instrument Cross-Border Cooperation in the Mediterranean*). This programme contributes to the promotion of cooperation in the Mediterranean Basin for the purpose of encouraging sustainable development and increasing the development potential of the countries involved. Among the priorities of ENPI CBC-Med, there is also the promotion of sustainability on a basin-wide scale, using measures designed to preserve the natural heritage. At the same time, it is committed to promoting water management actions in the countries involved[1]. ACCBAT is part of ENPI CBC-Med's general strategy, working on the priorities of the latter in order to promote sustainability at basin level (2nd priority); in particular, the project focused on the management of water resources (objective 2.1).

The partners of the project are: The National Center for Agricultural Research and Extension of Jordan- NCARE, the Lebanese Ministry of Agriculture, the Tunisian Ministry of Agriculture, and the Po River Basin Authority (Autorità di Bacino del fiume Po – ADBPo) in Italy.

1.1 Problems of the target countries and objectives of the project

The need for action to be taken in the target countries has emerged in the face of the difficulties encountered by the partner institutions in putting activities into practice to improve irrigation efficiency and reuse wastewaters in agriculture.

In the three countries, in fact, the use of **wastewaters** for agriculture is an objective of the national strategies and investments have been earmarked for the construction of WWTPs (*wastewater treatment plants*); however their effective spread in agriculture is still scarce, due to the poor quality of this water and the inability of the local institutions to transmit the required *know-how* to the farmers. Moreover, the

1 For further details on CBC-Med priorities, consult the official website http://www.enpicbcmed.eu/programme/about-the-programme/priorities-and-measures

irrigation networks are generally characterised by rather inefficient methods and high water losses due to farmers' lack of knowledge on the piloting of irrigation, and these problems add to the widespread conditions of water scarcity and drought that is a typical feature of these territories.

Specifically, the aim of ACCBAT is to improve the management of the water demand by the agricultural sector in Jordan, Lebanon and Tunisia. To this end, the project seeks to improve water use efficiency, to reduce the negative impact on the environment and to increase the use of treated wastewaters as a water supply source for irrigation, basing itself on strategies for the transfer of know-how and on training on *Best Agricultural Practices*.

The project produced the following results:

- technology transfer in the three target countries, with increased water use efficiency and the replacement of traditional water sources with wastewaters treated in pilot demo parcels;
- reinforcement of institutional capacities in the introduction of innovative technologies, in the Extension Services, and in the development of effective response strategies to the depletion of water resources in the partner countries; consolidation of the institutional network;
- increase in the profits of the farmers involved, with consequent improvement of their social and economic conditions;
- improvement of regional and international cooperation between the target countries and the other countries of the Mediterranean on the use of treated wastewaters for irrigation, with the employment of a shared water quality indicator developed by the project;
- actions to spread awareness of the problems concerning water and sustainability in agriculture; acceptance by the populations of the use of treated wastewaters in agriculture.

1.2 Activities, obtained results and beneficiaries

The project aimed to improve agricultural practices with a view to increasing water use efficiency and promoting the use of non conventional sources, such as treated wastewater and salt water. To this end, the areas and treatment plants on which to carry out the pilot project were selected:

- In Tunisia, the treatment plants of Beni Khiar and Nabeul that supply the irrigation perimeter of Oued Souhil and areas for the piloting of irrigation with conventional water sources in the perimeters of Beni Khalled, Haouaria (region of Cape Bon) and for the irrigation of treated salt waters in the region of Mahdia;
- In Jordan, the treatment plants of Ramtha (in the region of Irbid), Al Salt (Balqa Region) and Madaba (Region of Madaba), situated in the west to north-west area of the country;
- In Lebanon, the wastewater treatment plant of Ablah, District of Zahleh, in the Bekaa Valley.

Figures 1-2-3: ACCBAT area of intervention in Tunisia, Jordan and Lebanon

Source: Google Earth

Pilot demo fields have been prepared at the agricultural research centres of the three local partners and on the land of 2 farmers. They represent a tool for evaluating and demonstrating the advantages of the technological solutions introduced.

In Lebanon, the demo fields have been prepared on the land of two farmers to highlight any differences in production, using both treated wastewater and well water.

In Jordan, the demo plot at the NCARE research centre in Ramtha has been equipped with:

- a drip irrigation system equipped with filters and volumetric fertiliser system, the correct management of which will enable increased irrigation efficiency and savings on the use of fertilizers;
- a water storage basin made of stainless steel and plastic, covered with nonwoven fabric in order to minimise losses of water due to evaporation and the proliferation of algae, which offers greater flexibility as regards the adoption of irrigation practices and an improvement of the quality of the water obtained through settling.

In Tunisia, a demo field was prepared at the experimental centre of INRGREF[2] in Oued Souhil. It consists of a localised irrigation system with treated wastewater composed of pre-filtration devices, two 500 m3 storage and settling basins, each lined with geomembrane, pumps and sand and disc filters, fertiliser injectors and dripping lines, which enable the irrigation of 5 ha of fruit trees. Another demo field was prepared at the Technical Centre of Citrus of Beni Khalled, where the project built a system to demonstrate the efficiency of the piloting of the irrigation of a hectare with conventional water sources, equipped with filtration and fertigation system.

In Tunisia, a demo plot for the use of non-conventional water for irrigation has been established in Mahdia. In this area, the project contributed to the creation of a desalination unit (reverse osmosis) for brackish waters to be used in irrigation. The plot is composed by: a 150m3 storage basin for conventional water, a 200m3 storage basin for desalinated water and another basin of 600m3 for the storage of mixed waters (desalinated and conventional waters). A total of capacity of 200 m3/per day will be desalinated to reduce the quantity of mineral salts from 4.8 g. to 1.5 g. per litre of water and a total of 300m3/per day of mixed water will be used for the irrigation of about 60 greenhouses. Moreover, in the framework of the project, 24 farmers' greenhouses will benefit of irrigation equipment for a total coverage of 1.5ha.

In Jordan, the areas and beneficiaries of the project are located in some of the most densely populated areas of Jordan, the land of which is suitable for farming activities, and the production of treated wastewater is constant throughout the year. In Jordan 31 farmers have been equipped for a total area of 18ha: 10ha irrigated with

2 *Institut National de Recherches en Génie Rural, Eaux et Forêts* (Tunisia).

TWW and 8ha irrigated with more efficient irrigation systems with a mix of TWW and conventional water.

In the area assigned to the Al Salt plant, 11 farmers were selected with plots of land having average dimensions of 10-20 dunums (1-2ha). This land is mainly dedicated to growing fruit trees (olives, lemons, grapes, peaches, apricots and plums). Surface irrigation is used to water this area. In this area, a single storage basin with a capacity of approx. 200m^3 was built, equipped with a piping system from which the water is conveyed by gravity to the beneficiary farms.

Figure 4: Treatment plant at Al Salt

Source: ACCBAT

In the area of Ramtha a selection was made of 10 farmers producing fodder crops (clover, barley, corn, sorghum and alfalfa) and 7 water tanks were installed for water storage together with a pumping system and a drip irrigation network covering a surface area of 10du (1ha). Another 3 farmers who already had a water storage basin were given a drip irrigation with a capacity to cover an area of 10du (1ha).

In the area served by the Madaba plant, 10 farmers producing fodder crops were selected and 8 water storage basins were constructed complete with a pumping system to water the plots. 2 farmers who already had a water storage tank were given a drip irrigation system complete with filters and fertiliser injector, with a capacity to cover an area of 10du (1ha). In Jordan, 17 metal reservoirs for treated wastewater for a total capacity of 3,400 m3 have been built.

In Lebanon, 30 farmers were selected for a total area of 15 ha. Of these farmers, 28 will receive treated wastewater from the Ablah plant, while other 2 will

continue to use conventional water sources with more efficient irrigation systems. On the farmers' 30 plots of land, in which vines for table grapes are grown, efficient drip irrigation systems fitted out with fertigation injectors were installed.

Moreover, on land belonging to the Municipality of Ablah, a **storage basin** with a capacity of approximately 15,000 m^3 for storing treated wastewater was constructed, which will enable the farmers, for irrigation, to replace conventional water sources with treated wastewater from the nearby WWTP of Ablah.

In Tunisia, the following activities were carried out:

- in the irrigation perimeter of Oued Sohuil, 7 farmers, for a total of 7 ha, benefitted from the installation of a modern and innovative system for drip irrigation with treated wastewaters. It consists of a localised irrigation system composed of pre-filtration devices, two 400 m^3 storage and settling basins made of corrugated steel, pumps and sand and disc filters, fertiliser injectors and dripping lines.
- 25 farmers of the irrigation perimeter of Beni Khalled, for the growing of citrus fruits in an area of 25 ha, benefitted from a modern drip irrigation system. 4 of them also benefitted from 100m^3 basins for the collecting of conventional water sources;
- 24 farmers of the irrigation perimeter of Haouaria, for the growing of horticultural products, peanuts and tomatoes covering a total area of 22 ha, were also fitted out with modern systems for drip irrigation with the use of conventional water sources.

In some of the project target areas of the three countries, 5 **agricultural meteorological** have been set up so that irrigation techniques that take into account the effective water requirements of the crops can be put into practice (piloting of irrigation).

Figure 5: Tunisia - Haouaria meteorological station and irrigation systems

Source: ACCBAT

In parallel with the infrastructural works in the field, the project contributes to **reinforcing the local institutions** by improving their know-how on the management of irrigation and good agricultural practices and on the use of treated wastewater in agriculture. To this end, ACCBAT has assessed the training needs of the *Extension Agents* and the staff of the project's partner institutions by drawing up a strategy and a custom-tailored training road map, associated with field trips, workshops, conferences and seminars.

Figures 6-7: Tunisian Ministry of Agriculture staff training on fertigation

Source: ACCBAT

Training modules were also developed for the **farmers**, who, like the staff of the local institutions, benefitted from theory lessons and field days focusing on the

use of efficient irrigation methods and practices and the use of treated wastewater.

The aim of ACCBAT is also to improve **cooperation** in the countries involved on the quality and management of water resources for agriculture in the Mediterranean, through the development of a **water quality index** common to the three countries, with the final aim of reconciling and combining the existing laws.
As part of the project, international conferences and a study tour in Italy have been held attended by project partners, *stakeholders* and local and international players, and cooperation initiatives and exchanges with research centres and international agencies have been launched.

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The project in brief

Most of the countries bordering the Mediterranean Basin are in a state of physical water scarcity, in particular in the Southern and Eastern shore. This situation is getting alarming since water demand is growing rapidly due to intensified agriculture, industrial development, population growth and climatic change. In Jordan, Tunisia and Lebanon, water use efficiency and the use of treated wastewater in agriculture have already been incorporated in national strategies and priorities. Unfortunately, the stakeholders responsible to put these strategies into practice have not enough means and experience to target these goals and consequently need more support.

ACCBAT is conceived to respond to this specific expectation. In this framework, the project aims at improving water demand management and ensuring water needs of the agricultural sector through the increase of water-use efficiency and of use of treated waste water. Pilot actions, reinforcement of capacity building and training will be the key activities to achieve this objective.

Beneficiary

ICU - Istituto per la Cooperazione Universitaria - ONLUS (Italy, Lazio)

Partnership

National Centre for Agricultural Research and Extension (Jordan, Al Baqa)
Lebanese Ministry of Agriculture (Lebanon)
Tunisian Ministry of Agriculture (Tunisia, Tunis)
ADBPO - River Po Basin Authority (Italy, Emilia-Romagna)

Specific objective

To improve water demand management and ensure water needs of the agricultural sector on a regional scale through increase of water-use efficiency, increased use of treated waste water for irrigated agriculture, and reduced negative environmental impact, based on technology transfer and training in Best Agricultural Practices, that allow for adaption to climate change.

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