

Technology Fact Sheet for Adaptation

N. Use of Treated Wastewater in Irrigation ⁱ

Technology characteristics	
Introduction	The most common use of wastewater is for irrigation In Lebanon, until few years ago, most collected wastewater was discharged without any treatment into rivers, streams, groundwater and coastal bathing water. Wastewater disposed into rivers is used downstream for irrigation and in some cases for drinking purposes. This has resulted in the spread of waterborne diseases such as typhoid, dysentery and diarrhea. Recently, more than twenty five wastewater treatment plants have been planned to serve major cities of which several are under construction. A number of small-scale wastewater treatment plants have been implemented in various communities. To date, some of these plants are operational; they provide a secondary treated effluent that could be used for irrigation. Such effluent must follow regulations that permit the use of appropriately treated wastewater for irrigation of specific crops. However, effluent quality does not consider the required standards and farmers are using it to grow and wash vegetables. The proposed technology presents a model or protocol for reusing of treated wastewater in irrigation, for recommended crops. The objective is to make an efficient use of treated waste water, ensure water for plants, without having any negative impact on human health or the environment.
Technology characteristics/highlights	Success in using treated wastewater for crop production will largely depend on adopting appropriate strategies aimed at optimizing crop yields and quality, maintaining soil productivity and safeguarding the environment. Farmer should have prior information on effluent supply and its quality to ensure the formulation and adoption of an appropriate on-farm management strategy. Basically, the components of an on-farm strategy in using treated wastewater will consist of a combination of: crop selection, selection of irrigation method, and adoption of appropriate management practices. The degree to which the use of treated effluent influences crop selection will depend on Government policy on effluent irrigation, the goals of the user and the effluent quality.
Institutional and organizational requirements	Government policy will have the objectives of minimizing the health risk and influencing the type of productivity associated with effluent irrigation. Regulations must be realistic and achievable in the context of national and local environmental conditions and traditions. Finally, Government policy could be produced on the basis of the Lebanese guidelines proposed by the Food and Agricultural Organization (FAO) within the project: "Wastewater reuse and sludge valorization and reuse" that have taken place at Iaat-Baalback.

Operation and maintenance	Operation and maintenance consist primarily of carefully managing the supply and quality of treated effluent and properly selecting the irrigated site, crop to be grown and irrigation method in order to minimize the health hazards. Moreover, building capacities of farmers and all the concerned entities is required.
Endorsement by experts	In Lebanon, very limited research was conducted in the field of wastewater reuse. It is recommended to start as soon as possible, research projects on treated wastewater in agriculture. The findings of these projects will help to validate the Lebanese guidelines proposed by the Food and Agricultural Organization (FAO) within the project: "Wastewater reuse and sludge valorization and reuse"
Adequacy for current climate	Fits well, both for present and expected climate
Scale/Size of beneficiaries group	The beneficiaries involved with such technology could be primarily farmers and the Water Establishments that are responsible for water supply, irrigation and wastewater. Other government organizations with important roles in the wastewater and irrigation sectors are the Ministry of Energy and Water, the Council of Development and Reconstruction, the Ministry of Environment, the Ministry of Agriculture and the Ministry of Interior and Municipalities. As wastewater treatment and reuse have been recently introduced in Lebanon, there is considerable lack of capacities among concerned stakeholders. Capacity building and awareness rising in the field of wastewater reuse are urgently needed.
Disadvantages	Disadvantages could be related to the fact that most of the treatment plants are either not yet implemented or operating at very low capacity. Moreover, problems remain for convincing farmers to collaborate because usually they are using raw wastewater for irrigation. It should be noted that the conventional treatment plants are expensive and require high energy demand compared to some biological treatments such as constructed wetlands (i.e. treatment through reed plantation) that are cost-effective and low energy demanding.
Capital costs	
Cost to implement adaptation technology	It includes the cost related to the elaboration of research experiments on different irrigated crops with treated wastewater.
<u>Additional</u> cost to implement adaptation technology, compared to "business as usual"	Business as usual is currently the irrigation with raw wastewater to different crops. The additional cost will be limited to the cost of extension or training for farmers on how to use the treated wastewater.
Development impacts, direct and indirect benefits	
Direct benefits	Increase water resources for irrigation.
Reduction of vulnerability to climate change, indirect	The wastewater reuse is beginning to address the challenges posed by climate change, including regulatory burdens and pressure to reduce emissions. It enables coping with water shortage.
Economic benefits, indirect Employment Growth & Investment	Creation of jobs to provide training to farmers Can create investments in mobilizing treatment plants construction and appropriate irrigation transmission network
Social benefits, indirect Income	The technology can provide alternative water source for farmers that

Education	they can use to grow crops in areas where there is a lack of water for irrigation, and thus, they can increase their income.
Health	The reuse of treated water for irrigation will increase the educational level of farmers and food consumers about water quality, water-borne disease, and the importance of recycling water under future climate Improvement of health conditions by avoiding waterborne diseases usually developed in raw wastewater polluting watercourses
Environmental benefits, indirect	The use of wastewater is one of the most sustainable alternatives to cope with water shortage. It would have a number of advantages that include closing the gap between supply and demand, stopping the pollution of fresh water resources, and providing sound solution to water scarcity and climate change.
Local context	
Opportunities and Barriers	Wastewater reuse needs to be seen as an essential component of national strategies for integrated water resource management as well as a means to deliver economic benefits and environmental opportunity while securing water for population growth and economic development. Therefore, the Government should be involved by putting guidelines for wastewater reuse. At present there is no irrigation transmission network to convey the treated effluent to the agricultural lands. The development of a database on pilot agriculture area is needed as well as a soil monitoring programme.
Market potential	The market potential depends largely on the implementation of treatment plants
Status	Present in very few areas in the country (i.e. Iaat), but still not widely adopted.
Timeframe	The implementation can start on pilot agricultural area (short to medium).
Acceptability to local stakeholders	The technology is more or less difficult to be implemented since it depends largely upon its tolerance by farmers and local communities

ⁱ This fact sheet has been extracted from TNA Report – Technology Needs Assessment Reports For Climate Change Adaptation – Lebanon. You can access the complete report from the TNA project website <http://tech-action.org/>