Sustainable **Water treatment** and
Agricultural reuse options in Europe

Info-package 2
Agricultural Advisory Services

Fact Sheet 2.1 – **Cost benefit analysis and feasibility of using reclaimed water**

SUWANU EUROPE is a H2020 project aiming to promote the effective exchange of knowledge, experience and skills among practitioners and relevant actors on the use of reclaimed water in agriculture. This factsheet is part of a total of 5 factsheets in Info-package 2 aimed at agricultural advisors, that describes the principle, the interest and the method of Cost-Benefit Analysis (CBA) that should be integrated into the feasibility assessment process of water reuse projects.

1. Cost-benefit analysis : a valuable method to assess water reuse feasibility

The Cost-benefit analysis (CBA) is a method used to analyze projects to determine whether they are in the public's and private sector's interest (evaluate sustainability) thanks to the assignment of monetary value to each input and output resulting from the project. The CBA starts then from the premise that an investment should only be commissioned if the benefits exceed the aggregate costs. CBAs are thus implemented (i) to compare each other technical water reuse scenarios, and alternative scenarios, (ii) to assess projects' economic profitability for a community on a specific territory, and (iii) to identify which stakeholders win/lose to draft correction actions to reach a win/win balance. This very well-known methodology is rarely carried out for water reuse projects, or only partially. Moreover [Molinos-Senante et al., 2011] highlighted that the assessment of water reuse projects usually focuses on internal costs and benefits, and that more projects are economically viable when external benefits are integrated into a CBA analysis. Thus environmental and social costs and benefits (or impacts/externalities) need to be switched to monetary values to be integrated into a CBA (Condom et al., 2012 and Molinos-Senante et al., 2010) using specific valuation methods.

2. Case study of Clermont-Ferrand (France) : application and results of an ex post CBA

The agricultural water reuse project of Clermont-Ferrand is by far the largest water reuse project implemented in France with 1400 ha equipped for irrigation since 1996. The detailed economic analysis (CBA) below is therefore an ex post assessment. The water reuse project was initiated by local farmers : they had no access to any other major water resource on the territory. Indeed, irrigation was considered indispensable: (i) to increase and secure yields in an area where climatic conditions are highly variable from one year to another; and (ii) to enable farmers to comply with production specifications from a local seed company that required irrigation on seed maize.

The main crops of the area are maize (grain and seeds), sugar beet and wheat. Seed maize has the highest gross margin for farmers. Sugar beet production is sent to a sugar factory. The wastewater treatment plant (WWTP) is adjacent to the sugar factory and to the agricultural fields (Figure 1).

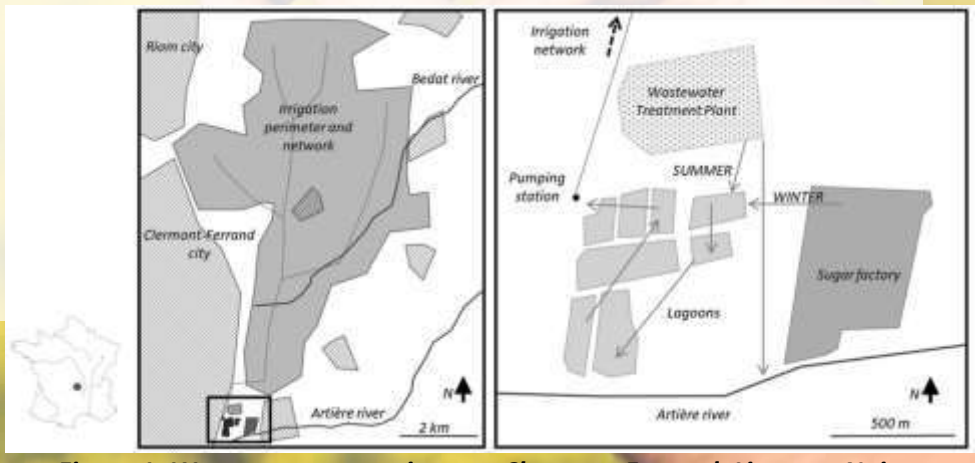

Figure 1: Water reuse scenario map, Clermont-Ferrand, Limagne Noire

Here, the implemented water reuse scenario and the benchmark scenario (no water reuse) are compared into a CBA. The main stakeholders involved are the sugar factory, the farmers (as a whole), and the funding agencies.

In the **water reuse scenario** (existing situation) pre-reclaimed water is supplied for free by the Clermont-Ferrand urban district, owner of the WWTP, to the farmers. The farmers' association is in charge of additional reclamation and responsible for irrigation water quality (compliance with irrigation water reuse regulations). A complementary reclamation is therefore required before use : 12 ha of lagoons, property of the sugar factory, are then used. In winter, the sugar factory uses the lagoons to store its effluents before spreading them onto the perimeter using the distribution system (Step 1). Then in early spring, when the lagoons are empty, they are used as tertiary treatment and storage space for reclaimed water before irrigation (Step 2).
Of the initial investments (distribution system, irrigation material, lagoon rehabilitation and sanitary studies), 59% were subsidized. The sugar factory bears part of the maintenance and operation (energy) costs proportional to the transiting volumes in Step 1.

The **benchmark scenario** (hypothetical situation) is the situation as it would have been without water reuse: farmers would have kept pumping into a small creek, the Bedat, to irrigate 200 ha (limited volume of water available) without affecting its quality. Irrigated seed maize surfaces would have significantly decreased compared to the water reuse scenario. It is considered that the rainfed crops distribution in the remaining perimeter (1200 ha) would have been similar to another rainfed perimeter located nearby.
Before water reuse implementation the effluent produced in winter by the factory used to be stored in the 12-ha lagoon system before being conveyed and treated by the Clermont-Ferrand WWTP in summer. In the benchmark scenario it is considered that the sugar factory would have kept on sending its effluent for treatment to the WWTP.

All detailed costs and benefits used in the CBA are detailed in reference [1]. Beyond OPEX and CAPEX the 2 major differences between the 2 scenarios are:

- In the benchmark scenario the sugar factory would have kept on sending its effluent for treatment to the WWTP at a high cost (€1.9 m^3), instead of spreading them on the fields, thus representing a high cost for the sugar factory.
- Total gross margins for farmers were calculated for both scenarios, considering the crop distribution.

Calculated economic Net Present Value (NPV) of the project is positive and around €10.1 Millions over 50 years (Figure 2). The project is sustainable for the community and it was worth being subsidized. The two stakeholders involved (farmers and the sugar factory) also get a positive financial NPV. Furthermore, the project's NPV would still be positive without public subsidies and the benefit shared among the two agents is largely in favour of the sugar factory.

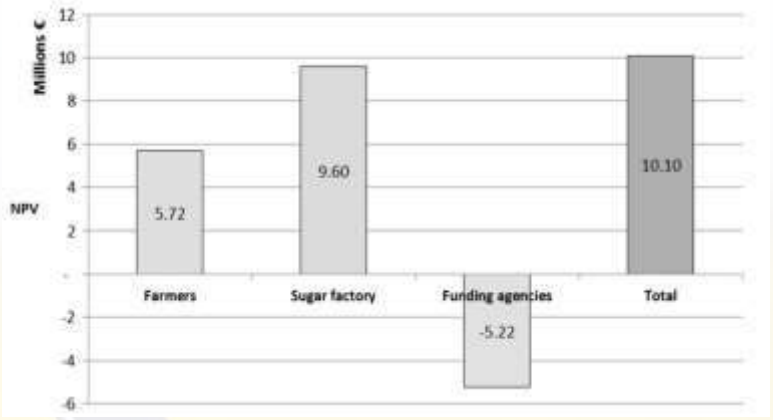

Figure 2: NPV of the different stakeholders, Clermont-Ferrand

References/further readings

[1] Declercq, Loubier, Condom and Molle, 2017, SOCIO-ECONOMIC INTEREST OF TREATED WASTEWATER REUSE IN AGRICULTURAL IRRIGATION AND INDIRECT POTABLE WATER REUSE: CLERMONT-FERRAND AND CANNES CASE STUDIES' COST–BENEFIT ANALYSIS, Irrig. and Drain. DOI: 10.1002/ird.2205
[2] Condom N, Lefebvre M, Vandome L. 2012. Treated Wastewater reuse in the Mediterranean: Lessons Learned and Tools for Project Development. Blue Plan Papers 11. Plan Bleu, Valbonne, France.
[3] Molinos-Senante M., et al. 2011. Cost-benefit analysis of water-reuse projects for environmental purposes: a case study for Spanish wastewater treatment plants. Journal of Environment Management, 92 3091-3097

CONTACTS:
Coordinator
Rafael Casielles (BIOAZUL SL)
Avenida Manuel Agustin Heredia nº18 1º4 Málaga (SPAIN)
Mail | info@suwanu-europe.eu **Website |** www.suwanu-europe.eu

CONTACTS:
Responsible for Factsheet
Rémi Declercq (ECOFILAE)
+33 7 63 07 89 30 | remi.declercq@ecofilae.fr | www.ecofilae.fr

THIS PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION' HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME UNDER GRANT AGREEMENT N. 818088