

# Mediterranean Cooperation in the Treatment and Valorisation of Olive Mill Wastewater (OMW)

## MEDOLICO

### Deliverable 1

#### Olive mill wastewater management:

- Activity 4.1 Analysis of OMW management existing status
- Activity 4.2 Overview of legal framework
- Activity 4.3 Technological benchmark
- Activity 4.4 Potential Valorization of OMW by-products



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## Summary

Olive cultivation and production of olive oil have begun in the Middle East, and spread west in the early times of agriculture. Moreover, for Mediterranean countries, olive cultivation for olive oil production had and still has cultural importance and positive human-health impacts. In fact, the presence of high value molecules, such as oleic acid, even if in trace, can be associated to positive effects in tumors and cardiologic diseases prevention, linked to the Mediterranean diet, in accordance with epidemiologic studies.

Today olive cultivation plays a major role in all Mediterranean countries, from preserving land and cultures to being an important component of their Gross National Product. The production of olive oil is accompanied by the discharge of wastes that may comprise up to 8 times more in weight and volume than the oil. Of these wastes, the most problematic is the olive mill wastewater (OMW), which is generated in volumes of up to 6 times more than the oil, and is toxic to the environment when discharged as is. To add to this, being a seasonal waste, the feasibility and economics of establishing treatment facilities is problematic. OMW can however be divided into water and efficient natural antioxidants and other compounds of potential commercial value. Since the 1950's the industry searches for a good solution for this potentially valuable waste stream, but as described here, the dominating solution in most producing countries to-date is discharge to the environment. The European committee (EC) as well as individual producing countries invest time and money in designing efficient solutions to treat OMW, and in some countries specific legislation is enforced. The problems arising from the above are aggravated in recent years with both growing water scarcity and the care for the environment. In many producing countries, water scarcity has always been a problem, and saving the water from the olive oil milling process is a justified cause for itself. Among these are Cyprus, Jordan and Israel, but also Greece, southern Italy and southern Spain, and the North African producing countries.

Treatment technologies have been developed and patented for decades, and may be divided into four subcategories: biological, physicochemical, advanced oxidation processes and combined techniques. A plentiful of patents and scientific publications were published and should have led to diminishing the problem through valorization and re-using of OMW water and components. It is surprising that treatment facilities in the larger producing countries are scarce, and one cannot find the valuable products on the shelves as over the counter (OTC) remedies or food additives. A careful analysis of the available data must bring to the conclusion that the lack of incentives is the major contributor to the lack of implementation of available technologies. While water prices are in the rise, as well as



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markets for natural beneficial products, olive oil prices are going down and social process create pressure on the mills, one has to tackle the incentives issue. This is indeed one of the outcomes of this review, and in agreement with the Oleico+ project. In smaller countries like Cyprus, which is also more sensitive to water issues, most of the mills already treat their OMW. In producing countries like Portugal, where the olive oil sector is dynamically changing, traditionally mills are rapidly replaced by modern ones, and those newly established mills, assisted by governmental and local funds seek for technologies to treat OMW. It is suggested that the combination of high fines to waste dischargers and supporting public funds will push the industry to treat its waste.

This document includes a thorough literature review, which focuses on publications from 1996 to 2012. The important lessons from this document are that the problems associated with OMW should be approached in the national and international arenas by harmonizing regulations in the EC and worldwide, increasing implementation and enforcement, e.g. high fines, and not less important – funds should be made available to mills and producers to support the establishment of treatment facilities; and in the industrial arena by promoting applied research to improve existing treatment procedures, invent novel and innovative means of treatments and valorization and establishing feasible and economical treatment and valorization technologies that will fit the various mills in terms of size of production, distance from water bodies, distance from agricultural lands and local traditions and regulations. The purpose of MEDOLICO within this document is to highlight the existing situation and the technologies that could be implemented in representative mills within the partners countries, and propose ways to implement them. In comparison to previous projects, MEDOLICO has the specific objective to valorize and to re-use substances in OMW, which is usually considered as a waste. In this project, these substances are considered as potential precious resources for re-use, in order to decrease management costs and to set up virtuous production cycles, more environmental-friendly. Through the MEDOLICO project three important technologies will be studied and developed such as catalytic photo-decomposition, high performance biological decomposition systems and membrane technologies with the specific goal to recover the treated water for agriculture purposes. In addition, the use of membrane technologies will be also evaluated for the recovery and valorization of high added value molecules, like polyphenols present in olives and in their vegetation waters.