



**LIFE + Environment Policy and Governance**

Project Number: LIFE10 ENV/GR/594

Duration: 01/09/11 – 31/08/15



**Project:** Best practices for agricultural wastes (AW) treatment and reuse in the Mediterranean countries

[www.wastereuse.eu](http://www.wastereuse.eu)

Action 2 - Initial assessment of existing AW treatment technologies

*Deliverable “Inventory of all available technologies for AW treatment, grouped by level of development (lab, pilot, full scale)”*

Prepared by: TUC

TUC coordinator: Prof K. Komnitsas

Technical University Crete

Dpt. Mineral Resources Engineering

Kounoupidiana, 73100

Hania, Crete, Greece

email: [komni@mred.tuc.gr](mailto:komni@mred.tuc.gr)

Reviewed by: Prof A. Zouboulis, Aristotle University of Thessaloniki, Greece

Report due: 31/03/12

Report submitted on: 31/03/12

**Contents**

Page number

Executive summary ..... 3

1. Introduction ..... 4

2. Agricultural waste ..... 4

    2.1 *Olive oil mill wastewaters (OMW)* ..... 5

    2.2 *Wine waste* ..... 5

    2.3 *Swine waste* ..... 6

    2.4 *Animal waste* ..... 6

    2.5 *Rice straw* ..... 6

3. Treatment technologies for AW ..... 6

References ..... 8

ANNEX I ..... 10

## **Executive summary**

In the line of Action 2, all available data regarding funded projects focused on the development of technologies for the treatment of agricultural wastes (AW) produced in the Mediterranean region, have been collected by Technical University of Crete (TUC). Data collection has focused on technologies developed for the treatment of the most important AW produced in large quantities in Med countries (mainly in Spain, Italy and Greece), namely olive oil mill wastewaters (OMW), wine, swine and animal waste, rice straw and various other AW eg. waste from cultivation and handling of fruits, horse or chicken manure, wheat straw etc.

TUC has extensively searched all relevant and available databases (LIFE, Sciencedirect, Scopus, Cordis, Google etc.) to collect data. A total of 49 funded projects have been identified; 16 of the projects are ongoing and active websites are available for only 29 projects.

All available technologies for AW treatment have been included in a comprehensive inventory (grouped by type of waste, level of development and coordinating country) which is also uploaded on the web-site of the project. Details for each project (duration, funding scheme, budget, beneficiaries) as well as a short description of the developed technologies are also included. More details can be found on the websites of the projects, where available.

## 1. Introduction

In the line of Action 2, all available data regarding funded projects focused on the development/application of technologies for the treatment of agricultural wastes (AW) produced in the Mediterranean region, have been collected by TUC. Data collection has focused on AW treatment technologies developed and used in Spain, Italy, Greece and other Med countries.

Actions 3 - 6 are based on the outcomes of Action 2. Actions 3 and 4 include lab experiments in order to evaluate the treated wastes derived from the different technologies developed so far, regarding their suitability to improve crop production and quality as well as to assess the potential effects on soil properties. The most suitable, environment friendly, low cost technologies will be used for the development of alternative cultivation practices for the main water and nutrient consuming crops in Spain and Italy; the feasibility of the application of treated wastes in open field and greenhouses cultivations will be also demonstrated (Actions 5 and 6).

European Commission has funded so far many projects (especially LIFE) pertinent to the development/application of AW treatment technologies aiming to recover useful by-products, minimize environmental impacts as well as produce “cleaner” waste for safe disposal. Also, some technologies to treat AW have been developed by private funding.

All available treatment technologies have been included in a comprehensive inventory (grouped by level of development, type of waste and coordinating country) which is also uploaded on the web-site of the project.

## 2. Agricultural waste

Agricultural wastes (AW) can be defined as the residues from the growing and first processing of raw agricultural products such as fruits, vegetables, meat, poultry, crops etc. This term includes both natural (organic) and non-natural wastes produced from various farming activities such as dairy farming, horticulture, seed growing, livestock breeding, grazing land, market gardens, nursery plots and even woodlands. AW can be in the form of solid, liquid or slurries depending on the nature of agricultural activities. Agricultural and food industry residues and wastes are characterized by seasonal production and also should be rapidly removed from the field to avoid interferences with other agricultural activities (Sarmah, 2009).

Depending on the agricultural activity, AW can be categorized as in Table 1 (Loehr, 1978). The most important AW produced in the Med region include olive oil mill wastewaters (OMW), wine, swine and animal waste, rice straw and various other AW (eg. waste from cultivation and handling of fruits, horse or chicken manure, wheat straw etc).

Although the quantity of wastes produced by the agricultural sector is significantly lower compared to wastes generated by other industries, the pollution potential of AW is high on a long-term basis. For instance, the land spreading of manures and slurries can cause nutrient and organic pollution of soils and waters. Given that animal excreta also contain a plethora of organic chemicals and pathogens, the risk for surface- and groundwater can be high (Sarmah, 2009).

Since the sources of agricultural wastes are diverse they can often be potentially hazardous and detrimental to the terrestrial and aquatic eco-systems. Uncontrolled and improper handling can often lead to many environmental adverse effects. Over-application of AW to crop land and pasture can result in decrease in crop production due to inhibitory amounts of nitrite nitrogen (NO<sub>2</sub>-N) or salts in the soil. Application of dairy effluents or feedlot manure to soils can also reduce their permeability and thus adversely affect crop growth. Excess loadings of nitrogen and phosphorus from AW applied to land may cause eutrophication of water bodies or contamination of drinking water (Sharpley et al., 1984; Anderson et al., 2002). Livestock wastes also contain significant amounts of steroid hormones (naturally released by animals of all species in urine) that may cause adverse effects on terrestrial and aquatic organisms (Jobling et al., 1998; Boxall et al., 2004).

Table 1. Characterization of AW depending on the agricultural activity (Loehr, 1978)

<i>Agricultural activity</i>	<i>Wastes</i>	<i>Method of disposal</i>
Crop production and harvest	Straw, stover	Land application, burning, plowing
Fruit and vegetable processing	Biological sludges, trimmings, peels, leaves, stems, soil, seeds and pits	Landfilling, animal feed, land application, burning
Sugar processing	Biological sludges, pulp, lime mud	Landfilling, burning, composting, animal feed
Animal production	Blood, bones, feather, litter, manures, liquid effluents	Land application, fertiliser
Dairy product processing	Biological sludges	Landfilling, land spreading
Leather tanning	Fleshings, hair, raw and tanned trimmings, lime and chrome sludge, grease	By-product recovery, landfilling, land spreading
Rice production	Bran, straw, hull	Feeds, mulch/soil conditioner, packaging material for glass and ceramics
Coconut production	Stover, cobs, husk, leaves, coco meal	Feeds, vinegar, activated carbon, coir products

### **2.1 Olive oil mill wastewaters (OMW)**

Generated in huge quantities over a short period every year (November - April), OMW represent a significant environmental problem in Mediterranean countries. One t of olives produces approximately 0.8 t of OMW which are characterized as acidic (pH 4-5), with an average chemical oxygen demand (COD) and biochemical oxygen demand (BOD) of 120 and 60 g/L, respectively, high concentration of suspended solids (7–15 g/L) and phenolic compounds up to 24 g/L. Their disposal may cause adverse effects on soils, surface- and groundwater. Various treatment methodologies including physical, chemical, biological and thermal options have been investigated and proposed aiming to decontaminate OMW prior to discharge or reuse, but when used individually suffer from drawbacks e.g. low efficiency or high cost. Due to the scattering of small olive oil production units in the Mediterranean countries, evaporation in ponds and disposal on agricultural land are the most commonly used OMW management options (Niaounakis and Halvadakis, 2006; Mekki et al., 2007; Khoufi et al., 2008; Zaharaki and Komnitsas, 2009; Camarsa et al., 2010).

### **2.2 Wine waste**

The wine making process results in the generation of significant amounts of solid waste and wastewater that should be further treated before disposed of in the environment. Wine waste can be divided into crush season (August to February) and non-crush season (March to July) waste involving mainly the production of solid waste and wastewater, respectively. In particular, solid waste can cause bad odours and contaminate soil and water resources; wastewater has a high organic content, contains both suspended (SS) and dissolved solids (DS), is usually acidic and

high in sulphide compounds which may lead to odour problems and in nitrogen concentration that can cause eutrophication of water sources (Report of LIFE03 ENV/GR/000223 project, 2004).

### **2.3 Swine waste**

The swine industry produces wastes in huge quantities and direct disposal causes severe environmental impacts such as odour increase, acidification due to emissions of NH<sub>3</sub>, SO<sub>2</sub> and NO<sub>x</sub>, increase of greenhouse effect due to emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, increase of organic and nutrient loading to surface- and groundwater due to the high BOD and nutrient content of piggery effluent, diffuse spreading of heavy metals, etc. Commonly employed waste treatment systems include aerobic and anaerobic ponds, anaerobic digestion, aerobic biological treatment using continuous flow activated sludge systems or sequencing batch reactors, composting of solid manure, incineration etc. (Deliverable of LIFE03 TCY/CY/000021 project, 2007, <http://pigwasteman.ari.gov.cy/>).

### **2.4 Animal waste**

Intensive livestock and poultry production results in large volumes of waste that threaten surface- and groundwater quality in case of waste spills, leakage from waste storage facilities and runoff from fields on which an excessive amount of waste has been applied as fertilizer. Animal waste generally refers to manure but also includes wastewater, urine, bedding, poultry litter and animal carcasses. The most common waste management practices include techniques to (1) limit waste runoff, such as cementing and curbing animal confinement areas or planting grassed buffers around these areas (2) collect and store waste, such as scraping or flushing systems and storage tanks or retention ponds (3) alter or treat waste, such as reformulating feed mixes or composting and (4) utilization of waste, such as organic fertilizer or additive to animal feed (GAO, 1999).

### **2.5 Rice straw**

Worldwide rice production is about 600 million t per year resulting in 810 million t of rice straw production, according to Food and Agriculture Organization of the United Nations. The most common treatments of rice straw include mulching in rice fields and on-site burning for producing manure or composting. Burning, which is difficult in most existing combustion systems, affects the air quality and the environment mainly due to CO<sub>2</sub> emission (Pütün et al., 2004; Sie et al., 2011). Composting is an attractive treatment of rice straw but may be inhibited due to variations of C/N ratio between 50 to 150; rice straw is rich in C and poor in N (Abdelhamid et al., 2004).

## **3. Treatment technologies for AW**

So far, many projects aiming at the development of AW treatment technologies have been funded within European Funding schemes and especially LIFE, as seen in Table 2. A total of 49 funded projects have been identified (16 of the projects are ongoing) and active websites are available for only 29 projects. TUC has searched all relevant and available databases (LIFE, Sciencedirect, Scopus, Cordis, Google etc.) to collect data.

All of the projects have focused on the development of innovative technologies for AW treatment as well as on the recovery of useful by-products and energy, minimization of the environmental impacts and production of “cleaner” wastes for safe disposal. Apart from European research/scientific communities, some technologies to treat AW have been developed by private funding, aiming at improving quality of the final products, minimizing waste volume and thus environmental degradation caused by their disposal.

All available technologies for AW treatment have been included in a comprehensive inventory (Table 3, Annex I) grouped by type of waste, level of development and coordinating country; the inventory is also uploaded on the web-site of the project. Details for each project (duration,

funding scheme, budget, beneficiaries) as well as a short description of the developed technology are also included. More details can be found on the websites of the projects, where available.

Table 2. Number of funded projects per type of AW (by March 2012)

<i>Waste</i>	<i>Number of funded projects (funded by)</i>
Olive oil mill wastewaters (OMW)	20 (11 by LIFE, 3 by FP5, 3 so far by FP7, 1 by ERDF Innovative Actions 2000-2006, 1 by SME, 1 by FAIR)
Wine waste	4 (by LIFE)
Swine waste	7 (by LIFE)
Animal waste	7 (6 by LIFE, 1 so far by FP7)
Rice straw	2 (by LIFE)
Various AW	9 (by LIFE)

Treated wastewaters or composted sludges produced by these technologies could potentially be used for irrigation and/or fertilization of crops after evaluation and definition of specific terms and conditions regarding their suitability to support plant growth, without causing phytotoxicity and other environmental problems. It is mentioned that AW treatment technologies, solely aiming at energy production are outside the scope of Action 2.

Co-utilization of treated or untreated waste (eg. OMW, wine waste, waste from the processing of fruits etc.) is explored in the frame of WasteReuse project. Also co-utilization of AW with sewage sludge may enhance the efficiency of AW treatment technologies, such as anaerobic digestion, composting etc. used to recover high added value products (soil improver, fertilizer for crops, compost). It is mentioned that in the frame of LIFE scheme, the following indicative projects relative to sewage sludge treatment, have been funded.

- “Recycling sewage sludge in forestry plantations”, funded by EC LIFE95 ENV/F/000682, duration 01-01-96 to 02-01-00, location France, no website is available.
- “New technique for recycling of nutrients in sludge and ash (Sludge & Ash)”, funded by EC LIFE98 ENV/S/000480, duration 01-11-98 to 31-10-02, location Sweden, no website is available.
- “Recycling of organic wastes through cofermentation in municipal sewage sludge digesters (Cofermentation in WWTP), funded by EC LIFE99 ENV/A/000406, duration 01-11-99 to 01-11-02, location Austria, no website is available.
- “Co-composting procedures and its use on afforestation, landscaping and forestry and agricultural crops in the Andalusian region (COMPOSTDISSEMINATION)”, funded by EC LIFE00 ENV/E/000543, duration 15-12-00 to 31-12-03, location Spain, no website is available.
- “The demonstration of high rate enzyme hydrolysis as the safest and most environmentally friendly way to treat sewage for the land recycling (MAD but better)”, funded by EC LIFE05 ENV/UK/000124, duration 15-01-05 to 30-06-07, location United Kingdom, website: [http://enzymichydrolysis.com/cms/index.php?option=com\\_content&view=article&id=19&Itemid=27](http://enzymichydrolysis.com/cms/index.php?option=com_content&view=article&id=19&Itemid=27).
- “Efficient recycling and disposal of sewage sludge with innovative thermo-catalytic low temperature conversion technique (LOTECOTEC)”, funded by EC LIFE06 ENV/D/000458, duration 01-11-06 to 30-04-10, location Germany, website: <http://www.lotecotec.de/>.

## References

1. Abdelhamid M.T., Horiuchi T., Oba S., 2004. Composting of rice straw with oilseed rape cake and poultry manure and its effects on faba bean (*Vicia faba* L.) growth and soil properties, *Bioresource Technology* 93, 183–189.
2. Anderson D.M., Gilbert P.M., Bukholder J.M., 2002. Harmful algal blooms and eutrophication: nutrient sources, composition, and consequences, *Estuaries* 25, 704–726.
3. Boxall A.B.A., Fogg L.A., Blackwell P., Kay P., Pemberton E.J., Croxford A., 2004. Veterinary medicines in the environment, *Reviews of Environmental Contamination and Toxicology* 180, 1–91.
4. Camarsa G., Gardner S., Jones W., Eldridge J., Hudson T., Thorpe E., O'Hara E., 2010. LIFE among the olives, Good practice in improving environmental performance in the olive oil sector, European Commission, Environment Directorate-General, Luxembourg: Office for Official Publications of the European Union, ISBN 978-92-79-14154-6 (available online: <http://www.scribd.com/doc/26776527/LIFE-among-the-olives-good-practice-in-improving-environmental-performance-in-the-olive-oil-sector>).
5. Deliverable “Identification of Best Available Techniques for the Cyprus Pig Farming Industry”, 2007. In the line of LIFE03 TCY/CY/000021 project “Guidelines to the Cyprus Competent Authorities for Policy Formulation for Sustainable Management of pig-farming wastes in Compliance with EU Practice (PIGWASTEMAN)”, duration 01-01-04 to 31-12-06, <http://pigwasteman.ari.gov.cy/>.
6. GAO (United States General Accounting Office, Washington), 1999. Animal Agriculture Waste Management Practices, Report to the Honorable Tom Harkin, Ranking Minority Member, Committee on Agriculture, Nutrition and Forestry, U.S. Senate.
7. Jobling S., Nolan M., Tyler C.R., Brighty G., Sumpter J.P., 1998. Widespread sexual disruption in wild fish, *Environmental Science & Technology* 32, 2498–2506.
8. Khoufi S., Aloui F., Sayadi S., 2008. Extraction of antioxidants from olive mill wastewater and electro-coagulation of exhausted fraction to reduce its toxicity on anaerobic digestion, *Journal of Hazardous Materials* 151(2-3), 531–539.
9. Loehr R., 1978. Hazardous solid waste from agriculture, *Environmental Health Perspectives* 27, 261-273.
10. Mekki A., Dhouib A., Sayadi S., 2007. Polyphenols dynamics and phytotoxicity in a soil amended by olive mill wastewaters, *Journal of Environmental Management* 84, 134–140.
11. Niaounakis M., Halvadakis C.P., 2006. Olive processing waste management, Literature Review and Patent Survey', Second Edition, Elsevier, Amsterdam.
12. Pütün A.E., Apaydm E., Pütün E., 2004. Rice straw as a bio-oil source via pyrolysis and steam pyrolysis, *Energy* 29, 2171–2180.
13. Report “Review on winery waste management technologies”, 2004. In the line of LIFE03 ENV/GR/000223 project “Development of an economically viable process for the integrated management via utility of winemaking industry wastes; production of high added value natural products and organic fertilizer (DIONYSOS)”, duration 01-10-03 to 30-12-06.
14. Sarmah A.K., 2009. Potential Risk and Environmental Benefits of Waste Derived from Animal Agriculture, In Agriculture Issues and Policies Series - Agricultural Wastes, Eds: Geoffrey S. Ashworth and Pablo Azevedo, ISBN 978-1-60741-305-9, Nova Science Publishers, Inc., New York.
15. Sharpley A.N., Smith S.J., Stewart B.A., Mathers A.C., 1984. Forms of phosphorous in soil receiving cattle feedlot waste, *Journal of Environmental Quality* 13, 211–216.

16. Sie J-L, Chang C-Y, Chen C-S, Shaw D-G, Chen Y-H, Kuan W-H, Ma H-K, 2011. Energy life cycle assessment of rice straw bio-energy derived from potential gasification technologies, *Bioresource Technology* 102, 6735–6741.
17. Zaharaki D., Komnitsas K., 2009. Existing and emerging technologies for the treatment of olive oil mill wastewaters, International Conference AMIREG 2009 “Towards sustainable development: Assessing the footprint of resource utilization and hazardous waste management” Athens, Greece (7 - 9 September).
18. [ec.europa.eu/environment/life/](http://ec.europa.eu/environment/life/) (accessed on 30/03/2012)
19. [http://cordis.europa.eu/home\\_en.html](http://cordis.europa.eu/home_en.html) (accessed on 30/03/2012)
20. <http://www.scopus.com/> (accessed on 30/03/2012)
21. <http://www.sciencedirect.com/> (accessed on 30/03/2012)
22. <http://www.resolve.com> (accessed on 17/02/2012)
23. <http://www.lifemanev.eu/> (accessed on 09/02/2012)
24. [http://www.crupa.it/nqcontent.cfm?a\\_id=3995](http://www.crupa.it/nqcontent.cfm?a_id=3995) (accessed on 09/02/2012)
25. <http://www.interwaste.org/> (accessed on 08/02/2012)
26. <http://www.achaia.gr/integraste/> (accessed on 08/02/2012)
27. [http://enzymichydrolysis.com/cms/index.php?option=com\\_content&view=article&id=19&Itemid=27](http://enzymichydrolysis.com/cms/index.php?option=com_content&view=article&id=19&Itemid=27) (accessed on 06/02/2012)
28. <http://www.lotecotec.de/> (accessed on 06/02/2012)
29. <http://www.biowaste.gr/site/> (accessed on 29/12/2011)
30. <http://www.tirsavplus.eu/> (accessed on 29/12/2011)
31. <http://www.eco-rice.net/> (accessed on 26/10/2011)
32. <http://www.biocompost.org/> (accessed on 26/10/2011)
33. <http://www.zurkoresearch.com/aptar/> (accessed on 25/10/2011)
34. <http://www.biomal.com/> (accessed on 24/10/2011)
35. <http://www.life-eswamar.eu/> (accessed on 24/10/2011)
36. <http://www.ecodiptera.info/> (accessed on 21/10/2011)
37. <http://www.zeronuisancepiggeries.com/fr/> (accessed on 21/10/2011)
38. <http://pigwasteman.ari.gov.cy/> (accessed on 21/10/2011)
39. <http://www.haprowine.eu/> (accessed on 19/10/2011)
40. <http://www.lifetaninos.org/> (accessed on 14/10/2011)
41. <http://www.fiw.rwth-aachen.de/cms/index.php?id=349> (accessed on 14/10/2011)
42. <http://www.ucm.es/info/improliv/index.htm> (accessed on 14/10/2011)
43. [www.ecoolivecleaner.gr](http://www.ecoolivecleaner.gr) (accessed on 13/10/2011)
44. <http://www3.aegean.gr/environment/eda/naias/> (accessed on 13/10/2011)
45. <http://www.enxolive.com/> (accessed on 12/10/2011)
46. <http://www.algatec.net/> (accessed on 12/10/2011)
47. <http://prosodol.gr> (accessed on 12/10/2011)
48. [www.envifriendly.tuc.gr](http://www.envifriendly.tuc.gr) (accessed on 3/10/2011)
49. <http://life-olivewaste.cartif.com/> (accessed on 3/10/2011)
50. [www.lifeoleico.it](http://www.lifeoleico.it) (accessed on 3/10/2011)

## **ANNEX I**

Table 3. Inventory of all available technologies for AW treatment (grouped by type of waste, level of development and coordinating country)

Waste	Project (Acronym)	Website	Duration Funding/budget	Beneficiaries	Coord. country	Technology	Level of development	Implementation of technology	Output
<b>Olive oil mill wastewater (OMW)</b>									
OMW	Innovative demonstration facility for the treatment of waste water from olive oil presses (OMW) with material and energetic utilization of the residues (OLIVIA)	No website is available	01-02-99 to 31-10-02 LIFE99 ENV/D/000424 Total budget: 1,190,778.34 € EC contribution: 343,744.60 €	Coordinator: Aquatec 3w GmbH Development Agency (DE) Assoc. Beneficiaries: WIP-Munich (DE), AFOI Boudourakis Crete (GR)	DE	Multi-stage process: a) wastewater purification (mechanical-biological pretreatment, anaerobic or membrane filtration stages), b) sludge treatment, c) biogas production	Pilot	Implementation in the island of Crete, Greece	Fertilizer or biogas for thermal/ electrical energy
OMW	Establishment, operation and demonstration of an innovative closed-cycle system of oil milling waste water using the Fenton method in Sitia-Crete, and reuse of treated water and by-products in agriculture (Elaiocycle)	No website is available	01-07-01 to 30-06-04 LIFE00 ENV/GR/000723 Total budget: 527,548 €	Coordinator: Sitia Development Organisation S.A. (GR)	GR	Treatment using the Fenton method in combination with dissolved air flotation; further solid phase processing using a closed vessel co-composting reactor.	Pilot	Implementation in Eastern Crete	Fertilizer (methodology adopted by Greek Agricultural Associations)
OMW	Process development for an integrated olive oil mill waste management recovering natural antioxidants and producing organic fertilizer (MINOS)	No website is available	01-09-01 to 01-04-04 LIFE00 ENV/GR/000671 Total budget: 1,239,213 € EC contribution: 608,561 €	Coordinator: National and Kapodistrian University of Athens (GR) Assoc. Beneficiaries: GAIA Institute-Goulandris Natural History Museum (GR), University of Crete Technical Institute (TEI) (GR)	GR	Integrated treatment system: successive wastewater filtration, nanofiltration/reverse osmosis.	Pilot	Operation for two successive oil producing periods	Clean water for disposal, purified polyphenols, natural fertilizer (compost)

OMW	New technologies for husks and waste waters recycling (TIRSAV)	No website is available	01-09-01 to 01-10-04 LIFE 00 ENV/IT/000223 Total budget: 1,075,006 € EC contribution: 298,868 €	Coordinator: Ente Parco Nazionale del Cilento e vallo di Diano (IT) Assoc. Beneficiaries: Province of Salerno (IT), Monopoli BA Azienda Monacelli (IT), Valle dell'Angelo SA Cooperativa Nuovo Cilento (IT), San Mauro Cilento SA (IT)	IT	Co-blending of olive oil wastewaters, fresh olive pomace and other natural organic by-products.	–	–	Compost
OMW	New technologies for husks and waste waters recycling plus (TIRSAVplus)	<a href="http://www.tirsavplus.eu/">http://www.tirsavplus.eu/</a>	01-10-05 to 30-06-12 LIFE05 ENV/IT/000845 Total budget: 5,454,264 € EC contribution: 944,208 €	Coordinator: Ente Parco Nazionale del Cilento e Vallo di Diano (IT) Assoc. Beneficiaries: Province of Salerno (IT), Monacelli Oil Mill–Villa Littorio SA (IT), University of L'Aquila–Department of Engineering (IT), Consorzio Nazionale Servizi (IT)	IT	Development of a cost-effective and innovative technology to recycle OMW and other organic wastes and produce organic fertilizers	Pilot	Oil mill level - planning and construction of a recycling plant	Organic fertilizers
OMW	A new application of phytodepuration as a treatment for the olive mill waste water disposal (OLEICO)	<a href="http://www.lifeoleico.it">www.lifeoleico.it</a>	01-09-04 to 30-10-07 LIFE04 ENV/IT/000409 Total budget: 582,900 € EC contribution: 288,488 €	Coordinator: Istituto superiore di ricerca e formazione sui materiali per tecnologie avanzate (IT) Assoc. Beneficiaries: Consorzio Olivicolo "Macine del Trasimeno" (IT), ARPA Umbria Perugia (IT), EUROCEI San Juan de Aznalfarache (ES), Instituto Nacional de Engenharia e Tecnologia Industrial–Lisbõa (PT)	IT	Phyto-depuration technique: a) excavation, water proofing, placement of draining layer, planting of trees b) transfer of OMW using a hydraulic network and degradation through aerobic/ anaerobic processes.	Pilot	Implementation in an Italian olive oil mill	Treated OMW
OMW	European awareness raising campaign for an environmentally sustainable olive mill waste management (OLEICO+)	<a href="http://www.lifeoleico.it">http://www.lifeoleico.it</a>	01-01-09 to 31-12-11 LIFE07 INF/IT/000438 Total budget: 1,003,636 € EC contribution: 500,413 €	Coordinator: Istituto Superiore di Ricerca e Formazione Sui Materiali per le Tecnologie Avanzate - ISRIM Scarl (IT) Assoc. Beneficiaries: Asociación Española de Municipios del Olivo (ES), Instituto Nacional de Engenharia, Tecnologia e Inovação (PT), Technical University of Crete (GR)	IT	Raise awareness among olive growers and olive oil producers about environmental problems caused by OMW disposal. Identification and adoption of the best eco-friendly technologies for the recovery and recycling of OMW.	–	–	Technologies for recovery and recycling of OMW

OMW	Processing plant for the integral treatment and valorization of the waste generated during the olive oil production process (OLIVEWASTE)	<a href="http://life-olivewaste.cartif.com/">http://life-olivewaste.cartif.com/</a>	30-11-05 to 30-03-09 LIFE05 ENV/E/000292 Total budget: 4,524,561 € EC contribution: 2,065,585 €	Coordinator: Fundación Cartif technological centre (ES) Assoc. Beneficiaries: Trainalba SL Integral Treatment of Alpechines Baena (ES), Enerman SA (ES)Co-financers: Ayuntamiento de Baena (ES), Diputación de Cordoba (ES)	ES	Treatment of OMW: a) accelerated S/L separation, b) evaporation-condensation and c) final treatment of water.	Pilot	Implementation in the Municipality of Baena, Córdoba, Spain	Clean water for irrigation, solid and liquid organic fertilizers
OMW & OJW	Environmental Friendly Technologies for Rural Development (ENVIFriendly)	<a href="http://www.envifriendly.tuc.gr">www.envifriendly.tuc.gr</a>	01-12-05 to 31-05-09 LIFE05 ENV/GR/000245 Total budget: 2,193,875 € EC contribution: 1,096,210 €	Coordinator: Prefecture of Laconia (GR) Assoc. Beneficiaries: Technical University of Crete (GR), Hellenic Centre for Marine Research (GR), Development Company of Laconia S.A. (GR), Alpha Mentor (GR), National Centre for Social Research (GR), Municipality of Elos (GR), Municipality of Skala (GR), Municipality of Pellana (GR), Municipality of Mystra (GR), Municipality of Oinountos (GR), Municipality of Faridos (GR), Municipality of Krokean (GR), Municipality of Therapnon (GR)	GR	Three approaches: 1) OMW filtration and degradation by phytoremediation using poplar trees, 2) liming for S/L separation, treated OMW to be used on agricultural land (irrigation of crops and subsurface disposal in a field with poplar trees), 3) electrolysis of OMW and orange juice wastewater (OJW).	Pilot	–	Treated OMW for irrigation of crops (corn and maize field); composting of solid phase
OMW	Strategies to improve and protect soil quality from the disposal of olive oil mills' wastes in the Mediterranean region (Prosodol)	<a href="http://prosodol.gr">http://prosodol.gr</a>	01-01-09 to 31-12-12 LIFE07 ENV/GR/000280 Total budget: 1,628,911 € EC contribution: 802,936 €	Coordinator: National Agricultural Research Foundation (NAGREF) - Soil Science Institute of Athens (SSIA) (GR) Assoc. Beneficiaries: Centro de Edafología y Aplicada del Segura (ES), Centro Regionale di Sperimentazione e Assistenza (IT), Foundation for Research and Technology (FORTH)-Institute of Mediterranean Studies (IMS) (GR), Technical University of Crete (GR)	GR	Technologies being tested/applied include bioremediation, use of low-cost porous materials as soil additives, use of low-cost additives for OMW pre-treatment.	Pilot	Two implementation areas (Municipality of Rethymno, Crete, Greece and Liguria region, Italy)	Treated OMW for irrigation and safe disposal, use of porous materials as soil additives, compost production.

OMW & manure	The condense managing system: production of novel fertilisers from manure and olive mill wastewater (CONDENSE)	No website is available	01-09-11 to 31-12-14 LIFE10 ENV/GR/000596 Total budget: 2,354,923 € EC contribution: 1,014,461 €	Coordinator: Iliaki Development Agency S.A. (GR) Assoc. Beneficiaries: Technological Institute of Crete (GR), University of Leeds (GB), Technical University of Crete (GR)	GR	Condensation of nutrients contained in OMW and manure and production of fertilizers.	Pilot	Capacity of 5-10 t/y	Fertilizer for use in agriculture and horticulture
OMW	Wastewater recycling of olive oil mills in Mediterranean countries -Demonstration and sustainable reuse of residuals (WAWAROMED)	No website is available	01-03-00 to 28-02-03 INCO-MED (FP5) of EC Total budget: 943,300 € EC contribution: 899,240 €	Coordinator: Aachen University of Applied Sciences (DE) Assoc. Beneficiaries: Office National de Eaux potable (MA), Ecole Superieure des Industries Alimentaires de Tunis (TN), National Agricultural Research Foundation (GR), Instituto Tecnologico de Canarias S.A. (ES), EPUVALEAU - Centre de Recherche et Bureau D'Etudes pour L'Epuration et Valoriation des Eaux (BE)	DE	Purification of OMW by aerobic/anaerobic treatment using a biological sedimenter; the diluted wastewater was used for irrigation of plants.	Pilot	Implementation in an olive mill in the municipality of Mousouron, Crete; treated wastewater was reused in agriculture	Treated water may be reused for irrigation or as a fertiliser in agriculture. The separated solid residuals may be used as biomass.
OMW	Technology for treatment and recycling of the water used to wash olives (UDOR)	No website is available	01-03-02 to 30-04-04 FP5 of the EC Total budget: 977,284 € EC contribution: 488,400 €	Coordinator: Argus Umwelt Biotechnologie GMBH (DE) Assoc. Beneficiaries: Universidad de Granada (ES), National Agricultural Research Foundation (GR), University of Rome "LA SAPIENZA"(IT), LABOR S.R.L (IT), Tecnoprocess SNC (IT), Kokotsakis E & others INC (GR), Torredonjimeno S.C.A. (ES), ICA S.R.L. (IT), INNOVA SPA (IT)	DE	The proposed treatment for recycling water includes: a) preliminary aerobic treatment, b) ultrafiltration, c) reverse osmosis.	-	-	Water to be used again for the washing of olives; decreased volume of wastewater to be disposed of

OMW	Development of a solar distillation wastewater treatment plant for olive oil mills (SOLAR DIST)	No website is available	01-01-03 to 31-12-04 FP5 of the EC Total budget: 826,794 € EC contribution: 413,344 €	Coordinator: IB Alternative Technologien (DE) Assoc. Beneficiaries: Argus Umweltbiotechnologie GMBH (DE), Verein zur Foerderung des Technologietransfers an der Hochschule Bremerhaven E.V. (DE), Stab Ambiente, Concepcao, Construcão e exploracao de Sistemas Ambientais (PT), Iliako Rewma Agriogiannes Michalis (GR), Union of Agricultural Cooperatives of Peza (GR), Millenium Electric T.O.U. INC. (IL), Tersan Puglia e sud Italia (IT), Globe Water AB (SE), Universita Degli Studi di Bari (IT)	DE	Combination of solar distillation and biological treatment (constructed wetland) for elimination of organic matter content.	Pilot	The SOLARDIST system and an organic waste composting process were used	Sludge generated is composted to be used as fertilizer; the condensate obtained is used for irrigation of constructed wetland
OMW	Biotechnological recycle of olive mills washing water by microalgae (ALGATEC)	<a href="http://www.algatec.net/">http://www.algatec.net/</a>	15-04-09 to 14-04-13 FP7 of the EC Total budget: 1,440,000 € EC contribution: 1,070,000 €	Coordinator: BIOAZUL S.L. (ES) Assoc. Beneficiaries: VALOR SABIO, Lda (PT), ISITEC GMBH (DE), BIOTMICROGEN S.L. (ES), Cooperative Olive Agriculturalist Nuestra Señora de los Desamparados (ES), Union of Agricultural Cooperatives of Peza (GR), University of Granada (ES), University of Tuscia (IT), NAGREF (GR), UMWELT (DE)	ES	Preliminary filtration of the washing water with a laminar settlement tank, main treatment with a photobioreactor using microalgae and post-photobioreactor treatment based on membrane filtration.	Pilot	Implementation in the DESAM facilities in Puente Genil, Andalusia, Spain and Peza, Greece	Recovery and recycle of most water used for olive washing
OMW	Supporting SME driven olive industry to comply with EU directives (EnXOlive)	<a href="http://www.enxolive.com">www.enxolive.com</a>	01-11-08 to 31-10-11 FP7 of the EC Total budget: 2,600,000 € EC contribution: 2,060,000 €	Coordinator: ITAv (ES) Assoc. Beneficiaries: ANEO (ES), APOOAT (IT), PEZA Union (GR), Cartif (ES), Fraunhofer-Gesellschaft IGB (DE), IDECAL (ES), Lachifarma (IT), PRODEVAL (ES), UGN-Umwelttechnik GmbH (DE)	ES	Treatment of OMW by anaerobic digestion using a modular scalable bioreactor and an integrated plant.	Full	Industrial plant	Production of biogas, extraction of polyphenols, fertilizers and water for irrigation

OMW	Adaptation of renewable energies technologies for the olive oil industry (RESOLIVE)	<a href="http://www.resolive.com">http://www.resolive.com</a>	01-01-09 to 31-03-12 FP7 of the EC Total budget: 2,037,219 € EC contribution: 1,417,791 €	Coordinator: Pan-Hellenic Confederation of Unions of Agricultural Cooperatives (PASEGES) (GR) Assoc. Beneficiaries: Sociedad Cooperativa Andaluza La Unión (UNIOLIVA) (ES), Centre Oleicola del Penedès S.C.C.L. (CEOLPE) (ES), Unione Nazionale tra le Associazioni di Produttori di Olive (UNAPROL) (IT), Cooperativa Agricola dos Olivicultores de Vila Flor e Ansaes C.R.L. (VILAFLO) (PT), Union of Agricultural Cooperatives of Peza (GR), Sabina Agricola S.C.L. (IT), Melabianakis Evripidis S.A. (GR), Investigación Y Tecnología Eléctrica, University of Jaén (INYTE) (ES), Institute for Solid Fuels Technology & Applications (ISFTA) (GR), Department of Agriculture and Environment University of Perugia (UNIPG) (IT), Verein zur Förderung des Technologietransfers an der Hochschule Bremerhaven e. V. (DE)	GR	Exploring of various processes (solar distillation, composting, etc) to obtain a valuable outcome from olive mill residues, eg. optimize existing techniques for biogas production	Pilot	Building and operation of a prototype gasification system combined with a 30 kW microturbine	Guidelines for olive oil producers to select best available renewable energy technologies; biogas production using optimized existing techniques
OMW	Innovative Olive Mill Waste Management Systems (NAIAS)	<a href="http://www3.aegean.gr/environment/eda/naias/">http://www3.aegean.gr/environment/eda/naias/</a>	ERDF Innovative Actions 2000-2006, Program 2001 GR 16 0 PP 209) Total budget: 440,000 € (for construction works and operation costs subsidizing 50% of the set up costs of the OMW pilot plants)	Coordinator: University of the Aegean (GR)	GR	The OMW management system involves a Phase Separation Tank (PST), where wastewater remains for five days and separated into three fractions (light, middle and heavy) by natural settling	Pilot	Three wastewater management pilot plants were constructed in three olive mills in Lesbos island, Greece	Low quality industrial olive oil (light fraction), soil enhancer/ organic fertilizer (middle fraction)
OMW	Eco Olive Cleaner	<a href="http://www.ecoolivcleaner.gr">www.ecoolivcleaner.gr</a>	SME	Developed in North Greece by individual olive oil mill owner, Aggelos Averis (GR)	GR	Separation of solid phase (olive paste) and wastewater by using a vibrating sieving system during primary oil production	Full	Industrial scale at Averis olive oil mill in North Greece	Clean coloured wastewater for reuse in the decanter or for irrigation; solid phase is considered as natural fertilizer

OMW	Improvements of Treatments and Validation of the Liquid-Solid Waste from the Two-Phase Olive Oil Extraction (IMPROLIVE)	<a href="http://www.ucom.es/info/improuliv/index.htm">http://www.ucom.es/info/improuliv/index.htm</a> <a href="http://www.fiw.rwth-aachen.de/cms/index.php?id=349">http://www.fiw.rwth-aachen.de/cms/index.php?id=349</a>	01-01-97 to 31-12-99 Programme FAIR (CT96-1420), EC, Directorate General XII E-2 Total budget: 892,491€ EC contribution: 787,491 €	Coordinator: Universidad Complutense de Madrid (ES) Assoc. Beneficiaries: University of Athens (GR), Forschungsinstitut für Wasser und Abfallwirtschaft (DE), Westfalia Separator AG (DE), Cognito Quam Electrotechnologies Ltd. (GR), Wye College (GB), Harokopio University (GR)	ES	The overall methodology integrates several procedures such as balanced-protein enrichment, aerobic bioremediation and nitrogen fixation, extraction by decanter centrifuge, fluidized bed, spray or drying and combustion/gasification.	Pilot	De-oiling and drying of alpeorujo	Oil of improved quality, humidified organic substrate for agricultural use, material for animal feed and/or food additive
<b>Wine waste</b>									
Wine waste	Development of an economically viable process for the integrated management via utilization of winemaking industry waste; production of high added value natural products and organic fertilizer (DIONYSOS)	No website is available	01-10-03 to 30-12-06 LIFE03 ENV/GR/000223 Total budget: 1,316,423 € EC contribution: 645,086 €	Coordinator: Agricultural University of Athens (GR) Assoc. Beneficiaries: Kapodistrian University of Athens-UOA (GR), GAIA Research Centre-Bioanalytical Department (GR), Terra Nova Ltd. (GR), KEOSOE-Central Union of Wine and Wine producing cooperative organizations of Greece (GR)	GR	Four main successive individual steps: a) extraction-filtration of grape pomace, b) selective adsorption of polyphenols through a series of resins, c) thermal treatment-solvent recovery, d) purification of resveratrol by FCPC (Fast Centrifugal Partition chromatography)	Pilot	Prototype composting unit in the Agricultural University of Athens and pilot plant for wine waste treatment	High nutritional value animal food, natural organic fertilizer (compost), enriched polyphenolic extract and pure polyphenols
Wine waste	Saving of forest exploitation for obtaining of tanning extracts through valorisation of wine waste (GRAPE TANNINS)	<a href="http://www.lifetaninos.org/">http://www.lifetaninos.org/</a>	01-11-04 to 31-12-07 LIFE04 ENV/ES/000237 Total budget: 964,608 € EC contribution: 474,804 €	Coordinator: Asociación de Investigación de las Industrias del Curtido y Anexas (ES) Assoc. Beneficiaries: Comercial Godó S.L. (ES), Villapana S.P.A. (ES), Curtidos Lancina S.A. (ES), Sociedad Aragonesa de Curtición de Ovinos S.A. (SARCO) (ES), D.G. Calidad Ambiental-Consejería de Turismo, Medio Ambiente y Política Territorial-Gobierno de La Rioja (DGCA) (ES), La Alcoholicera de La Rioja, Ebro y Duero S.A. (ES)	ES	Removal of oil content, tannin extraction in autoclave, analysis by filter-bell method.	Full	Industrial trials in two participating tanneries in Spain (Curtidos Lancina and SARCO)	Ultrafiltration product to tan cow hides and produce sole leather; nanofiltration product to tan sheepskin and produce lining leather.

Wine waste	Integrated waste management and life cycle assessment in the wine industry: From waste to high-value products (HAprowine)	<a href="http://www.haprowine.eu/">http://www.haprowine.eu/</a>	01-01-10 to 31-12-13 LIFE08 ENV/E/000143 Total budget: 1,508,636 € EC contribution: 660,611 €	Coordinator: Fundación Patrimonio Natural de Castilla y León (ES) Assoc. Beneficiaries: Fundación Centro Tecnológico de Miranda de Ebro (ES), Escola Superior de Comerç Internacional (ES), PE International GmbH (DE)	ES	–	Pilot	–	Products of high added-value with reduced environmental impacts; recovery and recycling of wine waste.
Wine waste	Advanced systems for the enhancement of the environmental performance of WINeries in Cyprus (WINEC)	<a href="http://www.eng.ucy.ac.cy/winec/">http://www.eng.ucy.ac.cy/winec/</a>	01-02-10 to 31-10-12 LIFE08 ENV/CY/000455 Total budget: 1,371,357 € EC contribution: 682,954 €	Coordinator: University of Cyprus (CY) Assoc. Beneficiaries: RTD TALOS LTD (CY), Technical University of Crete (GR), S.K. EUROMARKET Ltd. (CY), Tsiakkas Winery (CY), Environment Service-Ministry of Agriculture, Natural Resources and Environment (CY)	CY	Identification of the major environmental problems associated with the operation of wineries and establishment of environmental friendly and effective solutions	Pilot	An Environmental Management System will be implemented in Tsiakkas Winery (CY) (Membrane Bioreactor-MBR followed by Advanced Solar Oxidation – SOLAR)	Environmental friendly treatment of winery waste
<b>Swine waste</b>									
Swine waste	Pilot experiment: treatment and disposal of slurry from pig farming	No website is available	01-01-93 to 31-12-96 LIFE92 ENV/E/000018 Total budget: 271,318 € EC contribution: 132,807 €	Coordinator: Conselleria d'Agricultura y Pesca de la Generalitat Valenciana (ES)	ES	Application of techniques to treat waste from pig farms, involving homogenisation, solid press, anaerobic ponds, natural supply and aeration ponds and a maturing pond	Pilot	–	Recycled effluent for use in irrigation
Swine waste	Pig-Farm Integrated Management Project PIGS (PIGS)	No website is available	01-03-01 to 31-08-03 LIFE00 ENV/P/000829 Total budget: 461,962 € EC contribution: 91,864 €	Coordinator: Câmara Municipal de Montemor-o-Novo (PT) Assoc. Beneficiaries: Direcção Regional de Agricultura do Alentejo (PT), Direcção Regional do Ambiente e Ordenamento do Território do Alentejo (PT), Centro de Saúde de Montemor-o-Novo/Serviço de Saúde Pública (PT), Fundação da Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa (PT), Federação Portuguesa de Associações de Suinicultores (NGO) (PT)	PT	Development and implementation of a set of instruments, tools and best practices for the management and treatment of solid and liquid wastes from pig farms as well as study of the viability of composting process	Pilot	–	Compost from the solid part of pig manure

Swine waste	Guidelines to the Cyprus Competent Authorities for Policy Formulation for Sustainable Management of pig-farming wastes in Compliance with EU Practice (PIGWASTEMAN)	<a href="http://pigwasteman.ari.gov.cy/">http://pigwasteman.ari.gov.cy/</a>	01-01-04 to 31-12-06 LIFE03 TCY/CY/000021 Total budget: 563,401 € EC contribution: 376,706 €	Coordinator: Agricultural Research Institute (CY) Assoc. Beneficiaries: Nicolaides & Associates (CY), National Technical University of Athens (NTUA) (GR), Bioscan A/S (DK), Environment Service of the Ministry of Agriculture, Natural Resources and Environment (CY)	CY	Pilot treatment schemes: a) S/L separation, b) aerated lagoon or aerobic sequential batch reactor for the treatment of the liquid manure, c) composting or liming of solid manure, d) land spreading of treated liquid and solid manure	Pilot	Two piggery waste treatment systems	Formulation of a waste disposal policy for sustainable management of the pig-farming waste
Swine waste	Zero Nuisance Piggeries (ZNP)	<a href="http://www.zeronuisancepiggeries.com/fr/">http://www.zeronuisancepiggeries.com/fr/</a>	01-12-04 to 30-11-06 LIFE04 ENV/FR/000337 Total budget: 890,467 € EC contribution: 237,072 €	Coordinator: Centre de recherche sur l'eau de Veolia Environnement (FR) Assoc. Beneficiaries: Veolia Eau-Région OUEST (FR), Chambre d'Agriculture du Finistère (FR), Ecole Nationale Supérieure de Chimie de Rennes (FR)	FR	Combination of several existing techniques into a single system: a) fresh slurry management, b) preliminary S/L separation by centrifuge, c) biological treatment by activated sludge, d) composting system using centrifuge residue	Pilot	The prototype is installed in the experimental station at Guernévez, Finistère, France	Production of organic fertilizer (compost)
Swine waste	Implementation of a management model for the ecologically sustainable treatment of pig manure in the Region of Los Serranos, Valencia-Spain (Ecodiptera)	<a href="http://www.ecodiptera.info/">http://www.ecodiptera.info/</a>	01-12-05 to 30-11-08 LIFE05 ENV/E/000302 Total budget: 1,595,266 € EC contribution: 791,633 €	Coordinator: Valencia Provincial Council (ES) Assoc. Beneficiaries: Red de Municipios Valencianos Hacia La Sostenibilidad (ES), Fundación Europa Comunidad Valenciana-Región Europea (ES), Universidad de Alicante (ES), Institute of Zoology-Slovak Academy of Sciences (SK), Helsingin Yliopisto (FI), Eurovías-Asesoría Integral Comunitaria (ES)	ES	Treatment methodology: a) transfer of pig manure from the farm, b) pre-treatment of the manure, c) mass-rearing fly larvae phase, d) biodegradation phase	Pilot	Semi-industrial scale: prototype plant in Slovakia (mass-rearing Diptera flies) and pilot plant in Valencia, Spain (biodegradation of pig manure in a pig farming area)	Organic fertilizer and by-products (eg. biomass for animal feed); application tests to corn and sunflower crops showed results comparable with four commercial fertilizers

Swine waste	Environmentally-friendly management of swine waste based on innovative technology: a demonstration project set in Aragón (Spain) (ES-WAMAR)	<a href="http://www.life-eswamar.eu/">http://www.life-eswamar.eu/</a>	01-10-06 to 31-03-11 LIFE06 ENV/E/000044 Total budget: 7,135,375 € EC contribution: 2,564,163 €	Coordinator: SODEMASA - Sociedad de Desarrollo Rural de Aragón S.A.U. (ES) Assoc. Beneficiaries: CEMAGREF (FR), Agrupación para la Defensa Sanitaria del Porcino de Tauste (ADS de Tauste) (ES), Comarca DEL Maestrazgo (ES), Peñarroya de Tastavins, Spain Gobierno de Aragón (ES)	ES	Implementation of the best management techniques in order to minimize the environmental risk (transport of the waste from the farms to the plots, purification treatment, application as fertilizer)	Pilot	Implementation in three different Swine Waste Management Enterprises (SWMEs)	Production of organic fertilizer, design and development of global swine waste management tool
Swine waste	Evaluation of manure management and treatment technology for environmental protection and sustainable livestock farming in Europe (MANEV)	<a href="http://www.life-emanev.eu/">http://www.life-emanev.eu/</a>	01-01-11 to 31-12-14 LIFE09 ENV/ES/000453 Total budget: 4,165,832 € EC contribution: 2,076,153 €	Coordinator: SODEMASA - Sociedad de Desarrollo Rural de Aragón S.A.U. (ES) Assoc. Beneficiaries: Aarhus University (DK), Università degli Studi di Milano (IT), Centro Ricerche Produzioni Animali (CRPA) (IT), Fundació Estudis del Medi Ambient de Mollet del Valles (ES), Instituto Tecnológico Agrario de Castilla y León CSIC (ES), Urząd Marszałkowski Województwa Warmińsko-Mazurskiego w Olsztynie (PL)	ES	Assessment of 13 treatment technologies and manure management systems, located in 8 regions with high pig production in Spain, Italy, Denmark and Poland following a common monitoring and assessment protocol that will be developed.	-	-	Development of a common protocol among European regions for manure treatment, production of fertilizer
<b>Animal waste</b>									
Animal waste	Prevention of animal dejections related pollutions (ECOLIZ)	No website is available	01-02-97 to 01-08 -99 LIFE97 ENV/F/000188 Total budget: 635,499.93 € EC contribution: 179,301.77 €	Coordinator: Soferti - Grande Paroisse (FR) Assoc. Beneficiaries: ECOFIT (FR), GIE La Pimosa, Maroué, Côtes d'Armor (FR)	FR	Innovative and operating solution for the treatment of manure on the farm; the technique consists of mechanical separation of manure into two deodorized phases	Pilot	A fixed station was demonstrated at GIE, "La Pimosa", France	Liquid phase for irrigation and solid phase for fertilizer
Animal waste	Implementation of an AD facility at a Spanish slaughterhouse for a sustainably closed energy and waste (ENERWASTE)	No website is available	01-02-02 to 31-10-03 LIFE02 ENV/E/000187 Total budget: 347,932.53 € EC contribution: 84,039 €	Coordinator: Matadero Frigorífico del Nalón (ES) Assoc. Beneficiary: German Farmatic (DE)	DE	Anaerobic digestion of slaughterhouse waste similar to the one taking place in the digestive track of the animals	Pilot	Conversion of slaughterhouse wastes into biogas	Biogas (renewable energy) and fertilizer (new resource)

Animal waste	Development of a Processing Plant for Recycling of Duck Slurry (DUCK SLURRY)	No website is available	01-11-03 to 31-10-05 LIFE03 ENV/IRL/000312 Total budget: 1,601,300 € EC contribution: 490,000 €	Coordinator: Silver Hill Foods (IE)	IE	Duck slurry treatment: maceration and homogenization, S/L separation, drying of the solid, dissolved air flotation and anaerobic digestion of the dewatered liquid blend, capture and utilisation of biogas, safe discharge of the effluent	Full	Implementation in Silver Hill Foods, a fully integrated family owned Duck Company	Dried fertilizer pellets, biogas for heating
Animal waste	Demonstration of a new concept for a safe, environmental advantageous, economical sustainable and energy effective system for handling animal by-products in Europe (BIOMAL)	<a href="http://www.biomal.com/">http://www.biomal.com/</a>	01-01-04 to 31-03-07 LIFE04 ENV/SE/000774 Total budget: 8,143,640 € EC contribution: 1,239,888 €	Coordinator: Konvex AB (SE) Assoc. Beneficiaries: Karlskoga Kraftvärmeverk AB (SE), Findest Protein Oy (FI)	SE	Animal by-products processing: crushing and grinding of raw materials and pumping into a fluidized bed boiler for combustion with a base fuel.	Full	Konvex's (coordinator) processing plant produces 85,000 t of Biomal fuel annually for use in four heat and power plants in Sweden	Biofuel for production of renewable heat and electricity
Animal waste	Green (environmentally friendly) management of cattle farm waste and its repercussion on the GHG emissions (ECOREGA)	<a href="http://www.lifecorega.org/">http://www.lifecorega.org/</a>	01-01-11 to 31-12-12 LIFE09 ENV/ES/000459 Total budget: 599,500 € EC contribution: 282,250 €	Coordinator: Unións Agrarias - UPA (ES)	ES	An innovative system is proposed for mixing liquid manure from cattle farms with other types of organic waste (swine, bird)	Pilot	Adoption of the cattle waste management methodology in farms of Galicia, Extremadura and other regions in Spain	Natural fertilizer (compost) and methane
Animal waste	Demonstrative plant for manure management of a medium size exploitation by anaerobic digestion and agronomic valorisation of the digestate (UNIDIGES)	No website is available	01-09-11 to 01-03-15 LIFE10 ENV/ES/000442 Total budget: 1,310,678 € EC contribution: 614,089 €	Coordinator: Centro Tecnológico L'Urederra (ES) Assoc. Beneficiaries: I.T.G. Ganadero S.A. (ES), Nuevos Servicios Energéticos EN21 S.L. (ES), U.A.B. BIOCENSTRAS (ES), I.T.G. Agrícola S.A. (ES)	ES	Demonstration of a management scheme for manure at private livestock farms. Pilot plant based on manure anaerobic digestion, from a medium-size farm.	Pilot	The system will be tested on different farms and on several types of manure	Commercial end product

Animal waste	Global solutions for slaughterhouses, meat processing plants and phytosanitary sector: treatment of category 3 animal wastes and production of high value products with bio pesticide properties (APTAR)	<a href="http://www.zurkoresearch.com/aptar/">http://www.zurkoresearch.com/aptar/</a>	01-01-09 to 31-12-11 FP7 of the EC Total budget: 3,480,083 € EC contribution: 2,422,597 €	Coordinator: Zurko Research S.L.U. (ES) Assoc. Beneficiaries: Centro de Edafología y Aplicada del Segura (ES), Matadero Central de Asturias - Junquera Bobes (ES), Union Europeenne du Commerce du Betail et de la Viande (BE), Asociación de Investigación de Industrias de la Carne del Principado de Asturia (ES), Bulgarian Greenhouse Association (BG), Abonos Organicos Pedrin (ES), Alquimia Soluciones Ambientales (ES), Filipov (BG), Aldagot (BG), S.A. Marcell Muller & Cie (FR), The Stephan Angeloff Institute of Microbiology Bulgarian Academy of Sciences (BG), Agricultural University of Plovdi (BG)	ES	Treatment of category 3 animal by products: a) development of a cost-effective biotechnological method for by-products degradation using microorganisms, b) introduction of the derived products in the phytosanitary sector.	Pilot	Design, installation and optimization of a semi-scale pilot plant	Methodology for degradation of category 3 ABPs by using microorganisms; biopesticides for use in agriculture
<b>Rice straw</b>									
Rice straw	Demonstration Plant for composting municipal sewage sludges and rice straw, and evaluation of the agronomic quality of the produced compost (BIO COMPOST)	<a href="http://www.bio compost.org/">http://www.bio compost.org/</a>	01-08-01 to 31-07-04 LIFE00 ENV/E/000555 Total budget: 1,438,855.30 € EC contribution: 716,496.98 €	Coordinator: Ayuntamiento de Valencia-Consell Agrari Municipal (ES) Assoc. Beneficiaries: FUVAMA-Valencian Foundation for Agriculture and the Environment (ES), DAM (ES)	ES	Two treatment methodologies: a) mixing of rice stalks with organic material and composting in heaps, b) grinding of the rice stalks and mixing with sludge, organic material and pruning waste and composting in silos.	Pilot	The stalks gathered were used for composting in the Waste Treatment Plant FERVASA (Quart de Poblet, Spain)	High quality compost was used to amend a franco clayey soil during the cultivation of citrus fruits
Rice straw	Sustainable management of the rice straw (ECORICE)	<a href="http://www.eco-rice.net/">http://www.eco-rice.net/</a>	01-12-04 to 01-06-07 LIFE04 ENV/ES/000184 Total budget: 1,962,795 € EC contribution: 984,023 €	Coordinator: Concejalía de la Devesa-Albufera (ES) Assoc. Beneficiaries: Consellería de Territorio y Vivienda (ES), Comercial PROJAR (ES), Fund. Comunitat Valenciana Región Europea (ES), M <sup>a</sup> Fca. Francés (ES), Innove Verda (ES), FUVAMA (ES), Consell Agrari (ES)	ES	The methodology proposed in BIOCUMPOST project was used in ECORICE project	Pilot	Application of the straw blankets in pilot-site fields	Straw blankets or rolls enhancing vegetation growth and tree cultivation

---

**Various AW**

---

Various AW	Development and implementation of a centralized plant for the re-use and valorization of agricultural waste from intensive cultivation and handling of fruits and vegetable	No website is available	01-05-98 to 01-05-00 LIFE98 ENV/E/ 000370 Total budget: 2,844,913.52 € EC contribution: 333,417.64 €	Coordinator: Ayuntamiento de Torre-Pacheco (ES)	ES	Development of a plant for the treatment of AW from intensive cultivation and handling of fruits and vegetables: a) initial methanization through mesophilic anaerobic digestion, b) phase separation, c) secondary methanization, d) accelerated composting for fertilizer production e) reverse osmosis for liquid fertilizer production.	Pilot	Pre-industrial scale application	Four sub-products (biogas, organic fertilizer, liquid fertilizer and water)
Various AW	Modern and environmental friendly composting methods of agricultural waste (ECO FILTER)	No website is available	01-12-03 to 31-12-05 LIFE04 ENV/HU/000372 Total budget: 1,681,127 € EC contribution: 340,683 €	Coordinator: Bio-Fingi Mushroom growing & Compost producer Ltd (HU)	HU	Composting: a) pre-wetting and pre-fermentation of the mixture (horse or chicken manure, straw, water and gypsum etc.) in completely closed and floor aerated indoor tunnels, b) pasteurization of compost in tunnels, c) the spawn runs through the compost	Full	Implementation in the company's facilities	Environmental friendly compost (I, II and III phases)
Various AW	Integrated systems to enhance sequestration of carbon, producing energy crops by using organic residues (Seq-Cure)	<a href="http://www.crupa.it/ngcont.ent.cfm?a_id=3995">http://www.crupa.it/ngcont.ent.cfm?a_id=3995</a>	01-12-06 to 30-06-10 LIFE06 ENV/IT/000266 Total budget: 1,917,051 € EC contribution: 955,989 €	Coordinator: Centro Ricerche Produzioni Animali - CRPA S.p.A. (IT) Assoc. Beneficiaries: Fondazione CRPA Studi e Ricerche ONLUS (Fondazione CRPA) (IT), Terremerse Soc. Cop. (IT), Azienda Sperimentale Vittorio Tadini (AAS Tadini) (IT), Azienda Agraria Sperimentale "Stuard" (AAS Stuard) (IT), Max Planck Institute for Biogeochemistry (MPI-BGC) Confederazione Italiana Agricoltori Piacenza (IT)	IT	Contribution to the reduction of CO <sub>2</sub> atmospheric emissions and increase of carbon sequestration in soils through the production of biomass (renewable energy) as well as the use of organic residues to fertilise energy crops	Pilot	Demonstration energy farms in Emilia-Romagna, Italy	Renewable energy production, use of digestates as fertilizers

---

Various AW	Demonstration of an integrated waste-to-energy system for energy generation from biodegradable organic waste and wastewater (INTER-WASTE)	<a href="http://www.interwaste.org/">http://www.interwaste.org/</a>	01-01-10 to 30-09-12 LIFE08 ENV/CY/000457 Total budget: 1,471,838 € EC contribution: 735,330 €	Coordinator: Cyprus University of Technology (CY) Assoc. Beneficiaries: National Technical University of Athens (GR), University of Nicosia (CY), Environment Service of the Ministry of Agriculture, Natural Resources & Environment (CY), PROPLAN ltd(CY)	CY	Development and demonstration of a sustainable conversion technology for the management of biodegradable organic waste and wastewater through the construction of an innovative integrated Membrane Bioreactor System (MBR) based on anaerobic process	Pilot	The system receives a variety of organic waste and biowaste (household organic waste, agricultural waste and manure)	Biogas, stabilised solid product, high quality effluent that can be safely reused in agriculture
Various AW	Development of integrated agroindustrial waste management politics maximizing materials recovery and energy exploitation (INTEGRASTE)	<a href="http://www.achaia.gr/integraste/">http://www.achaia.gr/integraste/</a>	01-01-10 to 31-12-12 LIFE08 ENV/GR/000578 Total budget: 1,156,325 € EC contribution: 543,662 €	Coordinator: Western Greece Region (GR) Assoc. Beneficiaries: University of Patras (GR), Development Enterprise of Achaia Prefecture (N.E.A.) (GR)	GR	Utilization and management of Aw such as agricultural plant residues, wastes from olive mills, piggeries etc. using anaerobic digestion	Pilot	Upgrade of an existing pilot plant built at the Industrial Zone of Patras, Greece, to process both liquid AW (existing process) and solid AW (enhanced process)	Electrical and thermal energy, composting for the production of fertilizer for crops and valorisation of the residuals
Various AW	Sustainable biomass production, processing and demonstration of alternative cropping and energy systems (Alternative Biomass4Energy)	No website is available	01-09-11 to 31-08-16 LIFE10 ENV/DE/000126 Total budget: 4,843,904 € EC contribution: 2,403,661 €	Coordinator: European Institute for Energy Research (DE)	DE	Screening of multiple feedstocks of biowaste and alternative biomass production systems for large-scale production of biomass	Pilot	Demonstration of a new carbonisation technology for the conversion of different sources of waste and digestis	Biogas and biochar production

Various AW	Integrated management of bio-waste in Greece – the case study of Athens (Athens-Bio-waste)	<a href="http://www.biowaste.gr/site/">http://www.biowaste.gr/site/</a>	01-09-11 to 31-12-14 LIFE10 ENV/GR/000605 Total budget: 1,339,930 € EC contribution: 638,715 €	Coordinator: The National Technical University of Athens (GR) Assoc. Beneficiaries: Association of Communities and Municipalities in the Attica Region (GR), EPTA – Environmental Engineers – Consultants (GR), City of Athens (GR), Municipality of Kifissia (GR)	GR	Promotion of sustainable biowaste management in Greece using the municipalities of Athens and Kifissia as case study areas.	Pilot	Collection of biowaste and composting.	Composted biowaste, bio-waste management software tool
Various AW	New soil improvement products for reducing the pollution of soils and waters and revitalizing the soil system (Biorewit)	No website is available	01-01-12 to 31-12-14 LIFE10 ENV/PL/000661 Total budget: 1,863,195 € EC contribution: 926,597 €	Coordinator: Research Institute of Vegetable Crops-RIVC (PL) Assoc. Beneficiaries: Institute for Sustainable Technologies - National Research Institute (ITeE-PIB) (PL)	PL	Use of natural fibrous wastes e.g. straw, sawdust, wool, cotton for the production of soil improvers or biodegradable soilless substrates	Pilot	Application of new fibrous soil bio-activators in the cultivation of vegetables on demonstration plots and on experimental cultivation fields.	New soil improvers and soilless substrates for greenhouse cultivation
Various AW	Sustainable strategies for integrated management of agroindustrial fruit and vegetable wastes (AGRO WASTE)	No website is available	01-01-12 to 31-12-14 LIFE10 ENV/ES/000469 Total budget: 1,593,794 € EC contribution: 729,807 €	Coordinator: Centro de Edafología y Biología del Segura (ES) Assoc. Beneficiaries: Centro Tecnológico Nacional de la Conserva y Alimentación (CTNC) (ES)	ES	Integrated management system using fruit and vegetable wastes (FVW) in the Region of Murcia, Spain (e.g. anaerobic digestion of industrial wastewater and organic solid waste for biogas production, aerobic process for the production of mature organic soil amendments).	Pilot	–	Added value bioactive compounds for multifunctional food ingredients, biogas and mature organic soil amendment