

EU POLICY AND LEGISLATION ON RECYCLING OF ORGANIC WASTES TO AGRICULTURE

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Introduction

Organic waste is an inseparable element of human existence and activity. Among this waste we can include agricultural waste, animal and human waste, catering and household food waste etc. Each year the old European Union countries generate about 1.3 billion tones of waste. This figure produces about 3.5 tonnes of solid waste per head. Additionally further 700 million tonnes of agricultural waste is produced. Therefore, it should not surprise anyone that waste management becomes one of major human activities aimed for a reduction of negative effects of waste on environment.

Great deal of the organic waste produced in Europe has still been landfilled. This way of disposal arouses controversy as it generates hazardous liquid leachates which contain bacteria and chemical contaminants. It is a source of volatile compounds emission contributing to harmful greenhouse effect and odorous pollution of air.

The European Union regulations concerning waste management have been drawn up to protect the environment against irreversible effects of harmful and toxic compound emission into the environment as well as protection of natural resources by recycling materials including the organic wastes to agriculture.

Analysis of the available data points to great potentials in that matter. In order to illustrate it let us concentrate on just one example, namely an economic activity concerning swine breeding. For instance, it has been estimated that in 2010 there will be 115.6 million heads of swine in Western Europe. Germany, Spain, Great Britain and Holland alone produce 120.3 million Mg of waste [3, 5, 8, 11, 12]. It has been assessed that ammonia nitrogen emission to the atmosphere in the EU countries will amount to 800 thousand Mg annually [2] –twice the annual nitrogen production of “POLICE” Chemical Plant in Poland [13]. Synthesis of such vast amounts of ammonia would require a consumption of 32 million GJ of energy. To farther illustrate the situation it should be mentioned that the emission of ammonium in stock-farming is significantly higher that in swine breeding.

As far as phosphorus is concerned its percentage in swine excrements amounts to 0.26 % of mass (between 5 and 11 kg/t) [11]. It means that the previously mentioned amount of pig excretes totals 290 thousand Mg of the element, what is more than 40% mass of phosphorus in phosphoric acid produced annually in Western Europe or about 150% mass annual production of the previously mentioned chemical plant in Police. By utilizing just a fraction of the waste we can expect an improvement of animal production economy along with a decrease of phosphate raw material deficit [10].

In European environmental law there are no legislative documents related generally to all organic waste and its recycling to agriculture. The existing regulations only refer to individual and specific organic waste, for example to sewage sludge, animal or municipal waste. The three main ways of using organic waste are for soil improvement, for animal raising and to provide a source of energy.

Waste definition

Some definitions on waste have to be made first if we are to discuss the legal problems concerning waste and its recycling. Defining waste is crucial if we are to decide about its management - a substance is to be handled accordingly to waste legislation. What is waste? In common words wastes are *any materials unused and rejected as worthless or unwanted*.

In the environmental legislation there are several definitions of waste but the most important ones have been set down by the EU Commission and by the OECD (Organization for Economic Cooperation and Development) [4].

The EU Commission legal definition of waste can be found in the Waste Framework Directive 75/442/EEC where "*Waste shall mean any substance or object in the categories set out in Annex I which the holder discards or intends or is required to discard*".

The EU definition is inseparably linked with European lists of waste categories and waste types. Annex I of the Waste-framework directive contains a list of 16 different categories of waste. Most of organic waste can be classified to the category Q14 (*Products for which the holder has no further use (e.g. agricultural, household, office, commercial and shop discards, etc.)*)

The European Commission has proposed a more precise list of waste types established by Commission Decision 2000/532/EC. This was made to avoid any misunderstandings and uncertainties in discussions on waste.

The definition set by the OECD is more descriptive as it says that "*Waste refers to materials that are not prime products (i.e. products produced for market) for which the generator has*

no further use or for own purpose of production, transformation or consumption, and which he discards, or intends or is required to discard... Excluded from the definition are: residuals directly recycled or reused at the place of generation (i.e. establishment); waste materials that are directly discharged into ambient environment”.

It means that harvest residuals directly used by farmers are not included among waste. [6]

To avoid any more confusion we have to define the “organic waste”. In the European legislation there is no definition of organic waste. Here in this paper the *organic* waste is not considered in the strict chemists' sense of the word as compound which is based on carbon. The term *organic* is used as a synonym for *biodegradable* and this paper uses *organic* to mean waste which could be directly utilized in agriculture and composted or processed into useful products using other biological treatment i.e. other aerobic or anaerobic processes.

EU organic waste legislation

Before 1970 EU had no legislation and joint policy concerned waste management. Particular countries realized so called end-of-pipe solutions and the situation existed until 1975 when the Waste Framework Directive (75/442/EEC) came into force. From that time on a new waste policy has been implemented *“To prevent and minimize waste and maximize reuse, recycling and use of environmental friendly alternative materials...”*[9].

From the point of view of organic waste management and its recycling to agriculture the most important EU law regulations are the following (described are parts of documents related to organic wastes):

The Waste Framework Directive 75/442/EEC with amendments (Directive 91/156/EEC, Directive 91/692/EEC and Commission Decision 96/530/EC), establishing a framework for the management of waste across the European Union. In annex IIB to the directive recovery operations are mentioned as they occur in practice. The directive specifies operations which may lead to resource recovery, recycling, reclamation, direct re-use or alternative uses. The two following are related to organic waste recycling:

Recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes)

Land treatment resulting in benefit to agriculture or ecological improvement

Decision 2000/532/EC replacing Commission Decision 94/3/EC establishing a list of wastes and a list of hazardous waste. In this document wastes from agriculture, horticulture, aquaculture, forestry, hunting and fishing, food preparation and processing are classified to the category 02 in the list which imposes specific rules of their utilization.

Landfill Directive (99/31/EC) setting targets to reduce landfilling of biodegradable municipal waste. The Directive sets up strict limits on the amount of biodegradable municipal waste that is allowed to be disposed in landfill. The amount of biodegradable municipal solid waste that can be disposed in landfill has to be reduced to:

- 75% of the amount produced in 1995, by 2006
- 50% of the amount produced in 1995, by 2009
- 35% of the amount produced in 1995, by 2016

The Directive specifies two strategies that may lead to these targets:

- Recycling of source separated organic waste by aerobic (composting) or anaerobic (digestion in biogas plants) treatment
- Pre-treatment of residual waste before landfill by incineration, or mechanical-biological pretreatment.

Council Directive of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture (86/278/EEC).

The purpose of this Directive is to regulate the use of sewage sludge in agriculture in such a way as to prevent harmful effects on soil, vegetation, animals and man, thereby encouraging the correct use of such sewage sludge. The use of sludge is prohibited if the concentration of one or more heavy metals in the soil and in sludge exceeds the limit values given in Annex IA and shall take the necessary steps to ensure that those limit values are not exceeded as a result of the use of sludge. The directive also establishes maximum annual quantities of heavy metals which may be introduced into the soil (Annex IC).

Member States shall prohibit the use of sludge or the supply of sludge for use on:

grassland or forage crops if the grassland is to be grazed or the forage crops to be harvested before a certain period has elapsed,

soil in which fruit and vegetable crops are growing, with the exception of fruit trees,

ground intended for the cultivation of fruit and vegetable crops which are normally in direct contact with the soil and normally eaten raw, for a period of 10 months preceding the harvest of the crops and during the harvest itself.

Member States shall ensure that up-to-date records are kept, which register:

the quantities of sludge produced and the quantities supplied for use in agriculture;

the composition and properties of the sludge in relation to the parameters referred to in Annex II A;

the type of treatment carried out, as defined in Article 2 (b);

the names and addresses of the recipients of the sludge and the place where the sludge is to be used.

Commission Decision of 28 August 2001 establishing ecological criteria for the award of the Community eco-label to soil improvers and growing media. These criteria aim, in particular, at promoting the use and re-use of organic matter derived from processing of waste material and therefore contributing to minimization of solid waste at landfill. Eco-label requirements specify organic ingredients and determine that:

A product shall only be considered for the award of an eco-label if its organic matter content is derived from the processing and/or re-use of waste materials. The term "*organic*" refers in the general sense to materials of, or formed from living organisms.

Products shall not contain sewage sludge.

It is required that the following information shall be provided with the product:

the main input materials (those over 5 % by volume) from which the product has been manufactured, distinguishing between source separated municipal solid waste, wastes from agriculture or forestry, industrial and commercial wastes specifying the sector (e.g. food processing, paper, etc.);

Additionally the eco-label shall include the following text:

- contributes to reducing soil and water pollution,
- promotes use of organic waste,

Animal Waste Directive (90/667/EEC), replaced by the Animal By-Products Regulations No 1774/2002. On 1 July 2003 the EU Animal By-Products Regulations introduced new rules for the collection, treatment and disposal of animal by-products and catering waste. The main change was to re-classify some materials as animal by-products, previously classified as catering waste. These wastes can no longer be sent to landfill and must be managed by prescribed treatment and disposal routes.

The animal waste directive establishes requirements for the disposal and processing of animal waste in order to destroy pathogens and to produce feedstuffs in such a manner as to prevent the presence of any pathogens [1].

New regulation divides waste into three categories:

Category one: Animal by-products presenting a risk related to a transmissible spongiform encephalopathy (TSE) or an unknown risk or a risk related to the presence of residues of prohibited. These would have to be completely disposed of as waste by incineration, co-incineration or landfill.

Category two: Animal by-products presenting a risk related to animal diseases other than TSEs or a risk related to the presence of residues of veterinary drugs. Manure, digestive tract contents and slaughterhouse sludge are also included in this category. These would have to either be disposed of as waste or recycled for certain uses other than animal nutrition; i.e. biogas production, composting, fertilizers etc..

Category three: Animal by-products derived from healthy animals (i.e. animals slaughtered in a slaughterhouse which passed the health). Only these animal by-products would be permitted as feed material and then only following appropriate treatment.

Category three wastes may not be disposed of at landfill but can be treated in a biogas (anaerobic digestion) or composting plant according to the following requirements:

maximum particle size before entering the unit: 12 mm;

minimum temperature in all material in the unit: 70°C; and

minimum time in the unit without interruption: 60 minutes.

When Category 3 catering waste is the only animal by-product it can be treated in a biogas or composting plant according to national rules. Department for Environment Food and Rural Affairs (UK) has set national standards for composting based on a risk assessment. These are:

System	Composting in closed reactor	Composting in closed reactor	Composting in housed windrows
Minimum particle size	40 cm	6 cm	40 cm
Minimum temperature	60°C	70°C	60°C
Minimum time spent at minimum temperature	2 days	1 hour	8 days (during which the windrow shall be turned 3 times at no less than 2 day intervals)

Organic Farming Regulation (EEC) No 2092/91. Organic farming management relies on developing biological diversity in the field to disrupt habitat for pest organisms, and the purposeful maintenance and replenishment of soil fertility. The regulation says that the fertility and the biological activity of the soil must be maintained or increased by:

cultivation of legumes, green manures or deep-rooting plants in an appropriate multi-annual rotation programme,

incorporation of livestock manure from organic livestock production,

incorporation of other organic material, composted or not, from holdings producing according to the rules of this Regulation.

Maximum concentrations of heavy metals in product obtained from source separated household waste, which has been submitted to composting or to anaerobic fermentation for biogas production, are (in mg/kg of dry matter):

Cd: 0,7; Cu: 70; Ni: 25; Pb: 45; Zn: 200; Hg: 0,4; Cr (total): 70; Cr (VI): 0.

EU waste policy

The European Union's approach to waste management is based on three principles:

Waste prevention:

Recycling and reuse

Improving final disposal and monitoring

The Directive 75/442/EEC establishes a waste management hierarchy. The most desirable is waste prevention and minimization of waste generation. This is followed (in descending order of priority) by:

- | | | | |
|---|--------------------|---|--------------------------------------|
| 1 | Re-use of waste | 4 | Use of waste as source of energy |
| 2 | Recycling of waste | 5 | Incineration without energy recovery |
| 3 | Recovery of waste | 6 | Landfilling |

Landfilling is considered the least desirable waste management option [6].

Different economical mechanisms can be used to promote recycling and more environmental friendly treatment options and to make recycling a more attractive solution from an economical point of view. These are:

Tax differentiation so that the most expensive option is to landfill waste followed by incineration and further recycling.

Producer's responsibility for lifecycle and final treatment/disposal of the articles he produces.

Pay-As-You-Throw schemes – each business has to pay for the amount of waste it produces.

Prescriptive instruments - for example biodegradable municipal waste.

Diversion targets set by the Landfill Directive.

New legislation proposals

The most important legislation proposal dealing with organic waste recycling is Directive on the Biological Treatment of Biological Waste [7]. The Directive would aim to promote the biological treatment of biodegradable waste (i.e. composting, anaerobic digestion and spreading on land) to help meet the targets of the Landfill Directive.

The Directive refers not only to municipal waste, but also to biodegradable residues produced by the agricultural, food and drink, wood processing, paper, leather, textiles and packaging industries, including wastewater treatment sludges produced in these sectors along with sewage treatment processes.

The suggested hierarchy includes composting or anaerobic digestion of separately collected biowaste that is not recycled into the original material with the utilization of compost or digestate for agricultural benefit or ecological improvement. Only treated biowaste would be allowed for spreading on land, except for those untreated biowastes specifically mentioned in Annex I of the working document (most uncontaminated organic wastes) and for vegetable plant waste generated and remaining on agricultural or forest land.

References

1. *Animal waste under review - Environmental Health Journal – May 2001*
2. *Battye R. et al. Development and selection of ammonia emission factors: Final report. August 1994. [Report prepared for U.S. EPA; Contract No. 68-D3-0034]*
3. *Burton C.H., Turner C. - Manure Management. Treatment Strategies for Sustainable Agriculture, Ed. Silsoe Research Institute, Wrest Park – Silsoe - Bedford 2003*
4. *Curso Fertilizantes y Medio Ambiente. Legislacion sobre contenido de nitratos en el agua. Situacion problemática purines en España. Informe Fertiberia, Working Materials of Integrated Treatment Technology Workshop, Barcelona 2000*
5. *Drapalova L., Fisker L., Neszi N., Vanbrabant W. - Review of the management of municipal organic waste in Aarhus Environmental Studies, University of Aarhus 2004*
6. *EC Working Document "Biological Treatment of Biowaste" 2nd draft. 12th February 2001 (DG ENV.A.2/LM/biowaste/2nd draft)*
7. *Greaves J., Hobbs P., Chadwick D. and Haygarth P. - Prospects for the recovery of phosphorus from animal manures: A Review, Environ. Technol., 20 (1999) 697-708*
8. *Hansen, W., Cristopher, M. & Verbuecheln, M. - EU Waste Policy and Challenges for Regional and Local Authorities "Capacity Building on European Community's Environmental Policy". Ecologic, Institute for International and European Environmental Policy, 2002*
9. *Pawelczyk A., Muraviev D. – Integrated Technology of Liquid Manure Treatment, Przem. Chem., t. 82 nr 8/9 cz. 1, 2003, 861-864*
10. *Schulze-Rettmer R., Metzen P., Alfter P., Simbach B.- MAP Precipitation for Recovering Nutrients from Manures. Proc. 2nd Intl Conference on Recovery of Phosphates from Sewage and Animal Wastes. Noordwijkerhout, Holland, 12th-13th March 2001*
11. *Single European standard statistical classification of environmental protection activities and facilities, Conference of European Statisticians Forty-Second Plenary Session, Paris, 13-17 June 1994*
12. *Voorneburg F. van, Ruiten L.H.A.M. van, Have P.J.W. - Phosphate recovery from animal manure: the possibilities, CEFIC, Avenue E. Van Nieuwenhuysse 4, Bte 2, B1160, Bruxelles, Belgium, pp. 8 (1998)*
13. *Zyndul K., Paprocki E. – Effect of natural gas price on the situation of nitrogen fertilizer industry in Poland; "POLICE" Chemical Works experience. Conference "Towards a competitive natura gas market in Poland" 29-30 Sept. 2003, Jachranka*