


# “SCIENCE, TECHNOLOGY AND ENVIRONMENT: WASTE MANAGEMENT AND FOOD SECURITY”



## Use of organic waste for Food Security and Environment

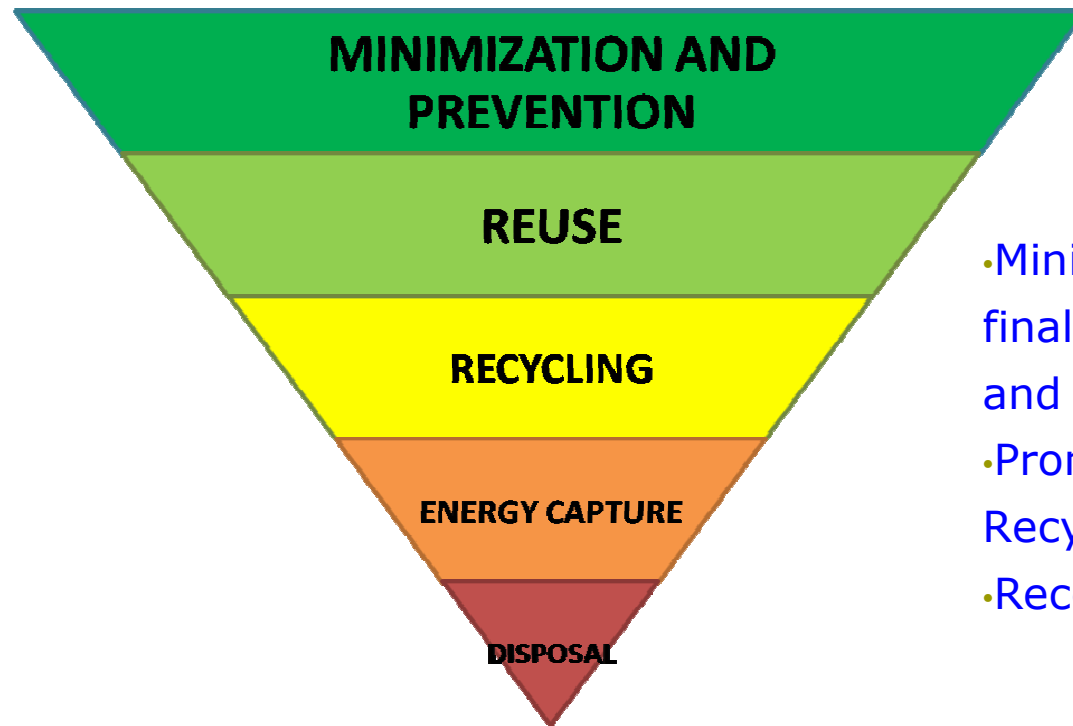
Giussago (PV)  
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# WFD 2008/98/EEC

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The European Waste framework Directive 2008/98/EC sets the basic concepts and definitions related to waste management according to a hierarchy pyramid:

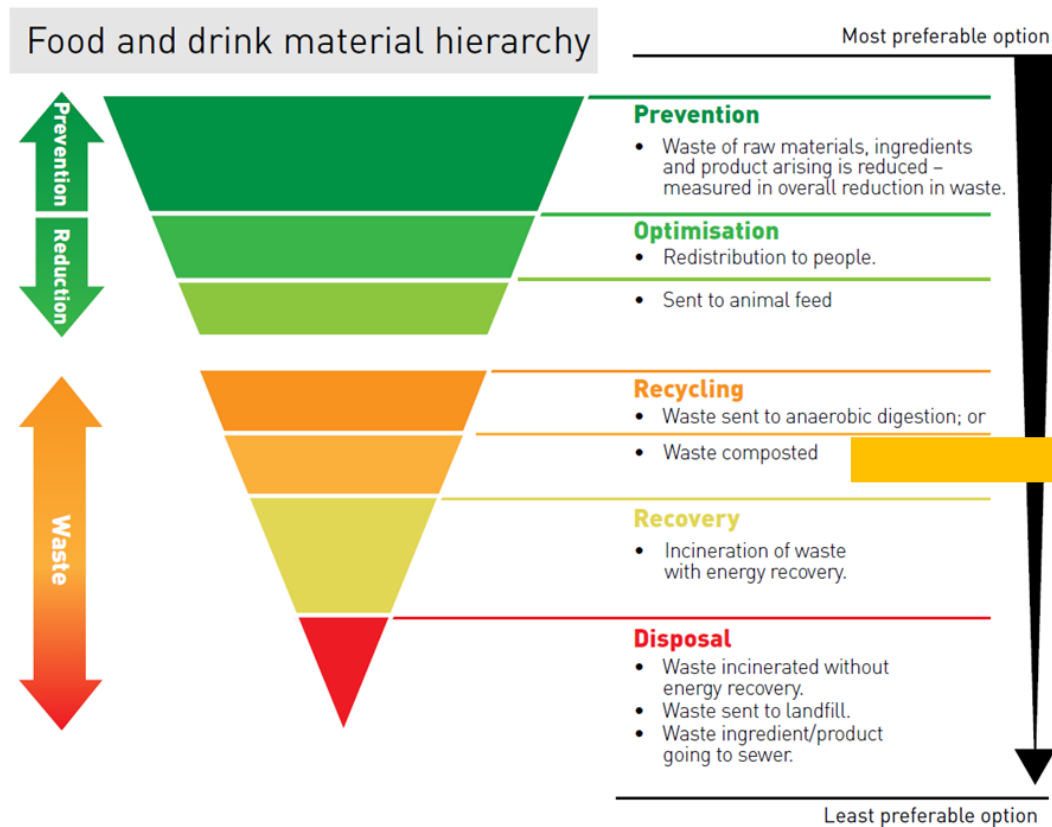


## Main objectives:

- Minimizing wastes to be sent to final disposal (through prevention and optimization)
- Promoting Reuse, Recovery and Recycling of materials at first
- Recovery of energy afterwards

# WFD 2008/98/EC

## AGRICULTURAL ORGANIC WASTE RECYCLING / REUSE



### Agricultural reuse of Organic Waste

One of the main way to promote waste recycling is the agricultural reuse of organic wastes after being properly treated, i.e. through anaerobic digestion or composting

# Waste recycling and nutrients cycle

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## **AGRICULTURAL ORGANIC WASTE RECYCLING**

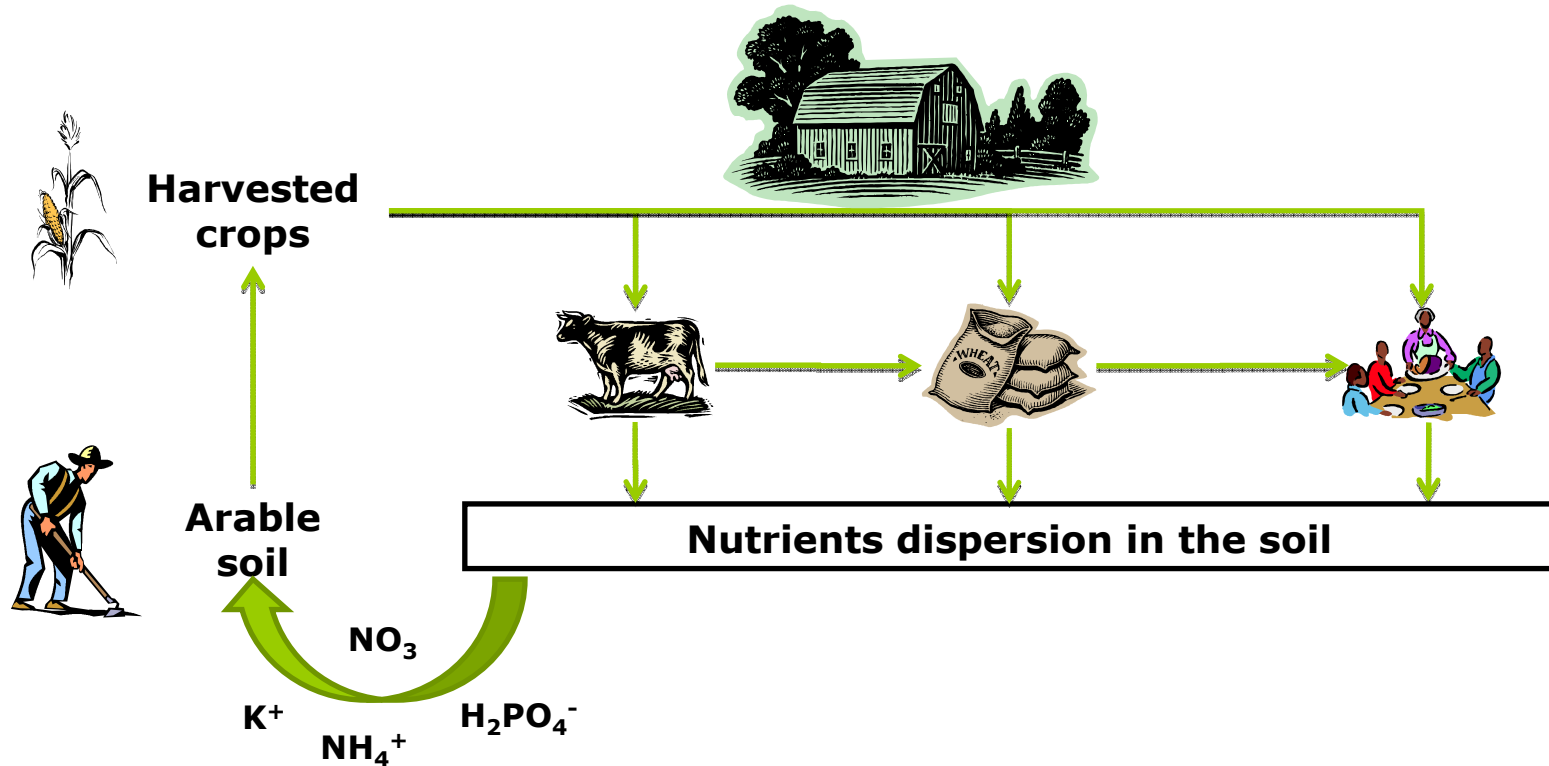
The general objective to provide a overall reduction of the amount of waste to be disposed may be achieved through the agricultural reuse of wastes and the consequent recovery of useful materials for agriculture (e.g. nutrients). Such practice is definitely suitable and may be integrated with the current requirements of the agricultural sector in terms of fertilizing elements.

Indeed, the depletion of organic matter and nutrients in the soil is currently being addressed through the provision of chemicals (mineral fertilizers containing N, P, K).

Therefore, the (re)use in agriculture of materials recovered from wastes may definitely represent a viable solution to the problem of progressive soil depletion.

# Waste recycling and recovery

**The nutrients closed cycle in the past (at farm scale)**

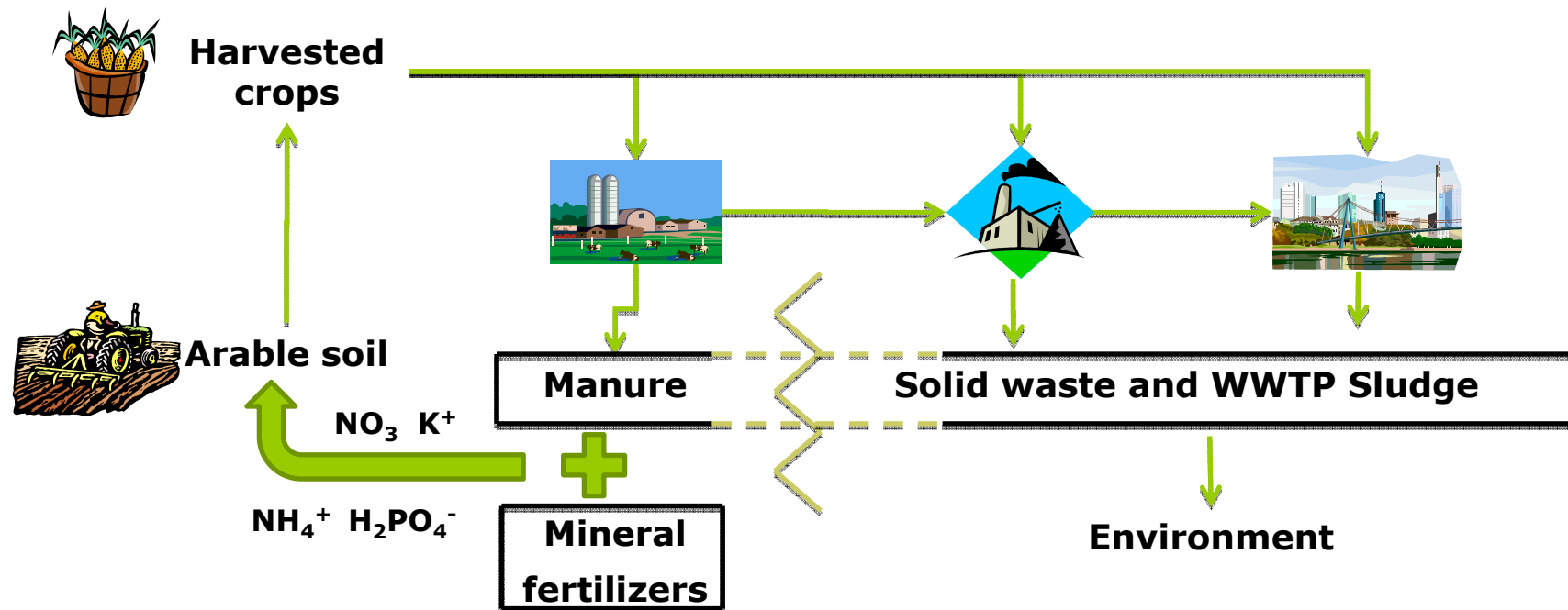


In the past, the use of human and livestock waste on the soil at limited (farm) scale, guaranteed a

**CLOSED NUTRIENTS CYCLE**

# Waste recycling and recovery

## Perturbation of nutrients cycle due to heavy urbanization



Heavy urbanization caused the modification / interruption of nutrients cycle which becomes an

**OPEN CYCLE**

# Agricultural Waste recycling: regulatory framework

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In order to close again the natural nutrients cycle, clear and effective rules need to be defined, as to be:

- easy as to encourage projects and virtuous practices;
- clear and precise, to safeguard public health and prevent environment pollution.

A comprehensive regulatory framework should combine the targets of the reference EU Directives in force:

- Waste Recovery and recycling (**2008/98/EC Directive**);
- Use of sewage sludge in agriculture (**86/278/EC Directive**)
- Protection of water from nitrates (**91/676/CE Directive**)



**Nutrient Cycle closure at a large scale (regional)**

# Agricultural Waste recycling in a “circular economy” – ER

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Assumed that an economy can be defined circular when waste in the production process is minimized and re-enters the process as recycled raw materials,

**Emilia-Romagna Region** has developed a lot of actions and tools in this direction consistent with the Communication from the Commission *Towards a circular economy: A zero waste programme for Europe*.

The implementation of policies to reduce the production and increase the quality and quantity of recycling will result in a progressive reduction in the need for treatment plants and disposal such as landfills and incinerators.



# Agricultural Waste recycling in a “circular economy” – ER

## THE SUPPORT OF GREEN ECONOMY «PRIVATE ACTORS» TO CIRCULAR ECONOMY IN EMILIA-ROMAGNA REGION

Sector	Companies	% of the total
Agro-food (processors of organic food included)	741	33%
Waste recycling	358	16%
Building	244	11%
Renewable energy and energy efficiency	216	10%
Integrated water cycle	200	9%
Green mobility	156	7%
Green mechanics	105	5%
Other (environmental certification, adoption of green practices, implementation of environmental technologies)	71	3%
Remediation sector	64	3%
Green management and depollution	48	2%
Total regional Green Economy	2.203	100%

# Agricultural Waste recycling in a “circular economy” – ER

Organic fraction of **municipal solid waste** and green waste.  
Estimate up to 2020 according to Regional Waste Management Programme.

<b>OFMSW</b>	<b>2011</b>	<b>2013</b>	<b>2017</b>	<b>2020</b>
Total produced (t)	461.019	550.322	496.444	440.314
Interception yield (%)	51	46	68	88
Total collected SWC (t)	233.852	253.505	336.913	386.413
Recycle rate (%)	47	59	71	84
Sent to recycle (t)	217.849	325.388	352.475	368.103

<b>Green waste</b>	<b>2011</b>	<b>2013</b>	<b>2017</b>	<b>2020</b>
Total produced (t)	481.468	492.393	481.112	467.648
Interception yield (%)	73	78	86	90
Total collected SWC (t)	353.735	383.348	414.359	419.728
Recycle rate (%)	64	69	75	78
Sent to recycle (t)	306.525	340.504	359.108	366.169

# Agricultural Waste recycling in a “circular economy” – ER

## SEWAGE SLUDGE RECOVERY IN AGRICULTURE IN ER

From 2010 to 2013, Emilia-Romagna Region have produced an average of 55.600 t SS/y of sewage sludge.

Provincia	2010		2011		2012		2013	
	(t) ss	(%)	(t) ss	(%)	(t) ss	(%)	(t) ss	(%)
Piacenza	1.960	3,5	2.495	4,3	1.938	3,4	1.699	3,3
Parma	6.356	11,2	6.742	11,6	6.439	11,4	5.828	11,4
Reggio Emilia	7.286	12,9	7.051	12,1	6.830	12,1	6.715	13,1
Modena	9.190	16,2	9.968	17,1	8.102	14,4	7.888	15,4
Bologna	8.227	14,5	9.756	16,7	11.076	19,7	9.099	17,7
Ferrara	2.930	5,2	2.918	5	2.270	4	1.958	3,8
Ravenna	8.458	14,9	7.621	13,1	8.483	15,1	6.776	13,2
Forlì - Cesena	6.549	11,6	6.012	10,3	5.405	9,6	5.765	11,2
Rimini	5.659	10	5.713	9,8	5.694	10,1	5.543	10,8
<b>Totale Regione</b>	<b>56.615</b>	<b>100</b>	<b>58.274</b>	<b>100</b>	<b>56.237</b>	<b>100</b>	<b>51.270</b>	<b>100</b>

Fonte: Elaborazione Arpa su dati provenienti dalle Province e dai gestori

In 2013 sewage sludge have been sent to the following destinations:

- **23% in agriculture**
- **28% treated by composting**
- 35% in landfills
- 14% treated by incineration

In 2013 about 32.000 t SS/y of sewage sludge (municipal and agro-industrial) have been used over 7.561 ha of agricultural land.

# Agricultural waste recycling in EU and Italian legislation

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Brief overview of the main legislative references regulating the agricultural use of waste:

- Sludge from WWTPs and agro-industry waste:  
**Sewage Sludge Directive 86/278/CEE, (in Italy D.Lgs n.99/92)**  
is the only one which defines procedures and sets very specific criteria for waste recovery in agriculture, although it is specifically referred to the use of sewage sludge
- Compost obtained from urban green waste, crop residues, OFMSW, sewage sludge, manure and slurry:  
**Reg. EU 2003/2003 (in Italy D.Lgs n.75/2010)**
- **Directive 91/676/CEE (National NAP + Regional NAP)**, referred to livestock manure and nitrogen fertilizers (NOT considered as waste if addressed for agricultural purpose). Nitrates Directive represents the mean to evaluate and control nitrogen supply when organic wastes are used in agriculture.

# Agricultural waste recycling in EU and Italian legislation

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Furthermore consistent with WFD 2008/98, **D.Lgs 152/06** introduces generic “recovery operation for agricultural benefit (R10)” but it doesn’t define conditions and procedures for its use.

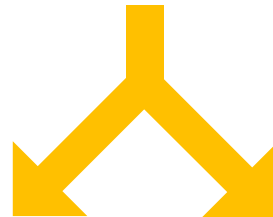
In some Regions, to overcome such gap, the rules applied to sewage sludge are taken as a reference for other type of organic waste. However, it is clear that such regulatory framework cannot be considered as sufficient for promoting agricultural recycle and safeguarding public health and environment.

# Agricultural waste recycling in EU legislation

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## Next steps towards safe OW reuse

Next steps in European legislation for the use of organic waste in agriculture



**Sludge Directive Revision** will include all Organic Wastes



Substances complying with minimum standards for safe use on soil but having characteristics not sufficient to become a product, and then used as a waste.

**End of Waste criteria**

As required by WFD 2008/98 defined by European Commission



High quality substances complying with very stringent standards, and used as a product (End of waste).

# Revision of Directive 86/278/EEC

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European Commission, by the means of **86/278/EEC Sludge Directive revision**, intends to regulate the use in agriculture of treated biodegradable waste whereas they do not comply with the quality standards required for compost/digestate (End of Waste), taking into account the criteria established for the agricultural use of sludge.

**The revision will only refer to wastes suitable for use on agricultural land.** The wastes that do not comply with such quality standards can be used on NON-agricultural soils or for environmental restoration and construction, according to national regulations.

# Revision of Directive 86/278/EEC

## Three-tiers system: Sludge/compost/digestate in 3 classes

	<b>Product EoW Compost/Digestate</b>	<b>Standard for sludge and organic wastes</b>	<b>Under standard quality</b>
<b>Input material</b>	Source segregated waste	All biodegradable waste (including mixed municipal waste and sewage sludge)	All biodegradable waste
<b>Use</b>	Not restricted	Allowed to be used in agriculture, however not on soils subject to high risk of contamination	Not to be use in agriculture, possible use on non-agri soils, for land reclamation or for construction purposes
<b>Monitoring</b>	Only in the production phase	Production; use on soils; monitoring of soils	Only at a national level
<b>Regulated by</b>	EoW criteria for organic wastes	Revision of Sludge Directive	Only at a national level



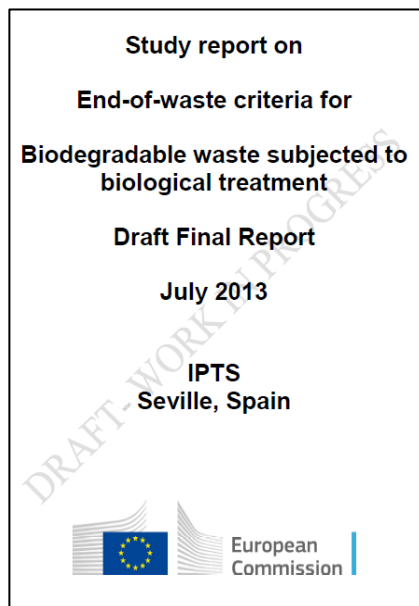
# End of Waste Criteria

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The Waste Framework Directive 2008/98/EC introduces a new procedure for defining **End-of-Waste (EoW) criteria**, to be fulfilled by any given waste stream in order to cease to be considered as a waste.

Targets of EoW criteria:

- Recovery of biodegradable wastes by composting and/or anaerobic digestion.
- Free circulation on the market of compost and digestate that meet defined standards.
- Use on soil without subsequent monitoring/control (End-of-Waste).



**EoW criteria are currently under discussion** and preparation by a technical group whose final product is the Draft Final Report of Seville in 2013

# End of Waste Criteria

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## Draft Final Report – Included and Excluded Waste

The EOW scope includes composted and digestate materials, sanitized and stabilized; they may be obtained through a process providing the biological treatment of waste. Only not contaminated materials, **resulting from separate collection of organic waste** (bio-waste), as well as **biodegradable waste** coming from agriculture (including manure), forestry, fishing and horticulture, or any material previously composted or digested, may be considered for biological treatment.

The limits for a EoW are much more restrictive than what is required by the current regulations for the use of sewage sludge in agriculture. On the other hand, there are no limits for the application amounts nor the need for analysis on the soil, while it is necessary a strict control on input materials.

# Conclusions

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**The recycling of Organic Waste in agriculture is actually a virtuous practice.** On the one side it allows the recovery of material, and on the other side it fosters the improvement of soil characteristics.

**Such practice is one of the priority in the hierarchy of waste management practices defined by the Framework Directive (2008/98/EC)** which places it at the second stage in the so-called "pyramid management" (immediately after prevention).

The **benefits of waste recycling in agriculture are:**

- recovery of materials as an alternative to permanent loss of resources (nutrients and organic matter);
- tackling soil depletion;
- soil conditioning and fertilizing;
- reduction of GHG emissions.

# Conclusions

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## What is missing?

A comprehensive regulatory framework including all organic wastes (not only sewage sludge) suitable for use in agriculture.

## What should the European Commission do?

**Quickly approve the End of Waste criteria for biodegradable waste.**

So far, the following three Regulation have been already approved:

- # 333/2011 (iron, **steel and aluminum** scrap)
- # 1179/2012 (**glass** cullet)
- # 715/2013 (**copper** scrap)

Technical studies on waste paper, biodegradable waste and waste plastic have been concluded and may led to the development of relative Regulations.



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Thank you for your attention!