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Composting & Anaerobic Digestion Association *of* Ireland

ECN

Organised by Cré in partnership with ECN

GORC

Global Organic Resources Congress
3 – 4 May 2016 Dublin, Ireland

CONGRESS BOOK OF ABSTRACTS

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GORC
Global Organic Resources Congress

GORC 2016

Crowne Plaza Hotel, Dublin Airport, Ireland
3th – 4th May 2016

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GORC is supported by the Phosphorus Platform, Compost Council of Canada, Biocycle, the European Biogas Association, the European Federation of Waste Management and Environmental Services, the Renewable Energy Association and the UK Biobased and Biodegradable Industries Association.

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Foreword from Cré

Céad Míle Fáilte - A Hundred Thousand Welcomes!

A Chara,

On behalf of Cré, the Composting & Anaerobic Digestion Association of Ireland, it gives me great pleasure to welcome you to the 2016 Global Organic Resources Congress. We are delighted to conduct this event in partnership with the European Compost Network.

cré
Composting & Anaerobic Digestion Association *of* Ireland

It is an honour to host this event in Ireland at a time of such economic and political uncertainty within the country and indeed in other parts of Europe.

It is the positive movements coming from policy and decision makers that are needed to help things back on track to recovery and growth.

With this is in mind, we would ask that the government in Ireland to introduce supports at a satisfactory level to encourage the development of AD projects across the country.

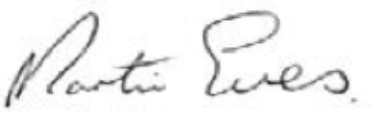
This year's Congress looks to the future and innovations in the bioeconomy, and setting us on a path to be ambitious and 'reach for the stars'. The recent EU Circular Economy package will provide opportunities for our sector to produce high quality end products but also, more importantly, it will help create new jobs from the collection and reprocessing of waste and the sale of end products.

The conference will provide an opportunity to network with members of those organisations active in the sector, including the European Compost Network, the European Biogas Association and the Composting Council of Canada. Cré extends a warm welcome to our colleagues and looks forward to ongoing fruitful exchanges.

I would very much like to thank our sponsors of the conference, the speakers, the exhibitors and the Conference Organising Committee (Stefanie Siebert, Fiacra Quinn, Maurice Cremin, Tim Duggan, Patrick O'Toole, Dearbhail Ni Chualainn, Munoo Prasad, Lee-jane Eastwood & Percy Foster) for their tremendous energy and committed work.

I welcome you all with a 'Céad Míle Fáilte' to Ireland- to what promises to be an excellent congress, both technically and socially.

Is mise le meas



Martin Eves
Chairman of Cré
April 2016

Foreword from ECN

Resource management in the Circular Economy of Europe

With the new proposal on Circular Economy, published in December 2015, the European Commission made a great step forward towards a resource efficient society and a circular economy in Europe. TThe current proposal, which includes an action plan and waste legislative proposals, leads the way to save and to recover resources from waste in a more sustainable way.

The new Circular Economy Package claims to 'boost competitiveness, create jobs and generate sustainable growth'. With the proposals for the revisions of the Waste Framework Directive, Landfill, Packaging and Batteries Directives, clear targets are set to boost separate collection and recycling of waste as well as reducing waste sent to landfill.

The new targets for recycling and landfilling waste include:

- A common EU target for recycling municipal waste of 65% by 2030;
- A common EU target for recycling packaging waste of 75% by 2030;
- Material-specific targets for different packaging materials; and
- A binding landfill reduction target of 10% by 2030.

These targets are accompanied by measures to simplify and harmonise definitions and calculation methods, as well as creating incentives through Horizon 2020 and structural funds.

Separate collection of bio-waste becomes obligatory for all Member States

For the bio-waste sector the revision of Article 22 in the Waste Framework Directive is a key element which will lead to improved bio-waste management in Europe. The revised Article 22 specifies that:

'Member States shall ensure the separate collection of bio-waste where technically, environmentally and economically practicable and appropriate to ensure the relevant quality standards for compost and to attain the targets set out in' the municipal waste recycling targets.

This is a significant step forward for Europe. The requirement placed on all Member States to collect bio-waste separately for both composting and anaerobic digestion will mean that even more organic carbon and plant nutrients will be recycled and put back onto Europe's soils'.

Future market for recycled organic material

With reference to the EU Circular Economy Package the Commission published the roadmap on the revision of the EU Fertilisers Regulation (EC) 2003/2003 in 2015 and published a legislative proposal in March 2016. With this proposal, the Commission aims to establish a regulatory framework to enable the production of fertilisers from recycled organic materials in order to place compost and digestate as soil improvers and organic fertilisers on the European market.

Both of these legislative initiatives of the Commission provide a major opportunity for Europe to significantly improve bio-waste management in Europe, and to direct waste-derived materials into high quality products through recycling. In addition, this will also give guidance to municipalities and companies to invest in clean environmentally sound technologies for separate collection and bio-waste recycling, the recovery of organic resources and for renewable energy.

Bio-waste plays a key role in Circular Economy

According to the EU Communication on Bio-waste (COM(2010) 235 final) the EU Member States produce between 118 and 138 Mtonnes of bio-waste each year. Currently, approximately 75% of this material is landfilled. Disposal in landfill leads to the diversion of the carbon and nutrients in the bio-waste away from ecosystems, making it unavailable for reuse. In addition, the uncontrolled decomposition of biowaste in landfills leads to the emission of greenhouse gases such as methane. Currently only about 25% (30 M tpa) of biowaste is effectively recycled, meaning that around 100 M tpa is wasted every year.

In a circular economy, bio-waste plays a key role. Instead of landfilling bio-waste, it forms a resource for organic soil improvers, fertilisers and biobased products. The carbon and nutrient contents of bio-waste are concentrated in organic

Foreword from ECN

fertilisers and soil improvers or can be extracted, modified or transformed into a range of different biobased products. After use, the residues of these products can flow back safely into the biosphere, thereby closing carbon and nutrient cycles. Besides theses contributions to the nutrient and carbon cycle, the recycling of bio-waste through anaerobic digestion provides renewable energy and biofuels, which has the additional positive effect of reducing greenhouse gas emissions.

In summary, recycling of bio-waste contributes significantly to circular economy and resource efficient objectives at large:

1. It closes biological material cycles, and reduces the linear economy of landfilling and incineration waste;
2. It contributes to long-term soil fertility, by production of quality soil improvers and organic fertilisers;
3. It produces bio-based products which can replace fossil-based products such as mineral fertilisers, peat and fossil fuels;
4. It creates a local economy with sustained jobs. Based on experience in countries with established bio-waste recycling infrastructure, additional recycling of 100 Mtonnes would lead to at least 20,000 jobs. In addition, it contributes to improving farmers' incomes and to distributed jobs in rural regions;
5. It contributes to climate change mitigation by replacing the use of fossil energy and fuel, peat and mineral fertilisers, sequestring carbon in soil and by avoiding landfill gas emissions.
6. Separating the bio-waste from the residual waste also enables increased recycling rates of the dry recyclables.

ECN welcomes the initiatives of the European Commission on circular economy, including the legislative proposals on waste and fertilisers. These provide a unique opportunity to use the "untapped potential for significant environmental and economic benefits" offered by bio-waste. Using waste as a resource to produce valuable products (compost, digestate and biogas/biofuel) for the European market will play a key part in achieving a more resource efficient Europe in the future!

It is now up to the Member States, the Members of the European Parliament and all stakeholders to accompany the Commission in its political decision process in a constructive way. A comprehensive waste recycling, resource-efficient and quality product policy will help to improve the European market for recycled products from bio-waste and boost Europe's green economy.

We welcome the initiative of Cré, the Compost and Anaerobic Digestion Association of Ireland, to organise this 'Global Organic Resource Conference – GORC 2016'. 2016 will be an important year for the bio-waste sector in Europe. At the same time, as we are discussing here, in Dublin, the future of Europe's circular bioeconomy, we are happy that the Compost Councils of the United States, Canada and Australia are celebrating 'Compost Awareness Week'. By this we can conclude that organic resources play an important role in sustainable resource management all over the world.

We hope that through this event we can contribute, to a sustainable future for bio-waste recovery and especially to decisions on effective organic waste recycling in Europe and around the world.

Stefanie Siebert
European Compost Network ECN e.V.

About ECN

The European Compost Network (ECN) is the leading European membership organisation promoting sustainable recycling practices by composting and anaerobic digestion of organic resources and guarding the quality and safe use of the recovered organic fertilisers/soil improvers.

The European Compost Network is an organisation with 72 members from 27 European Countries. Members include all European bio-waste organisations and their operating plants, researchers, policy makers, consultants and authorities. ECN represents 22 bio-waste organisations (compost and digestate quality assurance organisations) from 14 European Countries and two from abroad, 23 companies producing bio-based products (organic fertilisers, soil improvers, growing media and, biodegradable plastics), 10 non-governmental organisation of environmental protection organisations, 10 academic (research) institutes in environmental, agricultural and natural sciences and 3 environmental agencies.

Via the member organisations, ECN represents more than 3000 experts and plant operators with more than 30 million tonnes of biological waste treatment capacity.

DESCRIPTION OF SPONSORS

Cré and the ECN would like to thank the following organisations who have provided substantial assistance to this conference

MAIN SPONSOR NOVAMONT Via Fauser 8, Novara, Italy. 28100 Contact: Christian Garaffa Email: Christian.garaffa@novamont.com www.novamont.com Tel: +39 340 9301161	NOVAMONT is the world's leading company in the sector of BIOPLASTICS and BIOCHEMICALS obtained through the integration of CHEMISTRY, the ENVIRONMENT and AGRICULTURE. It's main product, MATER-BI, is an innovative family of bioplastics which uses substances obtained from plants such as cornstarch, and biodegradable polymers obtained both from renewable raw materials and fossil raw materials. MATER-BI is available in a range of grades developed for e.g. compostable carrier bags, bin liners, garden waste sacks, cutlery, biodegradable mulch film. All grades of MATER-BI are certified as biodegradable and compostable, according to the leading international standards, e.g. EN 13432 and ASTM 6400. Moreover, specific MATER-BI grades are certified for biodegradability in soil or home composting environments according to the Vinçotte certification schemes.
MAIN SPONSOR CONSORZIO ITALIANO COMPOSTATORI **Rome Office** Via Cavour, 183/A - IT-00184 ROME - Tel +39 06 4740589 cic@compost.it **Milan Office** Loc. Cascina Sofia - IT-20873 Cavenago Brianza (MB), Italy Tel. 39 02 95019471 segreteriatecnica@compost.it Twitter @consorzioCic	The Italian Composting and Biogas Association (CIC) unites public and private companies, local authorities and others involved in the production of quality compost, as well as organizations which do not make compost but have an interest in the composting process (producers of machinery and equipment, producers of fertilisers, research bodies etc.). The Association is a not-for-profit organization. It is important at a national level and has approximately 130 Members. It is the only organization in Italy which promotes and follows up, in collaboration with Local Authorities, proposals for new laws, the policy of waste reduction, the carrying out of separate waste collection for the selection, processing, recycling and utilisation of biomasses, and in general of organic waste which can be turned into quality compost.
MAIN SPONSOR S.E.S.A. SOCIETÀ ESTENSE SERVIZI AMBIENTALI S.p.A. **Società Estense Servizi Ambientali S.p.A**.Via Comuna, 5/B 35042 Este (PD), Italy Tel. 0429/612711 - 0429/612748 e: info@sesaeste.it w: www.sesaeste.it	S.E.S.A. S.p.A. is located in Este, Italy. Initially disposing of urban waste, today thanks to continuous development it operates primarily in the recovery of materials, transforming waste into resources. The site is characterised by a system of waste treatment facilities using waste-to-energy technology. These systems include a composting plant for the processing of organic waste into compost, and the process of anaerobic digestion that produces biogas either to be upgraded into biomethane or to produce electricity and heat. SESA supplies electricity to his own plant and sells the surplus to the national grid. Furthermore, the heat produced is used in a 7km district heating network, which SESA manufactured itself. The on-site depuration plant also allows for water to be cleaned and recycle for further use.

COFFEE BREAK SPONSOR www.enviroguide.ie	Enviroguide Consulting is a multi-disciplinary consultancy specialising in the areas of Environment, Waste Management and Planning. Established in 2010, Enviroguide Consulting currently serves a range of Private and Public Sector clients nationwide. Our consultants have extensive scientific, engineering and technical qualifications and collective experience in the Environmental and Waste Management sectors. This allows us to share with our clients the benefits of our knowledge and provide practical, cost effective solutions. Enviroguide has been contracted to complete the EIA process and EPA Licence applications for some of the largest composting and anaerobic digestion facilities in Ireland.
	Fáilte Ireland, the National Tourism Development Authority, was established under the National Tourism Development Authority Act, 2003. We provide strategic and practical support to develop and sustain Ireland as a high-quality and competitive tourist destination. In this context, our mission is broadly: "To increase the contribution of tourism to the economy by facilitating the development of a competitive and profitable tourism industry."
SPONSOR OF WEBSITE AND BOOK OF PROCEEDINGS	EPA Research is built around 3 pillars of Climate, Water and Sustainability. EPA Research has increased national understanding of our environment, the challenges it faces and responses to these. It has also developed high quality research capacity and supported innovation that is internationally respected. EPA Research is targeted to address the needs of key governmental and non-governmental stakeholders and also encourages the researcher community to engage with these stakeholders. EPA-funded environmental research provides essential scientific support for environmental policy development in the areas of Climate Action, Water management, National Peatland Strategy, Stockholm Convention on POPS and the National Radon Control Strategy.

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EUROPEAN CIRCULAR ECONOMY OPPORTUNITIES

An overview of the opportunities the EU Circular Economy package will create.
Mairead McGuinness MEP, Vice-President of the European Parliament

The video message can be viewed here:
https://www.youtube.com/watch?v=EYa8wpNfzyY&feature=youtu.be

Phil Hogan European Commissioner for Agriculture and Rural Development

The video message can be viewed here:
https://www.youtube.com/watch?v=T5xyqjBnN7I&feature=youtu.be

An Anaerobic Digestion/Compost Plant Operator in the Year 2050

Henrik Lystad, Chairman, European Compost Network

It is nearly impossible to predict the future, yet we cannot stop trying. The movie industry, for instance, made some interesting predictions on computer tablets (Space Odyssey, 1969) and biofuel from food waste (Back to the Future II, 1989).

From a plant owner's point of view, long term investments in plant infrastructure means that a future perspective of the sector is vital. With the introduction of the circular economy at a European level, waste management is undergoing a paradigm shift. And the development will most probably be fast. It already seems that various sources of renewable energy (solar, wind, hydro, bio, wave etc.) will provide a carbon neutral energy supply. On the other hand, the scarcity of materials and rare elements for a growing world population will move us towards giving a higher value to the materials in waste.

A crucial element of a circular economy is the sustainable management of our soils. This will drive us towards placing a higher value on the organic cycles that provide quality products which target improved soil quality.

Organic waste treatment, anaerobic digestion and composting will most certainly undergo radical changes over time. To be part of this development a plant owner of today needs to be open to possibilities. The benefits of being part of a business model that represents a fundamental role in the future circular economy and supports the need for increased food production are many.

Some of the elements we may see on a future anaerobic digestion or composting site include:

- The integration of other feedstocks, like wood fibres, agricultural, fishery and industrial residues.
- Production targeting product demands.
- More specific detection and sorting technologies.
- Utilisation of the resources for production of biochemistry/bioactives, fodder, biofuel, hydrogen, CO2 in combination with specified organic fertilisers and soil products.

This diversification of the sector will require improved communication, with carbon economics and accounting coming to the fore.

How the Bioeconomy Contributes to Making a Circular Economy

David Newman, Managing Director of the Bio-Based & Biodegradable Industries Association

The Bioeconomy is that part of industry which uses primarily bio-based sources that are transformed into chemicals, materials and energy, substituting oil- derived products in part, and creating new materials too. The advantage of most bio-based production is that the production process is generally less energy intensive and less polluting; whilst the product advantage lies in the improved performance and in the biodegradability of many bio-based materials.

Where biodegradability is a feature, as in compostable plastics for example, bio-based materials have a direct recovery stream into AD and composting through food waste collection systems. The importance of food waste collection and treatment lies in the need to get organic material back to soil, as soil erosion and the depletion of organic matter is a developing environmental issue – some 80% of agricultural soils globally are suffering from depletion of organic matter and are at risk of desertification. Compostable materials collected with food waste can help drive the return to soil of organic carbon.

So the bioeconomy value proposition is essentially about cleaner production, use of renewable resources, less waste, and increased replenishment of organic carbon to soil.

Whilst traditionally bioeconomy was about using bio-based materials such as forestry products and certain crops to make fuels, paper and textiles, now it is about the manufacture of speciality and commodity chemicals in third generation biorefineries.

From these a myriad of new products are produced including such unsophisticated products as compostable plastic films for use as caddy liners in food waste collection, or as mulch for farming; to food service products; packaging; lubricants; insecticides; paints; coatings; and even as components in the tyre, automobile and aircraft industries.

In order to develop this industry in the UK, which is currently far behind the USA and some EU countries, we need a bioeconomy strategy to channel policies and investments; a strong CE package from the EU which pushes food waste reduction and collection; employing fiscal and policy changes to favour biomaterials (as we do for example with landfill taxes to favour recycling); and raising quality standards, to ensure clean recovery of materials to soil (on digestate and compost for example).

This is an industrial sector which grows rapidly in countries such as France, Belgium, the Netherlands, Italy and the USA that adopt such policies. The UK can benefit too if it aligns it's policies to attract investment. With the closure of many traditional UK heavy industries, such as chemicals, coal and steel, the UK has enormous industrial experience and a skilled work force that could see the bioeconomy become a major inward investor and employer. The UK has among the highest global access to venture capital and a solid legal framework. With policy changes that are zero cost to the Treasury, a new and important industry could be developed, creating wealth and benefiting the environment too.

Carbon, Nutrients and Soil

Dr Jane Gilbert, Carbon Clarity, UK and Vice Chair of the ISWA Working Group on Biological Treatment

In June 2014 the ISWA Board established the ISWA Task Force on Resource Management. This report is one of six reports prepared by the Task Force and describes the potential value that can be recovered from organic wastes. It focusses specifically on the carbon and plant nutrient content in organic wastes and how they can be recycled to create high value products, contribute towards feeding an ever-growing global population, as well as help conserve resources and improve soils. It focusses on OECD countries, although the principles outlined in this report are global.

The report sets out estimates of the potential organic waste arising from municipal, commercial/industrial and agricultural sources. It established that within OECD countries, an estimated 124 million tonnes of organic municipal waste could be effectively collected annually, of which only 66 million tonnes are currently recycled through composting and anaerobic digestion. The potential for organic commercial and industrial wastes, crop residues and manures is largely unknown but is likely to be considerable and well in excess of the municipal waste fraction.

The resources contained within this 124 million tonnes of municipal organic waste are significant, holding anywhere between 0.1 to 3 million tonnes of nitrogen and 4 to 41 million tonnes of carbon. This carbon and nutrients can be extracted, modified, or transformed into a range of different products which can be classed into three main categories:

- high value, low volume products – these are bio-based fine and speciality chemicals which are used in relatively small amounts for high-technology applications;
- medium value, medium volume products – these include commodity chemicals, bioplastics, biogas, struvite, fibreboard and cellulose; and
- high volume, low value products – these are primarily compost and digestate, resulting from composting and anaerobic digestion processes, respectively.

The global market potential for these products is potentially massive, with estimates in the USD billions annually.
Across OECD countries an estimated 22 million tonnes of compost/digestate was produced in 2013, having a nutrient value in the region of USD 121 million per annum. This could rise to USD 227 million per annum if all municipal organic wastes were captured for recycling. Although the nutrient value of compost and digestate can be calculated with relative ease, the benefit of organic carbon and its effect on soil organic matter is currently not valued in monetary terms. An estimated five million tonnes of stable carbon (and ten million tonnes of carbon in total) is applied to OECD soils every year in the form of compost/digestate, which could rise to six million tonnes and 12 million tonnes respectively, if all of the potential municipal organic waste was composted and/or digested. This could potentially make a significant contribution towards improving soil function and increasing the soil carbon pool.

In conclusion, the carbon and nutrient value in organic waste is currently being realised, at least in part. Significant potential exists to maximise collection and recovery of organic wastes across OECD countries, and to use these to manufacture high-value bio-based products, as well as recycling nutrients and improving soils through the application of quality compost and digestate. To realise this, co-locating treatment and manufacturing processes at single sites, overcoming technical, logistical and fiscal barriers, and valuing the benefits of improving natural capital (in particular soils) all need to be addressed.

The report was funded by the International Solid Waste Association (ISWA), a global, independent and non-profit making association, working in the public interest to promote and develop sustainable waste management.
A copy of the report can be downloaded here:
http://www.iswa.org/iswa/iswa-groups/task-forces/

EU Fertiliser Regulations

Eric Liégeois, European Commission

The aims of the revised Regulations were to make fertilisers more sustainable, promote the recycling of nutrients and boost the market for secondary raw materials. The revisions came about as there were a number of issues that needed to be addressed, including technological, quality and safety aspects.

The proposal for the revised Regulation includes the new legislative framework approach which allows market availability of CE marked fertilising products. This would be possible if products are compliant with generic safety, quality and labelling requirements and standards. Conformity assessment procedures are also outlined which would require the manufacturer to operate a quality assurance system, in certain cases (e.g. waste-derived fertilising products) under surveillance of an independent notified certification body.

The new system will provide flexibility in terms of product description and design while clarifying the uncertainties as regards their waste status: a CE-marked compliant fertilising product would cease to be waste.

Overall the Regulation aims to improve the market conditions for more sustainable fertilisers, to set out proportionate requirements and to not create any unnecessary market disruptions.

Eric's presentation was recorded and can be viewed at this link: https://vimeo.com/user46597781/review/165556886/d0ecd2f64b

Nutrient Recovery from Manure Digestate: the ManureEcoMine Perspective

Dr. Cristina Pintucci, University of Ghent, Belgium

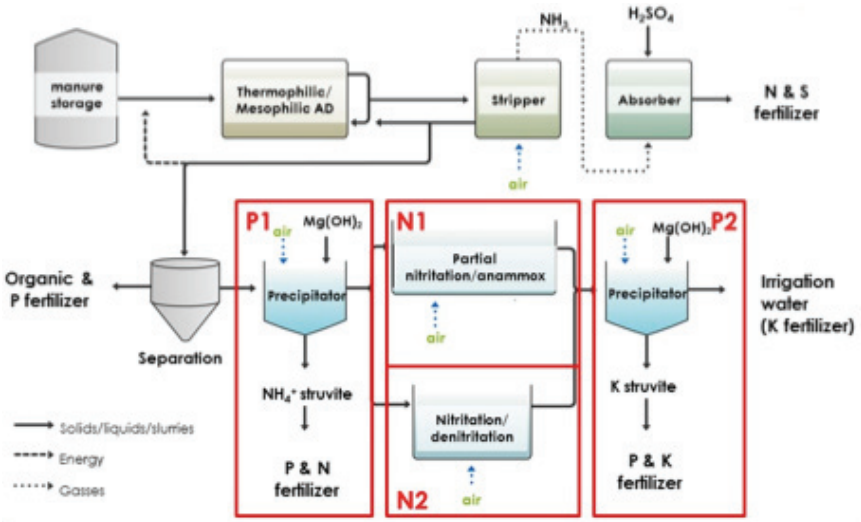
Intensive animal husbandry has lead to the production of large amounts of manure in the last decades. It is estimated that around 1.2 billion tonnes per year of manure was produced in Europe from cows and pigs. Such production levels represent a significant environmental threat from manure nutrient leaching into surface water. However, the high amount of nitrogen (N) and phosphorus (P) present in manure makes it an exquisite mining resource for the recovery and reuse of nutrients as "green" fertilisers.

The European FP7 project, ManureEcoMine, investigates nutrient recovery from manure digestate. The effectiveness of extracting nutrients in the form of ammonium sulphate and struvite from an anaerobic digestion pilot plant was studied, and the results were presented. Concentrated nutrient streams can be generated through the ManureEcoMine process, facilitating P and N transport from areas with intensive manure concentrations to nutrient shortage zones. Besides demonstrating the technical effectiveness of the pilot installation, the environmental and economic feasibility of the process was assessed.

The ManureEcoMine process (Figure 1) comprises a synergistic combination of well-known wastewater treatments. An anaerobic co-digester was coupled to an ammonia side-stripper, an innovative process that is hardly implemented at pilot scale. The stripper ensured a reduction of free ammonia inhibition in the digester thus allowing for better digester performance and, at the same time, the recovery of N as ammonium sulphate ($(NH_4)_2SO_4$), which is a known fertiliser. The stripped digestate was treated in a 2-step solid/liquid separation process, consisting of a decanter centrifuge and ultrafiltration on ceramic membranes. The filtered fraction served as influent for a struvite reactor, in which struvite ($NH_4MgPO_4 \cdot 6H_2O$) was precipitated for phosphorus recovery. As a last step, the struvite reactor effluent was processed for shortcut biological nitrogen removal, through partial nitritation/anammox or nitritation/denitritation. The process was demonstrated over a 10 month operation with pig manure and vegetable mix residues from supermarkets (Ecofrit) in the Netherlands. Optimisation of each operation unit was implemented in the manure processing plant with continuous support at laboratory level.

The N and P recovered from the pilot operation as ammonium sulphate and struvite were blended into green fertilisers which were tested in greenhouse experiments, comparing the results with a common P fertiliser (triple superphosphate, TSP). Based on the characteristics of the soil and the plant used (lupine and maize), better results were obtained when struvite was used as P fertiliser for plant growth than the common plant fertiliser TSP.

The entire process was monitored for trace contaminants risk and management, environmental assessment and economic feasibility. The ManureEcoMine cycle had a more positive impact than the manure processes currently implemented in livestock waste management.



Next Generation Anaerobic Digestion - Moving Beyond Biogas

Dr. René Rozendal, Chief Technology Officer, Paques bv, Netherlands

Anaerobic treatment of organic wastes has been commonplace for decades. Anaerobic digestion in its current form produces biogas, which is typically combusted for electricity and/or heat generation. Although this effectively uses the energy potential of the waste stream, it destroys the organic compounds that could theoretically also be used for the production of more valuable materials, fuels, and chemicals. To be able to fully exploit the potential of organic waste streams, Paques aims to approach organic waste digestion in a new way using the so-called volatile fatty acid (VFA) or carboxylate platform. This recently emerging platform technology does not require sterile fermentation conditions, making it particularly suitable for waste streams.

In the carboxylate platform, anaerobic digesters are operated in such a way that volatile fatty acids (VFA), such as acetic acid, propionic acid, and butyric acid are produced, while biogas generation is prevented. Subsequently, the produced volatile fatty acids are biologically and/or chemically converted to bio-based products, such as bioplastic, alcohols, and medium chain fatty acids (MCFA).

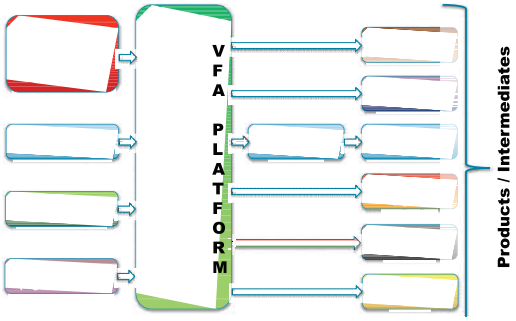


Figure 1. The VFA or carboxylate platform

Of all the production technologies that can be operated on VFAs, the production technology for polyhydroxyalkanote (PHA), a bioplastic, is most advanced. PHA, valued at 2-3 euro/kg, is a biodegradable, bio-based polymer with properties similar to oil based polypropylene and polyethylene.

In collaboration with the Delft University of Technology, Paques has developed a highly efficient process that converts wastewater- or organic waste-derived VFAs to PHA. This process is controlled in such a way that biopolymer accumulating bacteria are growing until they reach intracellular concentrations of the PHA of over 80 % of their cell weight. These high accumulation percentages, unique to this process, highly simplify the further downstream processing and application of this bioplastic.

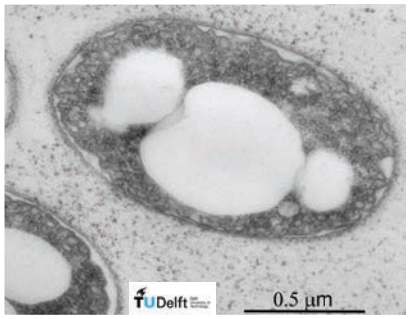


Figure 2. A scanning electron microscope image showing a microbe with high levels of intracellular PHA

The process has been successfully demonstrated at a pilot plant scale on wastewater at two locations in The Netherlands, i.e, Mars in Veghel (chocolate/candy production) and ESKA Graphic board in Hoogezand (cardboard production). Recently, the pilot plant was moved to an organic waste processing facility Orgawold in Lelystad (NL), where is it now being operated on a VFA containing percolate extracted from organic waste. The preliminary results are promising, as PHA levels are rising rapidly. The pilot will be further optimized in the months ahead.

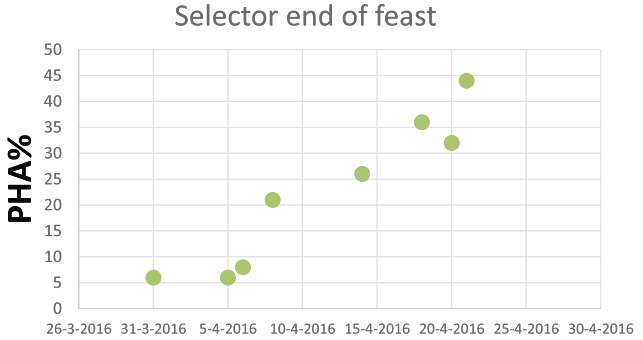


Figure 3. First results of the PHA pilot plant test at Orgawold in Lelystad (NL). PHA levels are increasing.

Acknowledgements: this project is supported by the Top Sector Energy of the Dutch Ministry of Economic Affairs

Locally Intergrated Biorefining: The Case Study of Novamont

Stefano Facco, New Business Development Director, Novamont, Italy

The Italian company is known as a producer of starch-based bioplastics and creating novel chemicals out of vegetable feedstocks.

Novamont have been developing new technologies based on vegetable oils and sugars to produce intermediate chemicals that can be used in other applications. Examples include azelaic acid (which can be transformed into a bio-based polymers, additives for greases, cosmetics etc) and pelargonic acid (which is used as a bioherbicide, ester for lubricants, cosmetics).

At a biorefinery in Sardinia, Novamont have illustrated how oils and protein are successfully extracted from thistle and used as an animal feed.

Overall, the potential from biorefining plant-based products is extensive, with potential applications in the traditional chemicals, horticultural and cosmetics sectors.

AD Helping the Food Production Sector Reduce its Greenhouse Gas Emissions

Harm Grobrugge, Vice-President of the European Biogas Association

EBA was founded in 2009 as an umbrella organization of national biogas associations because it became increasingly necessary to represent our industry's interests towards policymakers in the EU .

In the years 2011-2013, EBA, together with partners from industry and science, conducted an intensive project on the feasibility of anaerobic digestion in the food and beverage industries. The results showed that there are a lot of positive examples already, proving that with AD the industry can not only reduce waste streams treatment costs , but also produce a significant amount of energy needed for their processes. This reduces GHG emissions on both the input side and on the waste side of production.

The project report together with many best practice examples can be found under: http://www.fabbiogas.eu/en/project-results/mapping-biogas-plants-using-fab-industry-waste/

GORC
Global Organic Resources Congress

Achieving Greenhouse Gas Reductions Through Composting

Allan Yee, CD, M.Sc., P. Eng., Compost Council of Canada

Negative climate change effects resulting from increased concentrations of greenhouse gases (GHGs) released into the atmosphere from human activities have been well documented and publicised over the last 2 decades. The UN's Intergovernmental Panel on Climate Change (IPCC) has assessed and assigned a Global Warming Potential (GWP) number to each identified GHG in comparison to the reference number of 1 associated with CO_2 (carbon dioxide).

In the case of landfilling organic solid waste, approximately half of the resulting GHGs generated will be methane (CH_4). Methane has an assigned GWP number of 25, which means that the IPCC considers that over 100 years, a mass of methane released into the atmosphere will be 25 times as effective at trapping heat as the same mass of emitted CO_2.

The development of the Kyoto Protocol in 1997 created a number of market based "flexibility mechanisms"[1] wherein potential GHG emission reductions could be quantified and traded. In theory, carbon trading leverages the efficiencies of capitalism to achieve emission reductions at the lowest cost to society. However, unlike carbon taxes (every government already knows how to set and collect taxes), trading requires the organization of separate accounting bureaucracies that may well be subject to attempted shortcuts and cheating.

Composting is an alternative activity to landfilling that will result in lower GHG emissions because the process will largely generate CO_2, rather than methane, from organic waste. The calculation of "offset credits"[2] from composting requires the determination of the difference between the baseline GHG emissions that would have occurred from landfilling of a given mass of organic waste versus the calculated emissions that are generated from composting them. Baseline emissions are derived by using the accepted IPCC equation to obtain "L_o"[3] for a given mass, and then applying a first order decay (FOD) relationship "(e^{-kt})"[4] to L_o to yield a time distribution series of emissions (converted to CO_2 equivalents), by year. Different regulatory jurisdictions have specifically nuanced rules on what, in the above exercise, is allowed for a baseline quantity of emissions in calculating offsets.[5]

On the composting side, the mass of organic material composted must be tracked as well as all the energy inputs (e.g., electricity, natural gas, diesel fuel, etc.) into the process. Each of these quantities are multiplied by their jurisdictionally approved "emission factors"[6] for each of the 3 primary GHGs of concern – CO_2, CH_4 and N_2O. The results are then converted to CO_2 emission equivalents and subtracted from the allowable baseline to obtain the project offsets.

1 A flexibility mechanism describes a situation wherein a regulated GHG emitter pays another unrelated entity to achieve emission reductions elsewhere that they themselves cannot achieve through their own direct actions.
2 So called because they "offset" the GHG emissions from the regulated emitter purchasing them. Credits are quantified in terms of a common currency of equivalent tonnes of CO_2 emissions.
3 "L not", the methane generation potential, or the total amount of methane that could be generated from disposing of the mass into a landfill.
4 Where "e" is the natural logarithm base constant, "k" is a geography specific methane generation rate constant, and "t" is time in years.
5 In the California cap and trade system, the allowable baseline consists of the first 8 years of the FOD model results, whereas in Alberta, Canada, the allowable baseline FOD model can be extended out to 40 years.
6 E.g., for a given GHG, there would be separate emissions factors (in kgs/m^3) for both upstream extraction/production and for combustion of diesel fuel.

In the international effort to develop a successor agreement to the Kyoto Protocol, a more "bottom up" approach was taken with the Conference of the Parties discussions in Paris in late 2015 (COP 21), with the participating nations having previously submitted pledges of what GHG emission reductions they were willing to voluntarily undertake. The final Paris communique was also more positive than originally anticipated, with the participants in the end agreeing to *"pursue efforts to limit* [average global] *temperature increases to 1.5^0 C above pre-industrial levels"* rather than the +2^0 C which the best climate change models currently indicate is the point of no return when climate change will become irreversible. However, the sum total of the various national voluntary pledges, if kept, will only hold global temperature increases to about 2.7^0 C.

Nevertheless, there is some cause for hope. Ratification of the Paris Agreement by individual nations is well ahead of the pace at which Kyoto was ratified. And whereas the Kyoto Protocol only mandated climate change actions by developed nations (no actions were required by undeveloped nations), there is also now a well-funded mechanism (the Green Climate Fund) in place aimed solely at financing mitigation actions by developing countries. Then there is the promise that more targeted R&D work in the years ahead will enhance the development and viability of alternative, non-carbon based technologies aimed at not only mitigating the effects of GHG emissions, but also continuing to feed the world's constantly growing demand for more energy. Finally, a reversal in the concentration of atmospheric GHGs will not occur overnight, and there is considerably more pain to come over the next quarter century as the negative effects of climate change become more evident. Fear is a great incentive, and there is one school of thought that foresees the general public in all countries eventually getting ahead of their politicians in demanding faster and deeper cuts in GHG emissions.

A Review of Biochar Progress and its Innovative Uses

Hans-Peter Schmidt, Director of the Ithaka Institute for Carbon Strategies, Switzerland

Biochar is a very porous, charcoal like material which can be produced from all types of biomass including crop residues, pruning's, wood waste, digestate or chicken manure when heated to more than 400° C under limited oxygen or anaerobic conditions. Biochar is lightweight and has excellent adsorption and heat insulation capacities. It is also a long-term carbon sink and a renewable resource which can replace many fossil carbon based materials.

While the main application of biochar is currently in agriculture and animal farming, biochar is predicted to become a key substance for the circular bio-based economy. More than 50 industrial uses of biochar are currently listed. For example, it has been used as an advanced building material replacing sand, as well as in the paper, textile and electronic industries or in waste water treatment and air filtration processess [1].

In agriculture, biochar is mainly used as a carrier matrix for organic plant nutrients and thus as a biochar based organic fertilizer. Organic substances like liquid animal manure, liquid digestate or specially produced liquid fertilizers are loaded into the porous system of biochar where it is protected from leaching and becomes a slow release fertilizer. Initial results show that such organic biochar based fertilizers may be at least as efficient as conventional mineral fertilizers in enhancing plant growth [2].

If these preliminary findings can be confirmed, the highest value of biochar in agriculture might lie in organic nutrient capture and recycling. In mixed-use farms, biochar could thus first be used in manure management to decrease nutrient losses, reduce odours and to improve, when applied to soil, organic fertiliser efficiency while reducing greenhouse gas (GHG) emissions during the whole cascade of use from manure storage, to composting and application. Some of the biochars may even be used as feed additives to initiate the nutrient capturing effect of the biochar already in the digestive system of animals, while improving feed efficiency and animal fitness. Even though scientific proof of the latter is still scarce, more than 90% of the biochar holding a European Biochar Certificate [3] is first used in animal farming (partly as a feed supplement and mostly as bedding and manure treatment) and only after those initial uses is it then used as a soil amendment.

Five years ago biochar was mostly used as mono-constituent soil amendment at massive application rates. Nowadays, no farmer would even think of spreading 10 or more tonnes of dusty biochar onto their soil. Rather, they would use biochar material parsimoniously in combination with organic or mineral fertiliser as described above. It would be applied directly into the root zone of the crops [2], as opposed to top dressing it homogenously over the entire field, which was the assumed best practice in the mid-to-late 2000s.

1. Schmidt, H.-P.; Shackley, S. Biochar Horizon 2025. In Biochar in European Soils and Agriculture: Science and Practice; Shackley, S.; Ruysschaert, G.; Zwart, K.; Glaser, B., Eds.; London, 2016; p. accepted.

2. Schmidt, H.; Pandit, B.; Martinsen, V.; Cornelissen, G.; Conte, P.; Kammann, C. Fourfold Increase in Pumpkin Yield in Response to Low-Dosage Root Zone Application of Urine-Enhanced Biochar to a Fertile Tropical Soil. Agriculture 2015, 5, 723–741.

3. EBC European Biochar Certificate - Guidelines for a Sustainable Production of Biochar. Version 7.1 of 22th December 2015 http://www.european-biochar.org/en/download (accessed Jan 12, 2016).

20 Years Experience of a Successful Organic Waste Policy in Italy

Alberto Confalonieri, CIC - Italian Composting and Biogas Association

The Italian biowaste management system stands out as a successful example in Europe. The country steadily increased its collection rates to 5.7Mtons collected and recycled in 2014, meaning an average of 94kg/inhabitant involving almost 60% of the Italian population (85% of the municipalities).

Important regulatory drivers both derive from the enforcement of EU directives, i.e. the 50% recycling target until 2020, which in Italy includes biowaste within the calculation formula, and the "landfill" directive provisions, which increase residual waste disposal costs encouraging the diversion of biowaste; and national norms, such as a separate collection target of 65% and the obligation to collect organic waste by means of compostable bags only, increasing biowaste capture rates and quality.

Trends in biowaste collection systems development are represented by:

1) the pushing forward of doorstep collection systems
2) the independent collection of foodwaste, garden waste and residual waste at different frequencies (higher for foodwaste, which include cooked fractions) with the final goal of discouraging people from improperly throwing foodwaste in the residual waste flow.

Biowaste is mostly recycled in composting facilities (over 252 out of the 298 recycling sites operating in 2015) but, in terms of throughput, 40% of biowaste is recycled in 46 comparatively larger anaerobic digestion plants. AD plants are actually integrated AD + composting facilities, with compost being the only End of Waste in Italy.

A key role in the development of the biowaste sector and production and utilization of compost is played by the Italian Composting and Biogas Association (CIC) which unites public and private companies, local authorities and all the stakeholders directly or indirectly involved in the production of compost. CIC, associating companies managing around 80% of biowaste treated, surveys and monitors biowaste collection in Italy, supports the amendment and development of EU and National legislation on biowaste management and composting, and is actively involved in the activities of international associations such as ECN and ISWA.

CIC is directly committed in the assessment of the quality of foodwaste separately collected, with over 800 composition analyses performed every year. In 2015 the average non compostable fractions in foodwaste were set around 4.5% in weight, 66% represented by plastic bags and other plastic materials.

Since 2003, CIC has developed the first and only voluntary label for quality compost in Italy, in order to help compost facilities to make their product more appealing. This has allowed CIC to develop a robust database on the quality of national compost. After 12 years from its implementation, 50 products (from 44 companies), representing around 37% of the compost produced in Italy, have been awarded the CIC's label.

Successful Results of a Pilot on Educating Householders in Sligo to Source Separate Food Waste

Percy Foster, Executive
Cré – Composting and Anaerobic Digestion Association of Ireland

A report was conducted in 2013 entitled "Review of Best International Practice on How to Educate Households on Using the Brown Bin Correctly". One of the key recommendations of the report was for a national pilot programme of 'Brown Bin Advisors' to educate householders on how to use the brown bin system.

Sligo County Council coordinated the national pilot of the brown bin advisor programme in Sligo City, Ireland. The aim of the project was to see how a range of educational and collection tools, such as the use of brown bin advisors and the provision of kitchen caddies to householders, could improve the capture and quality of food waste in the brown bin. The goal was to demonstrate the positive impact that relatively low cost measures can have on the performance of the system.

The pilot involved the following elements:

- The hiring of three interns under the Job Bridge scheme. The interns went door to door to 6,000 householders in Sligo City, providing information on how to use the brown bin.
- Tailoring the national information leaflet developed by www.brownbin.ie to the local situation in Sligo City.
- A waste characterisation study was conducted before the interns started the education programme and again at the end of the programme. This helped determine the impact of the programme.
- The waste collection routes in Sligo city were divided into 3 areas so there were two areas given a different types of kitchen caddies and compostable liners and a group that would not have a kitchen caddy or compostable liner. This was used to assess the impact on the provision of a kitchen caddy and compostable liners to improve the capture rate of food waste.

The results indicated that the campaign significantly reduced levels of contamination in the brown bins, and that a combination of caddies, liners and educational materials all increased the quantity of food waste collected in the brown bins.

Recommendations:

- The provision of a door to door education programme might not be feasible for some waste collectors. However, the study has shown that the provision alone of just a kitchen caddy, compostable bags and an information leaflet will result in dramatic increases the quantity and quality of brown bin material collected.
- The pilot in Sligo is to act as a model for a brown bin education schemes which can be adopted by other towns.

The author gratefully acknowledges funding for the national brown bin awareness pilot by:

- Sligo County Council;
- Department of the Environment, Community and Local Government;
- Novamont and
- Cré- Composting and Anaerobic Digestion Association of Ireland.

De Meerlanden Compost and Biogas Facility

Gert- Jan Klaasse Bos, Plant Manager of Meerlanden organic waste treatment facility.

From an outside composting plant to a high efficiency energy producing process. From an idea, to a fully operating process. Meerlanden is located in the west of The Netherlands, in the metropol of Amsterdam, Haarlem and Schiphol Airport. Meerlanden works for around 30 Municipalities. In all kind of waste collecting, they operate stations where people can bring the waste. They are also involved in maintaining public spaces, road cleaning, de-icing the roads in winter time and providing other such services to the inhabitants of the municipalities.

9 municipalities are shareholders of Meerlanden. These municipalities have 314,000 inhabitants. Meerlanden also work for around 4,000 companies in the metropol Amsterdam, Haarlem and Schiphol. They collect and treat 55,000 tons of organic waste, about 80 % is organic waste from households, the other 20% is organic waste from companies and from public spaces such as public gardens. Meerlanden collects a total of about 190,000 tons of an organic waste, and other wastes like plastic, glass, garbage, paper, etc. Only the organic waste is transported to a treatment facility.

Before 2010, Meerlanden had an outside composting facility where the organic material was laying in batches for about 3-4 weeks. Under the piles there was an air system that sucked the air through the piles. The piles were about 2 meters high and took up a lot of ground space. The product they made was compost for agriculture.

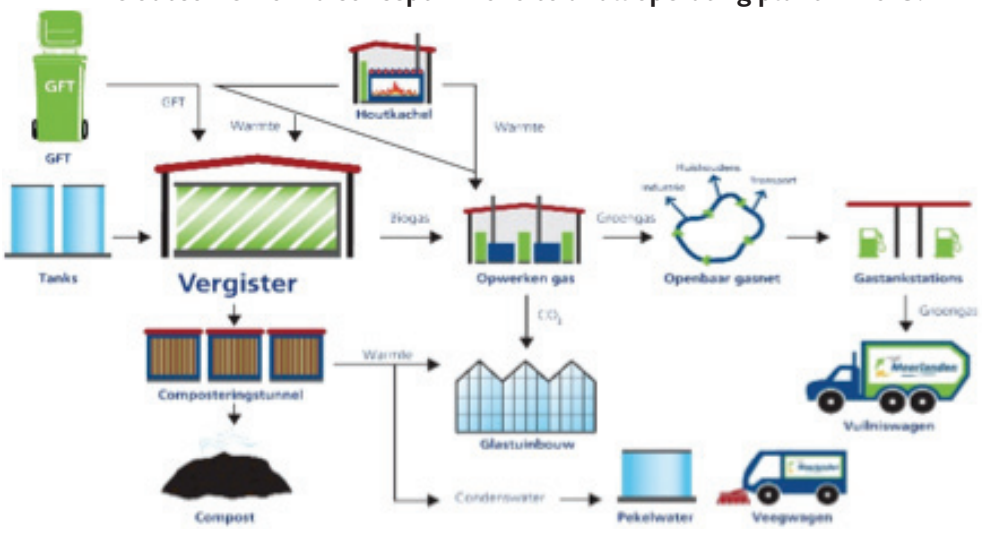
In 2010, Meerlanden had an idea for a circular system in the place where Meerlanden is located. They looked to the complete circle form collecting to end product and identified the following opportunities:

- Biogas which can be upgraded to greengas for use in Meerlanden trucks and those of other companies.
- CO2 out of the gas upgrading system can be used as a fertiliser in the greenhouse next to Meerlanden.
- Heat out of the composting process can be for heating the greenhouse next to Meerlanden.
- The condensate water out of the heat exchanger can be used by Meerlanden for cleaning the roads.
- And finely the compost can be used as a fertilizer for agriculture and flower growing and is a good alternative for using peat.

After the idea stage they started the construction stage. The big challenge they had was to operate the plant during the construction stage. So they did this step by step.

- Start with building the inside composting facility on a free area.
  - o A box composting facility where the materials goes up to 5 meters high.
- Build heat exchanger to deliver the heat out of the composting facility to the greenhouse.
- Eliminate the old composting facility to get free ground space.
- Build the digester and biogas upgrading system.
- Start up the digester and biogas upgrading system and delivering greengas to the grid.
- Start delivering CO2 to the greenhouse as a fertilizer.

This is a picture of the final concept.
The outcome from a concept in 2010 to a full operating plant in 2015.



Results:

- Producing 2.4 million m^3 of greengas per year.
- Producing around 1.6 million m^3 of CO2.
- Producing around 22.000 tons of compost.
- Producing 4.3 million litres of condensate water.
- Producing around 10 million kWh of heat per year out of the composting process.

The SESA Biomethane & Compost Production Facility

Wilbert Smeets, Technical Director, SESA SpA, Italy

SESA SpA (Este Environmental Services Company) is a partly governmental partly privately owned waste treatment plant. The plant consists of anaerobic digestion systems, tunnels for green waste composting and composting of kerb-side collected food waste and a water treatment plant.

The plant currently converts over 450,000 tonnes of organic waste per year into electricity, heat, biomethane and compost. In 2014, it generated 43.000 MWh of electricity, 32.000 MWh of thermal energy and 50,000 tonnes of compost.

The heat is used for district heating of, for example, the local school and hospital. Furthermore, a significant amount of compost is produced and used under the brand name of 'Terra Euganea' as an agricultural soil improver and in horticulture.

Biogas is upgraded to biomethane and is used to fuel the waste collection trucks.

It has a photovoltaic installation on the roofings of the plants that generates 2.5 MW of electricity.

The facility is a true example of the circular economy with all by products used.

An Irish Perspective on Sustainable Food Production

Padraig Brennan, An Bord Bia – The Irish Food Board

The Origin Green promise is an unprecedented one. It is the only sustainability programme in the world that operates on a national scale, uniting government, the private sector and food producers through Bord Bia, the Irish Food Board.

At company level, Origin Green requires individual companies to commit to developing a sustainability plan for their business that can help reduce costs and enhance their sustainability performance. Areas covered by plans include raw material sourcing, resource efficiency and social sustainability. Companies are also asked to report on their progress on an annual basis, with this framework enabling companies to get credit for their achievements to date, as well as any future efficiency which may be gained.

Independently verified, it enables Ireland's farmers and producers to set and achieve measurable sustainability targets – reducing environmental impact, serving local communities more effectively and protecting the extraordinarily rich natural resources that our country enjoys.

At the heart of the Origin Green programme is the Origin Green charter, a guideline document to the workings of the Origin Green programme.

From coast to coast, from seabed to soil, our ever-growing numbers of Origin Green members are fully committed to developing more stringent ways of working which will see 100% of Ireland's food and drink exports on the road to sustainability by 2016.

SPEAKERS PROFILES

Henrik Lystad, Chairman, European Compost Network
Henrik Lystad is chair of the European Compost Network and assistant managing director of Norwegian Waste Management and Recycling Association.

He has a Masters in Environmental Engineering from the Technical University of Berlin, Germany. Henrik has also conducted compost research at NIBIO. At the Norwegian Waste Management and Recycling Association Henrik has been active in developing the Norwegian biogas market, including the decision to produce a green paper on biogas and the formation of the Norwegian Gas Association with the aim of promoting safe use of energy gases, including biogas. In ECN Henrik has been with the Board since 2012 and chairman since 2015.

David Newman, Managing Director, Biobased and Biodegradable Industries Association
David is the Managing Director of the newly established BBIA promoting the bioeconomy in the UK. Since 2012 he holds the position of President of the International Solid Waste Association which operates from Vienna. He has worked in the waste industry since 1999 and specifically composting and AD, and lately has been involved in developing plastic bag legislation in Italy and the EU.

Mairead McGuinness MEP, Vice-President of the European Parliament
Mairead McGuinness, Fine Gael MEP for Midlands, North-West, is Vice-President of the European Parliament and serves on the European Parliament's Agriculture and Rural Development Committee and the Committee on the Environment, Public Health and Food Safety. As Vice-President Mairead chairs sessions of Parliament and oversees the Parliament's Communications. She also has responsibilities for the Parliament's scientific research body STOA and she plays a leading role in the area of children's rights as a Mediator in cases of international parental child abduction on behalf of the European Parliament. She serves on the European Parliament's Delegation for Relations with the countries of South Asia and is Vice-Chair of the Delegation to the EU-Montenegro Stabilisation and Association Parliamentary Committee.

She chaired the European Parliament Committee of Inquiry into the demise of Equitable Life, where thousands of pensioners lost out on their investments. Mairead is very active on agriculture and rural development, global development policy, the environment and food safety and security, taking a particular interest in food security, protecting EU food safety and traceability standards in trade agreements.

Dr Jane Gilbert, International Soild Waste Association
Dr Jane Gilbert is a chartered environmentalist (CEnv) and waste management professional (MCIWM), who has been involved in the organics recycling sector for over twenty years. She is the former chief executive of the Composting Association/ Association for Organics Recycling and co-founder of the European Compost Network. Jane has experience in working with both UK and European-based organisations and governmental departments, such as Defra and the European Commission. Jane originally trained as a microbiologist, has a doctorate in biochemistry and an MBA, and is currently vice chair of the International Solid Waste Association's Biological Treatment Working Group. She is also an active member of their Task Force on Resource Management, the European Group and Science & Technical Committee, working on the role of organics within a circular economy. Jane has authored a number of technical composting books and has presented widely at conferences in North America, Europe, Africa and Asia. She has recently launched Carbon Clarity Press, specialising in publishing resources to inspire sustainable living.

SPEAKERS PROFILES

Padraig Brennan, An Bord Bia – The Irish Food Board
Padraig holds the position of Sustainability Development Manager in Bord Bia (Irish Food Board). He has been part of the team involved in the development and implementation of Bord Bia's Origin Green Sustainability programme. From its launch in the second half of 2012 more than 460 Irish food and drink companies have registered their participant with 80% of Ireland's food and drink exports covered by verified members of the programme while more than almost 40,000 farms are undertaking sustainability assessments annually. Padraig is from a family farming background, holds a Bachelor of Agricultural Science from University College Dublin (UCD) and a Masters in Business Development from the University of Western Australia.

Eric Liégeois, DG GROW, European Commission
Eric was born in 1967 in Belgium. In 1990, he graduated as a Chemical Engineer for Agricultural Industries, from the University of Gembloux (Belgium). He joined the Belgian Federal Ministry for Agriculture in 1992 where he was successively in charge of plant protection products, GMOs, control of pesticides sprayers, as desk officer, principal engineer and finally staff member of the cabinet Gabriels-Neyts (in the Verhofstadt government).

Between 2002-2005 he joined DG Environment to work on the Thematic Strategy on the Sustainable Use of Pesticides. Back in Belgium as Director of the Risk Management Department in charge of REACH, CLP and Biocides, he rejoined the European Commission in 2007 as administrator in the Chemicals Unit at DG ENTR (now DG GROW) where he is now leading a team in charge of Fertilisers, Detergents, Plant Protection Products, Biocides, Waste recycling and Plastics and is part of the DG GROW team for the circular economy package.

Dr René Rozendal Chief Technology Officer, Paques bv
René Rozendal studied biochemical engineering at the Delft University of Technology (NL) followed by a PhD in Environmental Technology at Wageningen University (NL) and Wetsus (NL). After finishing his PhD, he worked as a Research Fellow at the Advanced Water Management Centre of University of Queensland (AU), focusing on the development of novel bioelectrochemical wastewater treatment processes. In 2011, he moved back to The Netherlands and started working for Paques, where he currently holds the position of CTO. One of his focal points is technology development for the Biobased Economy.

Stefano Facco, New Business Development Director Novamont Spa, Italy
Stefano Facco is New Business Development Director of Novamont SpA as well as the managing director of the German subsidiary of Novamont, which is based in Eschborn. He has held this position since 1997, following six years as Product Development Manager for Montedison Deutschland, where he worked on the market introduction of biofuels and biopolymers. Earlier, he had worked there on liquid crystal polymers for electronic applications like PCB and speciality fibres for EMI shielding. The first stages of his career were interspersed with two stints at the Italian Chamber of Commerce in Germany, as consultant for EDP and marketing issues and lately as Managing Director.

He is Vice President and co-founder of EuBP, the European Bioplastics Association and former member of the Din " biodegradable polymers" working group. Stefano Facco was born in Hong Kong 1963, went to High School in Germany and Austria, has a background in economics

SPEAKERS PROFILES

Allan Yee, CD, M.Sc., P.Eng.
Allan Yee has both a Bachelors Degree in Civil Engineering (1977) and a Masters Degree in Environmental Engineering (1982), both from the University of Alberta in Edmonton, Alberta, Canada. In between, he served as a commissioned officer (Military Engineer) in the Canadian Army.

Before retiring at the end of 2015, Allan was the Senior Engineer, Organics Processing for the City of Edmonton's Waste Management Services, managing an operation that composted over 200,000 tonnes of material per year. He has also worked as a wastewater treatment process engineer for the City and as a project engineer in the areas of municipal scale composting, biosolids management, household hazardous waste management, leachate management and environmental monitoring. As a Reservist, Allan retired from the Canadian Army in 2009 in the rank of Lieutenant Colonel.

Hans-Peter Schmidt, Director Ithaka Institute for Carbon Strategies, Switzerland
Hans-Peter Schmidt is founding director of the Ithaka Institute for carbon strategies in Valais (Switzerland). With his institute he develops and realizes concepts for carbon positive agriculture in Europe and Asia. He is considered one of the leading experts on designing biochar-based products for agriculture to recycle volatile organic nutrients as well as for the industry to introduce carbon positive biomaterials. Hans-Peter Schmidt chairs the European Biochar Foundation and is editor of the Biochar Journal.

Alberto Confalonieri, Chair of the Technical Committee of the Italian Composting and Biogas Association (CIC)
Alberto Confalonieri (M.Sc. Biological Sciences) works for the Scuola Agraria del Parco di Monza as a senior researcher. Since 2006 he is an expert in biowaste management, and collaborates with the Italian Composting Association (CIC) as a senior expert and chair of the CIC Technical Committee.

His present activity is focusing on the optimization of biowaste treatment technologies, with due attention on anaerobic digestion and biomethane generation, on the development of novel approaches to residual waste treatment maximizing material recovery, and on the prevention and reduction of odour nuisance associated to waste management.

He is a member of some working groups of the European Compost Network, chairing the Task Group on Biomethane and Renewable Energy.

Wilbert Smeets, Technical Director, SESA Compost & Biomethane Facility, Italy
Born system engineer Wilbert Smeets developed the composting process of SESA SpA, which runs one of the largest and most innovative waste treatment facilities. Growing up in Holland in a mushroom-growing family, Smeets got to see how biology and technology interact. Mushroom beds were followed by compost system projects around the world which Smeets designed for a Dutch company. In 1998 Wilbert Smeets finally "got stuck" in Italy with S.E.S.A. The plant receives 380,000 tons of green cuttings and organic waste each year and is located in Este (PD), Italy.

At this modern waste treatment plant, composting and anaerobic digestion complement each other perfectly. Wet organic waste supplies biogas for green power, while dry green waste supplies compost for consumers and farmers. That goes for S.E.S.A. and naturally for its sister facility BIOMAN Spa, which Smeets project managed from the first pipe to the last valve.

SPEAKERS PROFILES

Harm Grobrügge, Vice-President of the European Biogas Association
Harm Grobrügge is a Vice-President of the European Biogas Association (EBA) since its foundation in 2009 and has a broad knowledge of policies and policy-making at national and European level. He operates his family's farm in Northern Germany with an on-farm biogas plant installed in 1983. He has been active at the German Biogas Association (Fachverband Biogas) since 1985 in various positions: Regional spokesman, Board member, representative towards BEE (German Renewable Energy Federation), associate to the Clearingstelle-EEG

Cristina Pintucci – Center of Microbial Ecology and Technology, Ghent University
Ms Pintuccis role involves the management and daily coordination of the EU project ManureEcoMine - Green fertilizer upcycling from manure: Technological, economic and environmental sustainability demonstration. Her expertise is in the management of optimised approaches in manure nutrient recovery processes. She has ten years' experience in wastewater treatment and environmental biotechnologies including recovery of valuable products and their exploitation.

Gert-Jan Klaasse Bos, Plant Manager, Meerlanden Holding N.V Netherlands
Gert-Jan Klaasse Bos studied mechanical engineering at the H.T.S. Haarlem. Here he focused on renewable energy and anaerobic digestion. His area of research was "Optimization of biogas utilization in a fermentation plant for organic waste." On completion, Gert-Jan sought further knowledge of the fermentation process and began studying "Agricultural and Bioresource Engineering". His thesis here focused entirely on increasing the biogas yield from organic materials. The results of his thesis were presented at the international conference digestion 2007 in Brisbane Australia. Since 2011 he is responsible for the 'Green energy factory' at Meerlanden.

Gerald Dunst, Managing Director, *Sonnenerde,* Austria
Gerald studied at the University of Agricultural Sciences. He is the managing director of Sonnererde. In 2012 he constructed the first biochar production plant in Europe, winning the Austrian Climate Protection Award 2012.

Percy Foster, Cré – Composting and Anaerobic Digestion Association of Ireland
Mr foster has over 10 years experience in the organic waste sector. As CEO for Cré from 2006 to the present, Percy has coordinated and managed the activities of the association, representing the composting and anaerobic digestion industry at Government and European level. His work to date includes successfully campaigning for policy and legislation change to ensure quality standards in the industry are maintained, laying the foundations which led to the national compost standard in Ireland, devising and delivering an accredited certificate course for compost facility operators and providing technical support to a wide range of organic waste facilities in Ireland. On a European level Mr. Foster is a board member of the European Compost Network.

EUROPEAN COMPOST NETWORK ECN E.V.

The European Compost Network (ECN) is the leading European membership organisation promoting sustainable recycling practices by composting and anaerobic digestion of organic resources and guarding over the quality and safe use of the recovered organic fertilisers/soil improvers.

ECN Objectives:

ECN supports the policy objectives of the European Union through its activities and with its network of knowledgeable experts. The objectives are:

1. Achieve a EU legal framework that supports separate collection, biological treatment of organic residues and production and use of quality assured compost and digestate products
2. Achieve favourable market conditions across Europe for separate collection, biological treatment and use of compost & digestate products.
3. Achieve Europe wide implementation of compost and digestate quality assurance schemes, use ECN-QAS as a benchmark.
4. Increase knowledge and know-how amongst stakeholders, via networking platforms, information dissemination, educational campaigns, etc.
5. ECN is the leading European membership organisation on management of organic resources, representing all relevant stakeholder groups across Europe.

ECN's Vision:

ECN's vision is a Europe in which all organic resources are recycled and recovered in a sustainable way. From this vision, ECN's primary goal is to support the implementation of EU waste policies and thereby contributing to the development of a recycling society, to sustainable agriculture and energy recovery, to improve human health and to create overall added value within the European market. To achieve this, we believe that effective recycling in all Member States should be built on appropriate collection systems for organic waste to promote high quality products derived from biological treatment.

Quality Assurance Scheme for Compost and Digestate:

ECN published in October 2014 the Quality Manual 'ECN-QAS, European Quality Assurance Scheme for Compost and Digestate',defining harmonised requirements for national certification bodies and quality criteria for recycled materials from organic resources. The aim is to facilitate the free cross-border movement of composts and digestate made out of recycled biowastes within the EU. The ECN-QAS is registered as Trade Mark ('OHIM 2012/210: TM No 011007168') for certified quality assurance organisations, compost and digestate products.

ECN represents:

The European Compost Network is a membership organisation with 72 members from 27 European Countries. Members include all European bio-waste organisations and their operating plants, research, policy making, consultants and authorities. ECN represents 22 bio-waste organisations (compost and digestate quality assurance organisations) from 14 European Countries and two from abroad, 23 companies producing bio-based products (organic fertilisers, soil improvers, growing media and, biodegradable plastics), 10 non-governmental organisation of environmental protection organisations, 10 academic (research) institutes in environmental, agricultural and natural sciences and 3 environmental agencies.

Via the member organisations, ECN represents more than 3000 experts and plant operators with more than 30 million tonnes of biological waste treatment capacity.

If you are interested in the work of ECN, please find more information on the ECN website

www.compostnetwork.info

GORC
Global Organic Resources Congress

cré
Composting & Anaerobic Digestion
Association *of* Ireland

Cré is a non-profit Association that promotes composting, anaerobic digestion (AD) and the use of compost and digestate. Formed in 2001, Cré has a broad base membership which includes operators of composting and anaerobic digestion facilities, waste collectors, waste management companies, consultants, equipment suppliers, local authorities and researchers. Members are from the public and private sectors. Cré is the recognised national representative body for the composting and anaerobic digestion industry in Ireland and Northern Ireland. Cré is an active member of the European Compost Network.

As a strong membership body, Cré is better placed to contribute the industry's view when consulted by Government on proposed legislation and fiscal policy that would directly affect our members. Whether you are a supplier of biowastes, a producer of composts or digestates, consultant, supplier, service beneficiary, local authority or academic institution, joining Cré will put you in the heart of the industry with access to benefits unavailable from any other source.

The overall responsibility for running the association is by the Board of Directors. Daily management is by the Association Chair, Treasurer and Chief Executive who report to the Board. The Association has three committees – the Technical Committee, the Public Relations Committee and the Anaerobic Digestion Steering Committee. Cré has a Chief Executive who co-ordinates the affairs of the association.

VISION

Cré's vision is to help develop a sustainable composting and anaerobic digestion industry which is important for driving resource efficiency and tackling climate change. Cré wants to help organisations take advantage of opportunities which they have for making the proper management of organic waste sustainable both economically and environmentally.

Cré must be a well-informed/flexible/responsive organisation, but also have clear priorities. For example, the two most significant emerging areas is the implementation of the Food Waste Regulations and anaerobic digestion. Cré will continue to bring all stakeholders (waste producers, waste collectors, processors and end users of compost/digestate) together to develop the sector.

Cré will promote the industry as a solution provider for the sustainable sound management of organic waste by prevention, home composting, on-site composting and by using a brown bin service in which in the material is processed in a large scale composting/anaerobic digestion facility. This will result in sending less waste to landfill, reducing greenhouse gases, providing financial savings to waste producers and the creation of many new jobs. The combination of the collection of source separated organic waste, a highly controlled treatment process; a quality assurance system and control of the use of the end products guarantee traceability and result in high quality products which are safe to be used by farmers, horticulturalists, landscapers and hobby gardeners.

MISSION STATEMENT:

- To promote composting and anaerobic digestion in Ireland
- To promote the use of quality assured compost/digestate products
- To infuse best practices into the development of the industry
- Promote public awareness of the proper management of organic waste
- Promote proper management of organic waste in the business community
- Promote home and on-site composting
- Promote research
- Promote proper management of organic waste to reduce the amount of greenhouse gases generated
- Inform members on new emerging technologies

W: www.cre.ie **T:** 00 363 (0) 86 8129260 **E:** info@cre.ie

Italian Compost and Biogas Association

Director: Massimo Centemero centemero@compost.it
Senior consultants: Alberto Confalonieri, Michele Giavini, Marco Ricci segreteriatecnica@compost.it

Who we are

CIC was founded in 1992 and its mission is to enhance prevention and recycling of waste, share knowledge and know-how between CIC's associates, enhance compost quality and market, perform technical training for the composting sector, assist government entities in improving biowaste recovery. CIC is an association of public and private companies, local authorities and other stakeholders involved in the production of compost, as well as organizations which do not produce compost but have an interest in the composting process like producers of machinery and equipment, producers of fertilizers, research bodies etc.

Composting and AD plants

Key data about biowaste management

Key data about biowaste collection and recycling in Italy for year 2014

The comma "," does separate integers from digits (i.e. 1,35€ means 1 euro and 35 cents)

5.721.000 Tons	*Amounts of food-waste and green-waste collected in year 2014*
94 kg/pers/yr	*Separate collection of food- and green-waste (Italy's average per person) per person and year*
+9,5% annual increase	*Up to 500.000 tons more separate collection of food- and green-waste in year 2014*
252 & 46 Recycling plants	*About 300 composting & anaerobic digestion plants operating in Italy*
37% "Compost Qualità CIC"	*Share of compost produced in Italy with CIC's quality label*

In 1993 some 10 composting plants accepting biowaste were in operation; their number grew alongside with the spread of biowaste collection, and in year 2014 about 298 plants were operating, 46 of which including an anaerobic digestion (AD) step. Hence, the composting sector currently recycles 43% of all MSW separately collected, thus being the largest recycling industry in Italy. Over the last decade AD of biowaste has been steadily increasing. This form of treatment is chosen in almost all new opening composting facilities. In 2014 there were 46 AD plants in operation, for an annual turnover exceeding 2 million tons. The general approach in Italy is to couple AD with composting, and the compost obtained from source separated feedstock has the status of EoW (i.e. it is a product). Currently, all the biogas produced is exploited for electricity and heat production; the Italian regulation in progress is pushing forward the upgrading step, in order to produce biomethane for the gas grid or to be used as a biofuel.

Location of CIC's composting facilities in Italy

CIC's QAS for compost

CIC started in 2003 an Italian certification scheme for quality-compost, in order to enhance the quality of compost production and to make customers aware of the advantages of compost use. in 2015 CIC quality assurance scheme involved 49 plants and about 35% of the compost sold in the Italian market **had** gained **CIC label for quality compost**.

Keywords: Compost, Composting, Anaerobic Digestion, Digestate, Source Separation of Organic Waste, QAS, Compostable materials, Organic fertilisers, soil Improvers and Growing media, Biomethane

www.novamont.com

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THE ORIGINAL

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QUALITY OUR TOP PRIORITY

Using the MATER-BI trademark licence means that NOVAMONT's partners agree to comply with strict quality parameters and testing of random samples from the market. These are designed to ensure that films are converted under ideal conditions and that articles produced in MATER-BI meet all essential requirements. To date over 1000 products have been tested.

THE GUARANTEE OF AN ITALIAN BRAND

MATER-BI is part of a virtuous production system, undertaken entirely on Italian territory. It enters into a production chain that involves everyone, from the farmer to the composter, from the converter via the retailer to the consumer.

USED FOR ALL TYPES OF WASTE DISPOSAL

MATER-BI has unique, environmentally-friendly properties. It is biodegradable and compostable and contains renewable raw materials. It is the ideal solution for organic waste collection bags and is organically recycled into fertile compost.

OK compost VINÇOTTE

HOME OK compost VINÇOTTE

SOIL OK bio-degradable VINÇOTTE

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