DOING IT DIFFERENTLY: AD AND COMPOSTING IN SCOTLAND

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Abstract

Scotland has an ambitious Zero Waste Plan which aims to make the most efficient use of resources. An organics recycling strategy forms a key part of this plan, which includes strict targets for recycling and landfill avoidance that go well beyond those required by European legislation. The targets and proposed bans mean that action has been taken and will be taken in future to increase the quantity, and quality, of resources which are sent for composting and anaerobic digestion. In addition to the on-going divergence between Scottish and English recycling targets, there are also differences in regulatory approaches.

The increased availability of compost and digestate has stimulated the development of new markets for these materials in Scotland, but whilst agriculture remains the most significant market, it is in some ways the most precarious. This paper describes the differences between the organics recycling sectors in Scotland and England and draws conclusions on the impact of government targets incentives, government targets, the regulatory regimes, recent research and market demands on the development of composting and anaerobic digestion in each country.

Keywords

Compost, digestate, Scotland, organics recycling, Waste Regulations, Zero Waste Plan, anaerobic digestion, composting

Introduction

Scotland has an ambitious Zero Waste Plan which aims to make the most efficient use of resources by minimising the country's demand on primary resources, and maximising the reuse, recycling and recovery of resources instead of treating them as waste (Scottish Government, 2010). The vision describes a Scotland where resource use is minimised, valuable resources are not disposed of in landfills, and most waste is sorted into separate streams for reprocessing, leaving only limited amounts of waste to go to residual waste treatment, including energy from waste facilities.

An organics recycling strategy forms one key part of the Zero Waste Plan, and this includes strict targets for recycling and landfill avoidance that go well beyond those required by European legislation. The two main routes for recycling waste organic materials are composting and anaerobic digestion, and (to a large extent in response to Scottish Government targets and incentives) the Scottish organics recycling sector has developed from a very low base around 10 years ago to a thriving industry, where approximately 0.54M tonnes of organic waste were recycled into compost and digestate in 2013 (Zero Waste Scotland, 2014).

The increased availability of compost and digestate has stimulated the development of new markets for these materials in Scotland, from agriculture to large scale brownfield site restoration. Whilst agriculture remains the most significant market, it is in some ways the most precarious. Key farming stakeholders have set their own rules on compost and digestate quality to which their associated farmers, growers and licensees must adhere if they wish to use these materials.

Whilst this approach initially caused some consternation within the organics recycling sector, the focus on quality has ultimately had a beneficial effect, with both producers and users developing a clear understanding of what is expected in Scotland. This paper outlines the organics recycling sector in Scotland and summarises the ways in which the sector differs from that in England and Wales.

Scottish environmental legislation

Despite being part of the UK and subject to Westminster legislation in certain reserved areas, Scotland has always had a separate legal system and separate courts. Common law environmental law such as nuisance has therefore always been distinct, but historically, statute-based environmental law in Scotland has been similar to or the same as that in England and Wales. With the establishment of the Scottish Parliament, however, environment was designated a devolved matter. Environmental law in Scotland is gradually diverging from that in England and Wales, with the rate of divergence accelerating in some areas.

The broad areas of environmental legislation are the same in Scotland as in England (because of the historical background and because so much originates in Europe). However, the details and methods of implementation can be quite different. For example, Scotland led the way in the UK - and to a large extent in Europe - in transposing the Water Framework Directive into Scottish law. This came in with the Water Environment and Water Services (Scotland) Act 2003 and subordinate legislation. In waste law, Scotland retains separate Waste Management Licensing and Pollution Prevention and Control approaches that in England and Wales have been combined into a single Environmental Permitting approach – but this does not mean that Scottish environmental legislation is not moving forward: Scottish targets for recycling and landfill avoidance under the Zero Waste Plan go well beyond those required by European legislation.

Scotland's Zero Waste Plan (launched in 2010) set the strategic direction for Scottish waste policy, with targets running to 2025. The regulatory changes required to implement the plan were set out in the Waste (Scotland) Regulations 2012 (Scottish Government, 2012). Key targets and proposed bans are outlined in Table 1.

The targets and proposed bans mean that action has been taken and will be taken in future to increase the quantity, and quality, of resources which are sent for composting and anaerobic digestion. This should lead – in turn – to increases in the quantity and quality of compost and digestate products.

Regulators and rule-makers

The main environmental regulator in Scotland is the Scottish Environment Protection Agency (SEPA), a regulator independent from Government, established at the same time as the Environment Agency in 1995. SEPA's principal areas of regulation are similar to the Environment Agency's, and include pollution prevention and control (but also local air pollution control), waste management, water pollution and water resources, special sites under the contaminated land regime and radioactive substances. Local authorities are principal regulators on matters of contaminated land, flood management, statutory nuisance, local air pollution monitoring and environmental health.

In Scotland, key stakeholders other than the regulators have a significant impact on the way in which composts and digestates can be used in Scottish agriculture and field horticulture. These include principally the farm assurance schemes and produce buyers. It is important to note that the rules set out by the farm assurance schemes are not statutory. However, farmers and growers who sign up to become licensees of a given farm assurance scheme must sign a contract which states that they will adhere to the scheme rules. They also agree to be regularly

inspected and audited to ensure compliance with the assurance scheme rules in order that they can advertise their membership of the scheme and sell produce using the scheme logo.

Table 1: Scottish targets and bans which relate to organics recycling

Target/ban	Date by which target/ban is to be achieved	Target mirrored in England?
Only organic waste recycled into PAS 100 compost or PAS 110 digestate and which has a market will count towards recycling targets.	01.06.2010	No
50% recycling, preparation for re-use or composting of all local authority collected household waste	31.12.2013	Yes (but not until 2020)
Medium/large businesses in food waste production, food retail and food preparation must present food waste for collection[a]	31.12.2013	No
Local Authorities must begin to roll-out food waste collections[a]	31.12.2013	No
Ban on mixing segregated materials	31.12.2013	No
Ban on landfilling source-segregated materials	31.12.2013	No
Small businesses in food waste production, food retail and food preparation must present food waste for collection[a]	31.12.2015	No
Local Authorities must complete roll-out of food waste collections[a]	31.12.2015	No
Ban on non-domestic use of food waste macerators and food waste digesters where the “treated” food waste is discharged into public sewers directly	31.12.2015	No
60% recycling, preparation for re-use or composting of all local authority collected household waste	31.12.2020	No
Ban on biodegradable material to landfill	31.12.2020	No
70% recycling and composting of all waste by 2025, whether from a business or a household	31.12.2025	No
[a]Regulation does not apply to areas defined as “rural”		

Organics processing capacity, process types and types of material processed in Scotland

Zero Waste Scotland published a definitive study on the size and nature of the organics recycling sector in 2013 (Zero Waste Scotland, 2014). Key data are reproduced below.

- Processing capacity
  - Composting: 598,000 fresh tonnes per year
  - AD: 168,000 fresh tonnes per year

- Sources of feedstock
  - Composting: 411,000 tonnes (83% from local authorities, 10% from retail / food processors / hospitality, and 7% from landscapers)
  - AD: 132,000 tonnes (27% from local authorities, 58% from retail / food processors / hospitality, 15% from agriculture,)
- Tonnages produced
  - Compost: 203,000 fresh tonnes per year
  - Digestate: 119,000 fresh tonnes per year

Differences between markets for compost and digestate in Scotland and England

There are virtually no differences in markets for digestate across the UK – the majority being applied to agricultural land in the different nations. This is partly a reflection of logistics (the agronomic benefits of digestate are most easily realised when it is used in agricultural cropping systems) and partly a reflection of regulatory approach. In those nations where the digestate Quality Protocol applies, allowable markets for digestate are somewhat restricted (see below for more information on the Quality Protocols and end of waste). Whilst it has demonstrable value in higher-value markets (such as growing media and protected soil-less horticulture), the Quality Protocol does not permit digestate use in these markets – and the alternative (using the material as a waste) has not proven sufficiently attractive to prompt market uptake. The Quality Protocol does not apply in Scotland, and the Scottish end of waste approach is not prescriptive with reference to digestate markets – but as yet there has been little development of non-agricultural markets.

The uses for compost are more diverse than those for digestate (Figure 1) – perhaps illustrating future market opportunities for separated fibre digestates.

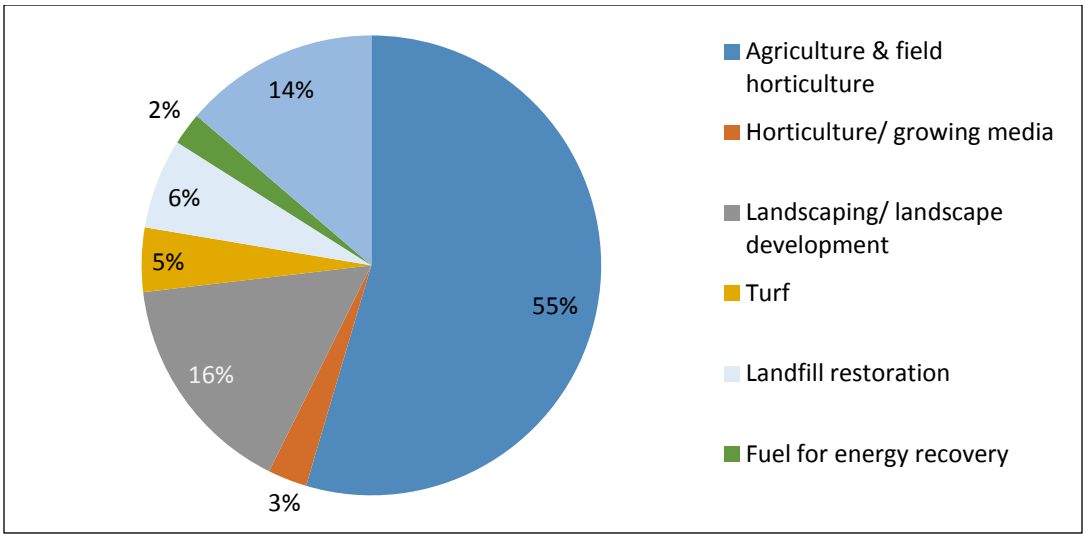

Figure 1. End Markets for Compost Output, as % of total Scottish market by weight, 2013

Only 55% of the compost produced in Scotland went to agriculture and field horticulture in 2013 (60% in 2012), whereas 67% of that produced in the UK as a whole went to agriculture in 2012 (no figures were available for the UK in 2013). These differences probably reflect the

determination of Scottish compost producers to secure higher market value for their products, with the other significant market being landscaping (16% in 2013). Anecdotally, compost quality in Scotland is higher than elsewhere in the UK – although differences will vary from site to site.

In 2013, 24% of the compost produced in Scotland was used in growing media, horticulture, landscaping and turf (18% in 2012), whereas 22% of that produced in the UK as a whole was used for these purposes in 2012 (no figures were available for the UK in 2013). The change in Scotland suggests that compost producers are increasingly targeting higher value markets for their products. This idea is supported when the length of processing times for composting is considered: the average composting duration in Scotland in 2013 was 15 weeks (12 weeks in 2012), whereas average composting duration in the UK as a whole in 2012 was 11.4 weeks (no figures were available for 2013). Scottish compost producers are clearly prepared to spend longer making compost in order to produce the more stable products required for higher value markets.

The market value for composts produced in Scotland in 2013 was £690,000, an increase in value of 22%, despite the tonnage produced having dropped by 13% in 2013. This is a clear indication that compost producers are achieving higher prices for their products. It is not possible to directly compare these figures with those from either England and Wales, or the UK as a whole in 2013. Figures obtained in 2012 showed that the overall market value of UK compost increased by £2.2m (24%) between 2010 and 2012. However, much of this growth was attributable to the fact that the quantity produced was 23% higher in 2012, so the reason for the increase in total market value was different to that for the increase in Scotland in 2013.

When waste-derived compost and digestate cease to be defined as 'wastes'

"End of waste" for compost and digestate in England and Wales

Quality Protocols have been developed by the Environment Agency and WRAP, in consultation with Defra, which currently define the point at which composts and digestates are no longer wastes in England, Wales and Northern Ireland. The Protocols have three purposes:

1. To clarify the point where waste management controls are no longer required;
2. To provide users with the confidence that the compost or digestate they buy conforms to an approved standard; and
3. To protect human health and the environment by describing acceptable good practice for the different end uses of the compost and digestate.

The Quality Protocol for Compost requires that the material conform to an approved standard. The only approved standard is currently BSI Publicly Available Specification 100, or PAS 100 [BSI/WRAP, 2011]. Similarly, the Quality Protocol for Digestate (ADQP) refers to a sole approved standard for digestates (BSI Publicly Available Specification 110, or PAS 110 [BSI, 2014]). To achieve end of waste for compost or digestate in England, Wales or Northern Ireland requires independent certification to the relevant quality protocol, which in turn requires conformance to the relevant PAS. The key differences between the Quality Protocols and the Publicly Available Specifications are that the former prescribe the allowable inputs to composting or anaerobic digestion processes and prescribe the markets to which the resulting products can be supplied; whereas the latter prescribe the processing methods and baseline product quality parameters.

"End of waste" for compost and digestate in Scotland

Scotland has not adopted the Compost or Digestate Quality Protocols and compliance with these is not required unless compost or digestate producers in Scotland intend to sell or distribute products into England, Wales or Northern Ireland.

SEPA has set out the conditions under which compost can be considered fully recovered (for use in Scotland) in a position statement (SEPA, 2004). Their current position is that compost

produced for a market is no longer considered a waste (and is therefore taken to be fully recovered) if it satisfies the following criteria:

1. it must meet an appropriate quality standard (currently the only appropriate standard for compost is PAS 100) without further modification and before any blending of the compost with other wastes, materials, composts, products or additives;
2. there is certainty of market and the compost can be put to use without further recovery.

SEPA has also set out the conditions under which digestates can be considered fully recovered (for use in Scotland) in a position statement (SEPA, 2014). SEPA's classification of AD outputs depends on two criteria:

1. whether the digestate meets the specification in PAS110 and the criteria set out in their own position statement;
2. whether the digestate was produced using only agricultural wastes (as defined) and other non-wastes (e.g. energy crops grown specifically for anaerobic digestion).

SEPA considers that the application of waste controls to the use of PAS 110 certified digestates on land would be disproportionate. Therefore they do not apply waste regulatory controls to waste derived digestates from AD processes as long as the production and usage complies with a series of defined conditions as follows:

1. AD plants and processes that produce digestates from waste must have the relevant environmental authorisation and operate in compliance with that authorisation.
2. The AD process and any digestates produced must be certified to conform to the requirements of BSI PAS110:2014.
3. Input materials shall be source-segregated biowastes and/or source segregated biodegradable materials. These include, but are not restricted to, wastes listed in Appendix B of the ADQP and Annex 1 to the position statement (SEPA, 2014).
4. The digestates must meet PAS110:2014 without having to be blended with any other materials including other digestates, composts, materials, products or additives.
5. The PAS 110:2014 certification process must be carried out by a third party accredited by the United Kingdom Accreditations Service to carry out this certification. (Digestates from AD plants which have not yet completed the certification process will be regulated as waste until full certification is achieved.)
6. Steps must have been taken to exclude potentially polluting or toxic materials or products from the feedstock. This includes invasive plant species such as giant hogweed, Japanese knotweed and Himalayan balsam or toxic species such as ragwort and yew.
7. No waste from the leather industry, except wastes falling within the EWC and description provided (SEPA, 2014), or sludges from sewage treatment processes can be included as input material to the AD process producing the digestates.

Compliance with "end of waste" criteria (and beyond) in Scotland

As a result of local authority requirements, market demands and Zero Waste Scotland's targets and financial support for plants working towards PAS 100/110 accreditation, 90% of composting processes in Scotland are now certified to PAS100 (representing 97% of compost produced). This contrasts with the situation in England and Wales, where an estimated 43% and 50% of composting processes are certified, respectively. Whilst the same drivers apply to the certification of digestate products (to PAS110), the extent of digestate certification is less than for compost – although still higher in Scotland than in England and Wales. Approximately 40% of Scottish digestate is certified, whilst the figure for England and Wales is 32% (in both cases).

The Scottish organics recycling sector has changed considerably over the past 8 years in response to pressures to improve compost and digestate quality (in particular with respect to the presence of physical contaminants such as plastic, glass and metals). Organisations which have struggled or failed to consistently produce compost of sufficient quality to meet the requirements of available markets have simply ceased to exist and those who have worked hard to improve their processes and product quality have expanded to take on increased feedstock tonnages. Around 90% of Scottish compost producers remove physical contaminants by hand prior to the start of their composting processes and many site owners feel that that is the only way to guarantee that their composts are of sufficiently high quality for their intended purpose (ZWS, 2014 and personal discussions between A Litterick and Scottish compost producers).

Impacts of the Waste (Scotland) Regulations and Scottish farm assurance scheme rules

Zero Waste Scotland incentives to achieve "end of waste"

Zero Waste Scotland have invested heavily in the development of a robust organics recycling sector. They have offered grants and loans towards construction and improvement of composting and AD facilities. They have identified all compost and digestate producers taking commercial/non-farm wastes in Scotland and have offered encouragement and financial support towards achievement of PAS100 and PAS110. Zero Waste Scotland regularly assesses the size, nature and performance of the Scottish organics recycling sector, publishing an annual organics report. They continue to support quality improvements in both composts and digestates produced in Scotland in order to continue to build market confidence in these materials, and to ensure that increasing tonnages of composts and digestates can be sold into discerning, higher value markets such as high value horticulture, turf, landscaping and growing media.

Farm assurance scheme rules and attitudes of produce buyers

The food supply chain between farmers and consumers is extremely complex, and a number of the intermediaries have positions on the acceptability of compost and digestate – whether required or recommended. This is true in Scotland as in the rest of the UK, although the greater relative value of Scotland's food and drink sector to its economy means that the acceptability of compost and digestate has received particular scrutiny here, due to perceived (and actual) market risks. These risks encompass aspects as diverse as the potential for compost to directly impact on the health of grazing livestock, to the potential for consumers to react negatively to the recycling of food waste in digestate (in the same way that there is always a potential for negative reaction to the use of biosolids on land where crops are grown for human consumption). Less tangible, but nonetheless vitally important questions have also arisen around the potential for compost and digestate to impact on the flavour profiles of barley – which when malted and then used for whisky production could have repercussions in decades' time.

Zero Waste Scotland and WRAP have invested very heavily to fund research into these questions, to understand whether the use of certified compost or digestate presents unacceptable risks to food quality and safety. In all cases the results of this research have been 'no' – provided that statutory requirements are followed. As a result of this work, some previous restrictions on the use of compost and digestate have been lifted in Scotland. However, this does not mean that the industry can afford to be complacent. Whilst statutory controls (and those required by the compost and digestate certification schemes) are considered adequate to manage microbiological and toxicological risks, they are not considered adequate by all in Scotland to manage risks from physical contaminants such as plastic fragments. To date it has proved impossible to quantitatively assess the risks (to humans, animals or the environment) from such contaminants, but they can undoubtedly have a significant visual impact as well as a potentially catastrophic impact on the value and productivity of agricultural land. Doubts have been raised in users' minds about the overall integrity of composting or AD processes that allow such contaminants to be present in the final products. In Scotland this has been addressed by the addition of specific restrictions in the cattle and sheep scheme rules of Quality Meat Scotland,

where physical contaminants must not be present at levels greater than 8% of those allowed by PAS110 (for digestate) or 50% of those allowed by PAS100 (for compost, Quality Meat Scotland, 2015). NFU Scotland recommend that these limits apply to all digestate and compost (whether PAS100/PAS110 accredited or not) used by all farmers in Scotland, whether assured by Quality Meat Scotland or not (A. Bauer, Deputy Director of Policy, NFUS, personal communication).

Outside Scotland, perceptions about compost and digestate quality/safety have been similar, but the reaction a little different. For example, Red Tractor Assurance has never actively prohibited its scheme members from using compost or digestate, and does not require that these materials meet standards beyond those required by legislation and the biofertiliser/compost certification schemes. However, what is common to farm assurance schemes both north and south of the border is their emphasis on meeting customer requirements. In other words, the ultimate decision about whether to use compost or digestate should largely be dictated by the farmer's end customer, and not the intermediary farm assurance scheme. In most cases customers recognise the benefits (and safety) of compost and digestate, but in some cases their use is still discouraged, if not actively prohibited – particularly by the small number of 'in-house' quality assurance schemes operated by UK supermarkets. This highlights the need for continued vigilance and focus on product quality – whether digestate and compost are produced in Scotland or elsewhere in the UK.

The drive to improve product quality

What can go wrong

Provided that regulatory requirements are followed, that certified compost and digestate are used, and that the additional requirements of specific farm assurance bodies are followed – then confidence in compost and digestate in Scotland should remain strong. However, accidents do sometimes happen – and whilst infrequent, these can threaten entire sectors of the organics recycling industry (for example, by spreading digestate that is heavily contaminated with plastic). The primary cause of such accidents must surely be a failure to implement correctly or enforce robust quality management systems, as no well-conceived QMS would allow sub-standard material to leave a site.

Who is driving the improvements?

For several years, Quality Meat Scotland banned their members from using 'off-farm' composts and digestates, and in so doing may have done the organics recycling industry an enormous service in the medium to long term – both in Scotland and elsewhere. The key market stakeholders in Scotland are now well-attuned to matters relating to compost and digestate quality, and producers' vigilance must be constant. Zero Waste Scotland continue to bring together both the market stakeholders and producers, together with SEPA, to ensure that markets are secured for the long term. This collaborative focus is not necessarily repeated elsewhere in the UK.

Current and recent developments

Zero Waste Scotland and SEPA continue to liaise with all sectors supplying feedstocks to composting and anaerobic digestion sites (commercial & industrial suppliers, as well as local authorities and waste collection businesses) to impart the importance of material cleanliness and the requirements of the Waste (Scotland) Regulations 2012 to source-segregate organic material and remove recyclable packaging.

Working with NFUS, Zero Waste Scotland have produced guidance on sourcing and using compost and digestate for Scottish farmers. WRAP continue to work on similar guidance for farmers in England and Wales.

Zero Waste Scotland have supported HACCP and quality management system training for Scottish AD operators, with a specific focus on digestate quality. This is intended to ensure that digestate quality management approaches are sufficiently robust at all of Scotland's commercial

AD facilities to demonstrate clearly that only digestate of suitable quality is supplied to agricultural markets.

Quality Meat Scotland's standards were reviewed during the summer of 2015, and minor changes made to the sections covering compost and digestate. These changes were intended to clarify that the only 'off-farm' composts and digestates that can be accepted by Quality Meat Scotland (QMS) members are those that meet the physical contaminant limits specified in the QMS standards – and that these materials must be used as specified in those standards. These physical contaminant limits are much more stringent than those allowed by PAS100 and PAS110.

Conclusions

The feedstocks, processing systems and end markets for compost and digestate are broadly similar across the UK. However, the degree to which Scotland's government, non-departmental government bodies, regulator and other stakeholders have implemented policies, procedures, regulations and guidance with the aim of developing a robust, effective organics recycling strategy has led to the development of a vibrant industry in which the percentage of quality (i.e. non-waste) composts and digestates produced is higher than that produced in England.

Increasing volumes of Scottish-produced compost are going to high value horticultural markets, but the majority of compost and most digestate is still being applied to agricultural land. Although the use of composts and digestates in agriculture has not been without its challenges within Scotland in recent years, a great deal of time, effort and money have been spent investigating the potential risks of using composts and digestates in agriculture. This work, which to a large extent resulted from questions raised by Scottish agricultural stakeholders, has clearly shown that the benefits of appropriate, responsible use of quality composts and digestates in agriculture greatly outweigh the risks and all major Scottish farm assurance schemes now permit their use, albeit with some restrictions. Many Scottish agricultural stakeholders are continuing to exert pressure on the composting and AD industries to further improve their products and there is little doubt that the industry is listening.

The continuing focus on product quality comes at an interesting time, with the Zero Waste Plan stimulating further collection and recycling of food waste (principally through anaerobic digestion), and a general desire amongst businesses to reduce their reliance on landfill. This has created some conflicts, with (anecdotally) excessively packaged material supplied to AD facilities for processing – reducing potential income from recycled packaging whilst simultaneously impacting on downstream digestate quality. However, the on-going liaison between Scottish Government, SEPA, Zero Waste Scotland, the organics recycling sector and key market players means that such issues can be identified, quantified and addressed before they have a major impact. Such an integrated approach will remain vital to future market development as recycling of organic wastes continues to increase in response to Scottish Government targets.

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