**Final Version**

# AD and Composting Industry Market Survey Report 2020 Final Version

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**Written by:** Liz Victor, Winning Moves

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# Executive summary

**Background**

The objective of the 2019 survey was to gather data to provide up-to-date information about the capacity and throughput of the AD and composting industries in England and to compare this data to that gathered in previous survey exercises.

This research has covered: all AD activity in England with the exception of sewage-based AD, Mechanical Biological Treatment (MBT) or transfer facilities; and all permitted composting of all types (open windrows and in vessel composting) but not exempt small scale composting operations.

Data was collected from survey respondents for the calendar year 2018. All data refers to this period with some exceptions based upon secondary data for 2019.

Data was collected through a mixture of self-completed proformas and telephone interviews. Data was collected from 51 of 371 AD sites (14% of sites and an estimated 18% of capacity). Data was collected from 77 of 272 composting sites (27% of sites).

The combination of a relatively low response and instances of missing data, mean that the number of respondents for each question was sometimes quite small and as such the data that is presented should be considered indicative rather than strictly representative.

Some of the key data points in the survey (inputs, outputs and employment) have been grossed up to provide estimates of these for the industry population for England. However, a comparison with secondary data from the Waste Data Flow data on local authority waste suggests that the grossed up sample data may be overestimating composting inputs in particular.

**Findings from the AD industry**

**AD sites**

Sites were classified as commercial if they were understood to include a food waste feedstock. These could include some sites based on farms. Sites have been classified as farm if their feedstock requirement was understood to consist only of manure/slurry, purpose grown crops or crop waste.

There has been growth in all types of AD (farm, commercial, industrial) but growth has been highest in the farm sector. In 2019, there were 372 sites: 252 farm sites; 87 commercial sites; and 33 industrial sites. This compares to a total of 85 sites in 2013: 39 farm sites; 27 commercial sites; and 19 industrial sites. Growth of the industry is expected to continue with the development of further sites.

There was a total estimated employment of 1,381 full time equivalent jobs on AD sites in 2018: 487 on commercial sites; 779 on farm sites; and 115 on industrial sites).

The majority of sites reported using continuous, wet, mesophilic AD systems (as they did in 2012). A higher proportion of sites (88%) are now undertaking some processing of digestate compared to in 2012.

**AD capacity and feedstocks**

The operational capacity of AD sites in England has grown to 3.2 million tonnes for food waste within a total operational capacity of 9.6 million tonnes in 2019. By site type, operational capacity was 4.55 million tonnes for farm sites (0.85 in 2013); 4.21 million tonnes for commercial sites (1.33 in 2013); and 0.87 million tonnes for industrial sites (0.53 in 2013). Operational capacity indicates how much feedstock sites could take as a maximum and could be limited by a permit, planning or physical constraints. The operational capacity figure is likely to be a conservative estimate.

There was an estimated total feedstock of 8.0 million tonnes for 2018 (excluding industrial sites). This is estimated to comprise of: 3.2 million tonnes of purpose grown crops; 2.7 million tonnes of solid separated food; 1.1 million tonnes of manure/slurry; 0.8 million tonnes of liquid; and 0.2 million tonnes of mixed food and green waste.

Comparing estimates of feedstock and operational capacity, this suggests there is currently spare capacity for food waste of at least 500,000 tonnes at commercial sites. There is also estimated to be spare capacity of at least 450,000 tonnes on farm sites.

**AD rejections**

The proportion of feedstock removed on site before anaerobic digestion was estimated to be 5-6% on average. Rejected material was mainly being sent to landfill or for energy from waste.

The majority of commercial site operators responding said that compostable packaging was having an impact upon their business through increasing reject levels (and disposal costs) and causing problems in the AD process because it did not break down.

**AD outputs**

An estimated 7.5 million tonnes of digestate was produced in 2018. About half of survey respondents said they separated the digestate into fibre and liquor, but this was more common amongst farm sites than commercial sites.

Small numbers of respondents answered questions about digestate destinations. Commercial sites (n=11) reported that they were paying users to remove nearly all (99% by weight) of the whole digestate they produced. Farms reported using all of the whole digestate they produced on their own farm and some of the fibre and liquor produced themselves. Farms also provided fibre and liquor to others to use free of charge. Nearly all respondents (irrespective of the type of AD operation) said that digestate (whole, fibre and liquor) was applied to agricultural land. Small numbers of respondents gave a price for digestate in its different forms but the evidence available indicates that digestate is generally a low value product.

There were 60 AD sites certified for PAS 110 in 2019. The majority of survey respondents who were PAS 110 certified said this applied to all of the output rather than a part of it.

A total estimate of 1,231 million $m^3$ of biogas was produced. Amongst both commercial and farm sites, approximately a quarter of this was being directly injected into the national grid which represents a considerable increase compared to 2012 when nearly all gas was used for CHP.

**Expansion of the AD industry**

The majority of commercial and farm AD site operators surveyed expected their output for 2019 to be similar to 2018. Almost half of commercial site operators (45%) said that they thought the amount they processed over the next five years would increase. A much smaller proportion of operators of

farm sites (15%) said that they thought the amount they processed over the next five years would increase.

However, nearly all operators answering the question said they thought that there were specific and significant barriers to expanding the amount they process. About half of the operators who identified barriers specified the supply of feedstocks as a barrier.

## Findings on the composting industry

### Composting sites

An estimated 272 permitted composting sites were identified in 2019. The number of permitted composting sites has been relatively stable over time, 271 permitted sites were reported to exist in 2012 and 291 in 2010. The composting industry was estimated to provide a gross estimated employment of 1,449 full time equivalent jobs.

### Composting capacity and feedstocks

The operational capacity of the composting industry (the maximum working capacity taking into consideration planning, regulatory and physical constraints) has been estimated to be 6.8 million tonnes in 2018.

The estimated grossed composting feedstock in England for 2018 was 5.1 million tonnes. This suggests there is spare capacity of 1.7 million tonnes in the composting industry. The majority of composting feedstocks in 2018 were local authority (84%). This is similar to 2012. The majority (72%) of all feedstock was green or garden waste.

### Composting rejections

Reported levels of rejections were low, although anecdotal evidence from stakeholders suggests these may be higher than reported. Just under half of operators said that growth in the use of compostable packaging was having an impact upon their business and made comments relating to this needing to be removed before or during composting. Where respondents identified specific and significant barriers to using green garden waste, the most frequently identified barrier was contamination of green garden waste with other matter and this was often cited to be plastic contamination. In 2018, large proportions of composting sites used: hand picking (88%); and screening (65%). The proportion of those using hand picking and screening has increased considerably compared to the 2012 survey.

### Compost

The grossed estimated compost produced was 2.7 million tonnes in 2018. About two thirds (66%) of the compost produced was sold to users off-site. About one fifth (19%) was provided free of charge to others. The majority (70%) of the compost produced was reported to go to agriculture and field horticulture. About a tenth (11%) went to horticulture and growing media and the same amount to landscape development.

In 2019, there were 137 PAS 100 certified composting processes (covering approximately 136 composting sites). These sites produced 1.6 million tonnes of certified compost, of which the majority (78%) was principal grade compost.

**Expansion of the composting industry**

Almost half (43%) of operators expected their output to increase over the next five years and half (50%) expected their output to stay the same. The most frequently cited barriers to expansion related to regulation; costs; and limited space.

# Contents

# Glossary

**ADBA:** Anaerobic Digestion and Biogas Association

**Aerated static pile composting:** Organic waste is mixed together in one large pile instead of rows. To aerate the pile, layers of loosely piled bulking agents (e.g., wood chips, shredded newspaper) are added so that air can pass from the bottom to the top of the pile. The piles also can be placed over a network of pipes that deliver air into or draw air out of the pile.

**Anaerobic digestion (AD):** Process of controlled decomposition of biodegradable materials under managed conditions where free oxygen is absent, at temperatures suitable for naturally occurring mesophilic or thermophilic anaerobic and facultative bacteria species that convert the inputs to biogas and whole digestate.

**Animal By-Products Regulations (ABPR):** The Animal By-Products Regulations 2005 (SI 2347/2005) provide for the application of EU Regulation in England. This controls the collection, transport, storage, handling, processing and use or disposal of animal by-products in EU member states, including catering wastes. Similar legislation applies in Scotland and Wales. The England Regulations were amended with effect from 2 May 2009 by the Animal By-Products (Amendment) Regulations 2009 (SI 2011/1774).

**Continuous block:** Continuous block composting is an approach used to compost large volumes of material, employing minimal process management: large piles are formed, with new material added at one end and compost harvested at the other. Composting relies largely on passive aeration with turning often achieved through the use of a side turner, or use of a 360 degree excavator which sits on the top of the block and moves the material, which slowly moves the table a windrow's width down the pad at a time, starting from one end. Continuous block composting is commonly used for non-putrescible materials, such as woody green wastes, and may take a number of months to produce a composted product.

**EA:** Environment Agency

**EWC Code:** European Waste Catalogue Code

**In-vessel composting (IVC):** A term used to describe a wide range of composting systems where the composting feedstock is contained in a purpose-built structure for the sanitisation phase of composting, allowing a higher degree of process control and environmental protection than OAW. Many IVC sites incorporate an element of windrow composting for maturation of the material following the sanitisation phase. At present, IVC is primarily used for feedstocks that fall under the provision of the ABPR.

**Mechanical biological treatment (MBT):** A generic term for an integration of several processes treating mixed wastes, such as Materials Recovery Facilities, sorting and composting or AD.

**NNFCC:** National Non-Food Crop Centre (The Bioeconomy Consultants) at the University of York

**Open air windrow (OAW):** Mechanically turned windrow located outdoors (in the open air), as opposed to under a cover or in a building.

**Organic waste:** Waste of animal or plant origin which, for recovery purposes, can be decomposed by micro-organisms, other larger soil-borne organisms or enzymes.

**PAS 100:** Publicly Available Specification 100, which is the British Standards Institution specification for composted material published in 2005 (the relevant edition in effect in 2009) and updated in 2011.

**PAS 110:** Publicly Available Specification 110, which is the British Standards Institution specification for whole digestate, separated liquor and separated fibre derived from the AD of source-segregated biodegradable materials, published in February 2010.

**Permitted/exempt waste operation**: A permitted waste operation is one which is subject to the granting of an Environmental Permit. This is a permit granted by the regulator allowing the operation of a regulated facility subject to certain conditions. An Exempt waste operation is a waste operation exempt from the need to hold an environmental permit where it meets certain criteria. Exemptions include:
T23 - Aerobic composting and associated prior treatment e.g. an allotment association wants to compost their old plants and trimmings.
T24 - Anaerobic digestion at premises used for agriculture and burning of resultant biogas e.g. anaerobically digest manure and plant tissue waste in a dedicated AD plant to produce a digestate.

**REA:** Renewable Energy Association

**Static pile with aeration:** Form of composting where the materials are turned infrequently, and the fresh air is introduced into the pile through a forced aeration system. This may be either through channels in the ground or through a perforated pipe laid within the compost. Aeration may be either positive (pushed through the composting mass) or negative (sucked through the mass).

# Acknowledgements

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# 1.0 Introduction

## 1.1 Research objectives

Defra has asked WRAP to provide up-to-date information about the capacity and throughput of the anaerobic digestion (AD) and composting industries. The information gathered will be used to inform strategy and policy development that will deliver Defra's objectives for the Resources and Waste Strategy.

A survey-based methodology was recommended. This was envisaged to build on previous surveys of the organics recycling industry, the last of which was completed in 2015, following several annual surveys prior to this dating back to the mid-90s[1]. There is therefore a time series of data, with which the survey has compared.

The objectives of the 2019 survey were therefore to gather data to provide up-to-date information about the capacity and throughput of the AD and composting industries identifying what is actually accepted, processed and rejected at composting and AD sites.

The aim was to conduct high quality research in collaboration with the anaerobic digestion and composting industries, so that the results from the survey are suitable for publication and to be used to inform strategy and policy development.

## 1.2 Research scope

This research has covered England only.

In terms of the type of organics recycling activities, it has covered:

- All AD activity with the exception of sewage-based AD, Mechanical Biological Treatment (MBT) or transfer facilities
- Permitted composting of all types (open windrows and in vessel composting).[2]

Data was collected from survey respondents for the calendar year 2018. All data refers to this period with some exceptions based upon secondary data for 2019 which are clearly noted in the report.

## 1.3 Report structure

This report has the following structure:

- Section 2 summarises the methodology
- Section 3 presents the findings on the AD industry
- Section 4 presents the findings on the composting industry

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[1] *A survey of the UK Anaerobic Digestion Industry 2013*
*http://www.wrap.org.uk/sites/files/wrap/A_survey_of_the_UK_Anaerobic_Digestion_industry_in_2013.pdf*

*A survey of the UK organics recycling industry in 2012 http://www.wrap.org.uk/sites/files/wrap/ASORI%202012.pdf*

*A survey of the UK organics recycling industry in 2010*
*http://www.wrap.org.uk/sites/files/wrap/ASORI%20Final%20Report%202010%20v2.pdf*

[2] *Permitted composting only was covered in the 2012 and 2015 studies and permitted AD only in 2012. For reference, the Environment Agency (end of June 2019) lists 10,999 sites with T23 waste exemption: aerobic composting and associated prior treatment of which 1,649 were not on a farm. It also lists 1,252 non permitted AD sites with T24 waste exemption: anaerobic digestion at premises used for agriculture and burning resulting biogas of which 104 were not on a farm.*

- Section 5 describes the conclusions of the study
- Appendix 1 gives further details on the method to collect and analyse data.

## 2.0 Overview of the survey methodology

A detailed description of the methodology is given in section 6.0: Appendix 1.

The questionnaire was developed using earlier questionnaires as a starting point in order to maintain a time series of data but with some additional questions reflecting current areas of interest for Defra, WRAP and other stakeholders. Separate questionnaires were developed for AD and composting following a similar format but tailored to the nature of the industry.

The questionnaires included sections on:

- Employment
- Capacity
- Feedstocks (nature and source)
- Rejections
- Outputs (composting/digestate); destinations and application; certification
- Power outputs (AD) and use
- Processes used
- Wider factors affecting the business: compostable packaging; barriers and enablers to expansion; impacts of regulation.

Data was collected through a mixture of self-completed proformas and telephone interviews.

Data was collected from 51 of 371 AD sites (14% of sites). Very limited data was provided for six of these sites. Using data on capacity from the NNFCC database, this represents an estimated 18% of operational capacity.

Data was collected from 77 of 272 composting sites (27% of sites). Very limited data was provided for 10 of these sites.

Some of the key data points in the survey (inputs, outputs and employment) have been grossed up to provide estimates of these for the industry population for England (as in previous reports).

The combination of a relatively low response and instances of missing data, means that the number of respondents for each question can be quite small and as such the data should be considered indicative rather than representative.

## 3.0 Findings on the AD industry

### 3.1 Summary of grossed figures for the AD industry

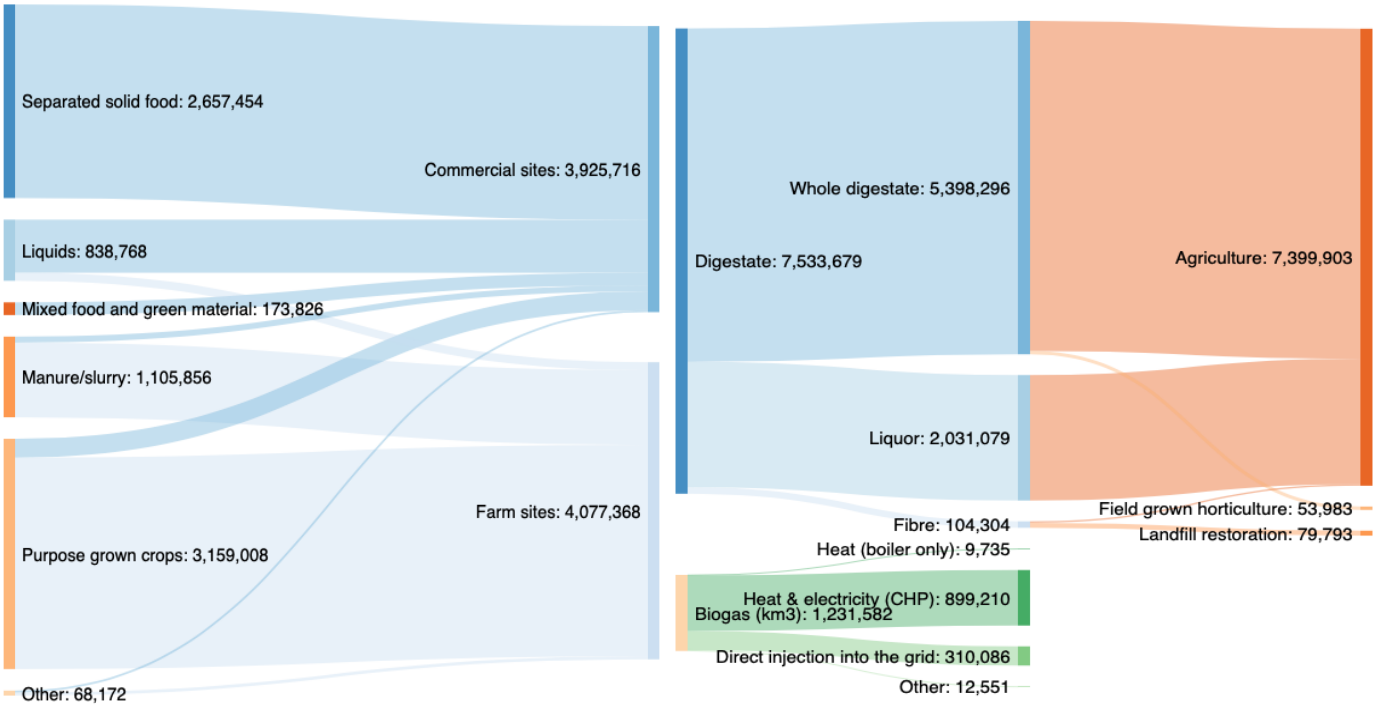
Figure 1 shows a summary of the grossed estimated AD industry inputs and outputs. Sites have been classified as farm, commercial or industrial on the following basis.

- Sites were marked as commercial if they had a food waste feedstock requirement on the NNFCC database. These could include some sites based on farms.
- Sites were marked as farm if their feedstock requirement consisted only of manure/slurry, purpose grown crops or crop waste on the NNFCC database.
- Sites were marked as industrial if they were marked as industrial on the online ADBA map. As discussed in the methodology (Appendix 1), industrial sites have been excluded

from the survey analysis due to poor representation in the sample but have been included where secondary population data is available for them from the NNFCC database.

- The small number of sites that were left uncategorised as farm or commercial were checked against the online ADBA map and marked in line with the ADBA map categorisation.

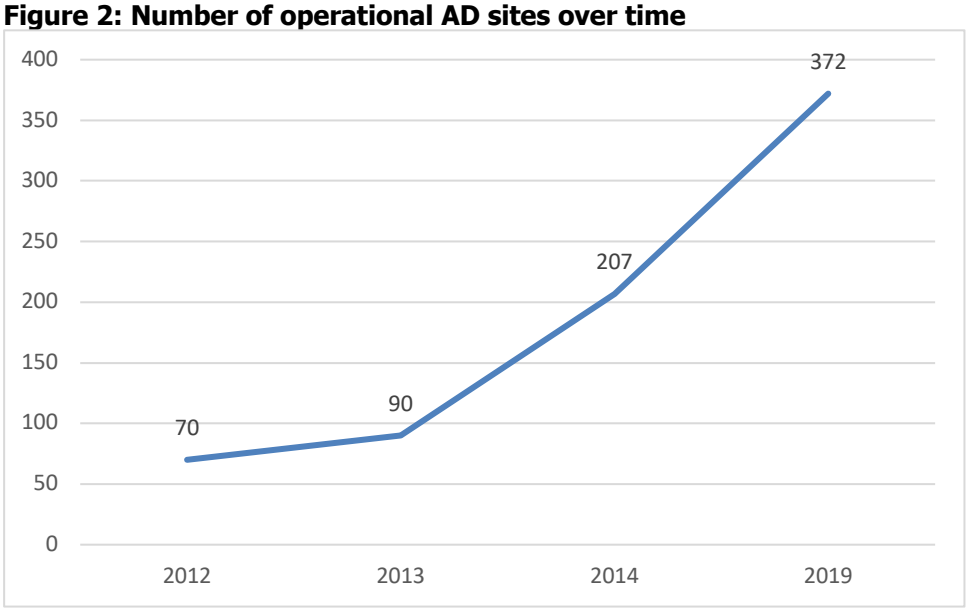
**Figure 1: Sankey diagram of grossed estimated AD inputs and outputs (tonnes)**




## 3.2 AD sites

The number of AD sites has grown over time to 372 in 2019.

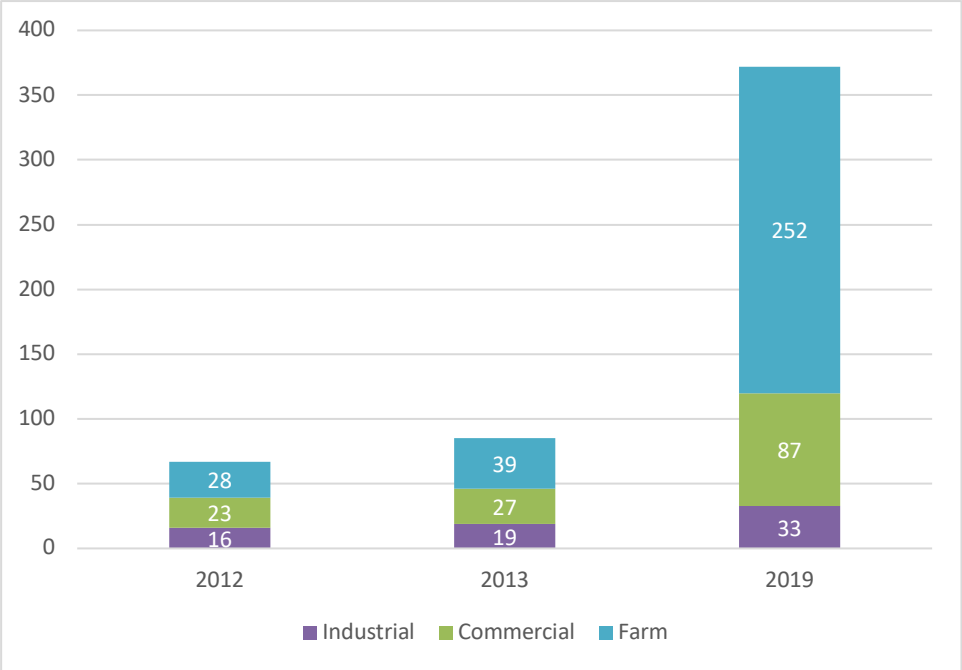
**Figure 2: Number of operational AD sites over time**




Source: NNFCC database 2019; 2012, 2013 and 2015 previous WRAP organics reports

There has been growth in all types of AD (farm, commercial, industrial[3]) but growth has been highest in the farm sector.

**Figure 3: Number of operational AD sites over time by type**




Source: NNFCC database 2019; 2012 and 2013 previous WRAP organics reports

This growth is set to continue, based on analysis of the NNFCC database which draws on planning information:

- A further 35 sites (18 commercial; 17 farm) were under construction in 2019 and 2020.
- Another 168 sites (39 commercial; 122 farm; 8 industrial) have had their application for planning permission approved and are due to be completed in 2020.

## 3.3 Employment in the AD industry

50 sites reported a total employment of 239 full time equivalent jobs. To calculate grossed employment for the AD sector, mean employment by size category (small, medium, large as per the definition given on page 55) was calculated in the sample and then applied to the population (NNFCC database). This gives a total estimated employment of 1,381 (487 on commercial sites; 779 on farm sites; and 115 on industrial sites). This compares to an estimated 1,000 in 2014.

**Table 1: AD site employment mean by scale of site**

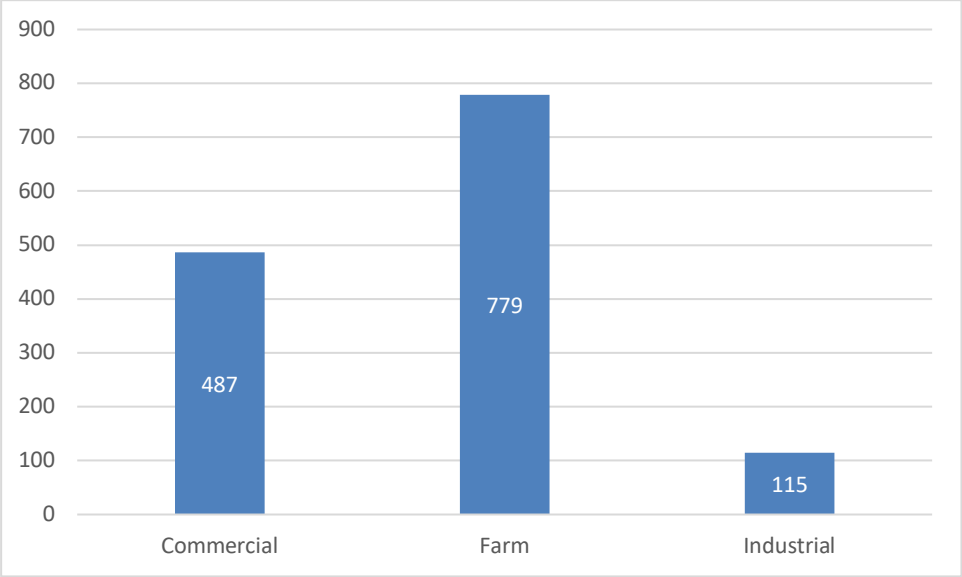
| Scale of site | Surveyed sites | Mean total employment |
|---|---|---|
| Large | 25 | 6.76 |

| | | |
|---|---|---|
| Medium | 18 | 2.66 |
| Small | 6 | 2.00 |

Source: 2018 survey data

Figure 4 shows the estimated grossed AD employment in 2018 by site type.

**Figure 4: Estimated grossed AD employment by site type (full time equivalent jobs)**




Source: 2018 survey data

A small proportion, 7%, of the employment reported, was stated to be temporary rather than permanent employment.

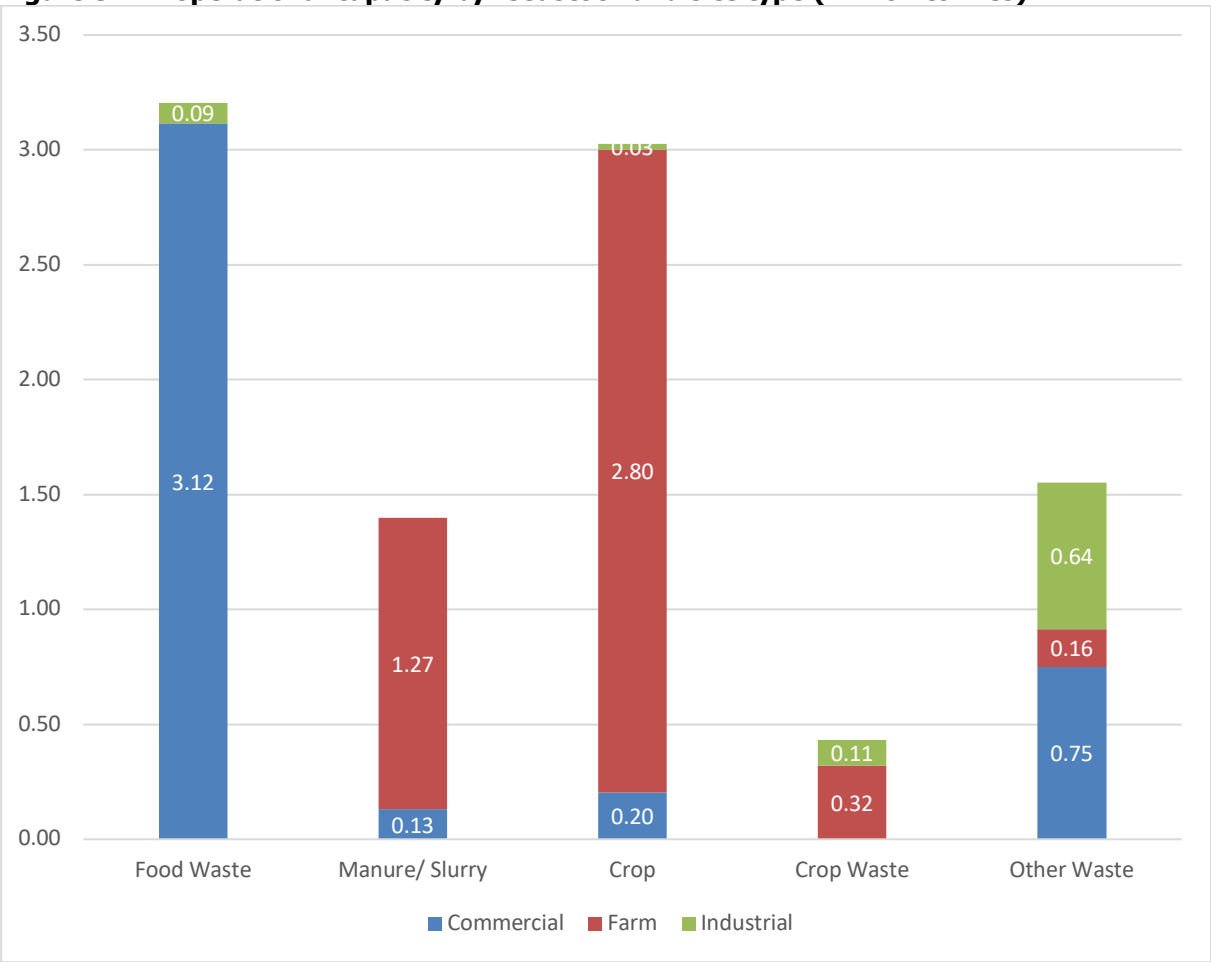
## 3.4 AD operational capacity

The operational capacity of AD sites in England has grown to 3.2 million tonnes for food waste within a total operational capacity of 9.6 million tonnes in 2019.[4] By site type, operational capacity was 4.55 million tonnes for farm sites (0.85 in 2013); 4.21 million tonnes for commercial sites (1.33 in 2013); and 0.87 million tonnes for industrial sites (0.53 in 2013). Operational capacity indicates how much feedstock sites could take as a maximum. This figure could be limited by a permit, planning or physical constraints. The 2019 figure is based on the NNFCC database capacity figures. These draw primarily on planning information but may also be informed by permits, renewable incentives applications, media coverage of facilities and conversations with operators and developers. Some

*[4] This excludes 6 sites for which operational capacity data is not known. In addition, about half of respondents gave a higher operational capacity figure than that listed in the NNFCC database. We do not know the reason for this difference. It is possible that sites which do not have planning conditions limiting the amount of feedstock they take may have increased the amount they process through developing improved site efficiencies. If this was the case, there may be greater operational capacity than the NNFCC figures suggest.*

assumptions may be made by NNFCC about the make-up of feedstocks through an informed understanding of the operator's business.

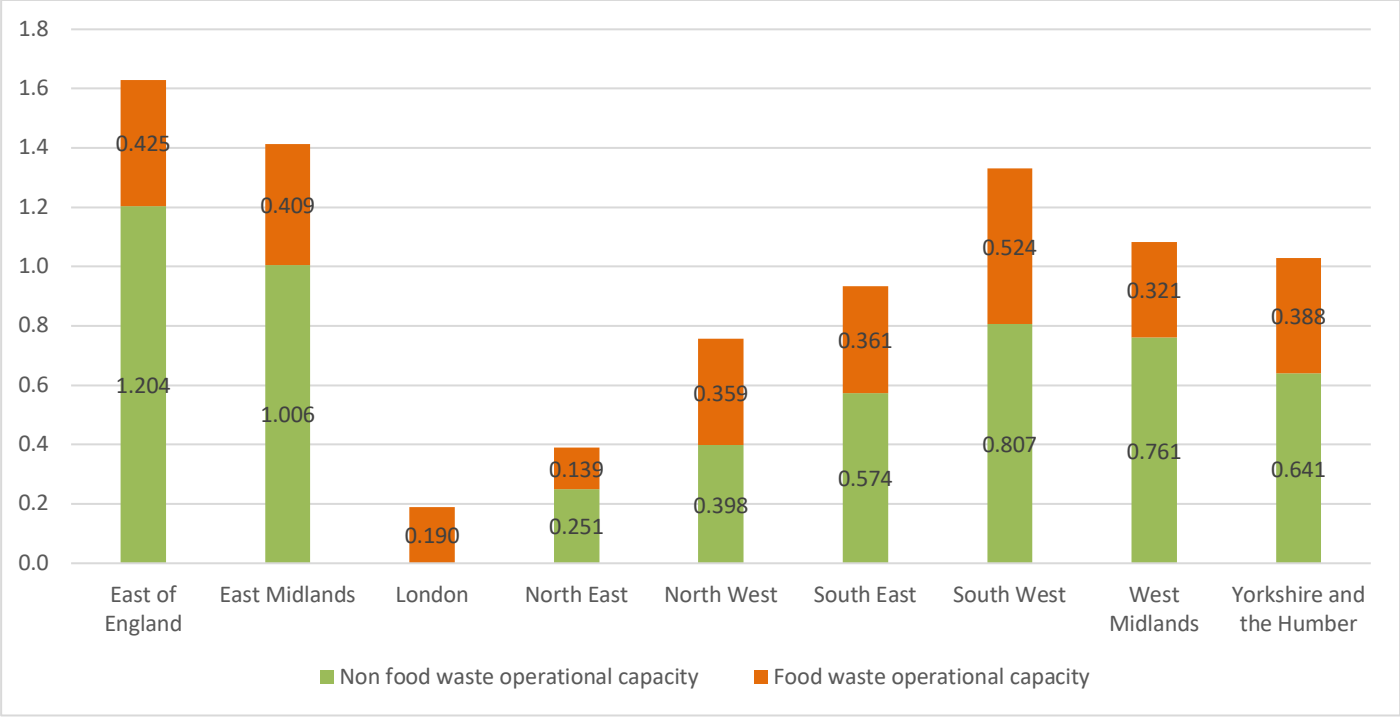
**Figure 5: AD operational capacity by feedstock and site type (million tonnes)**




Source: NNFCC database 2019

Figure 6 shows operational capacity by region for food and non-food waste for commercial and farm sites (industrial sites are excluded).

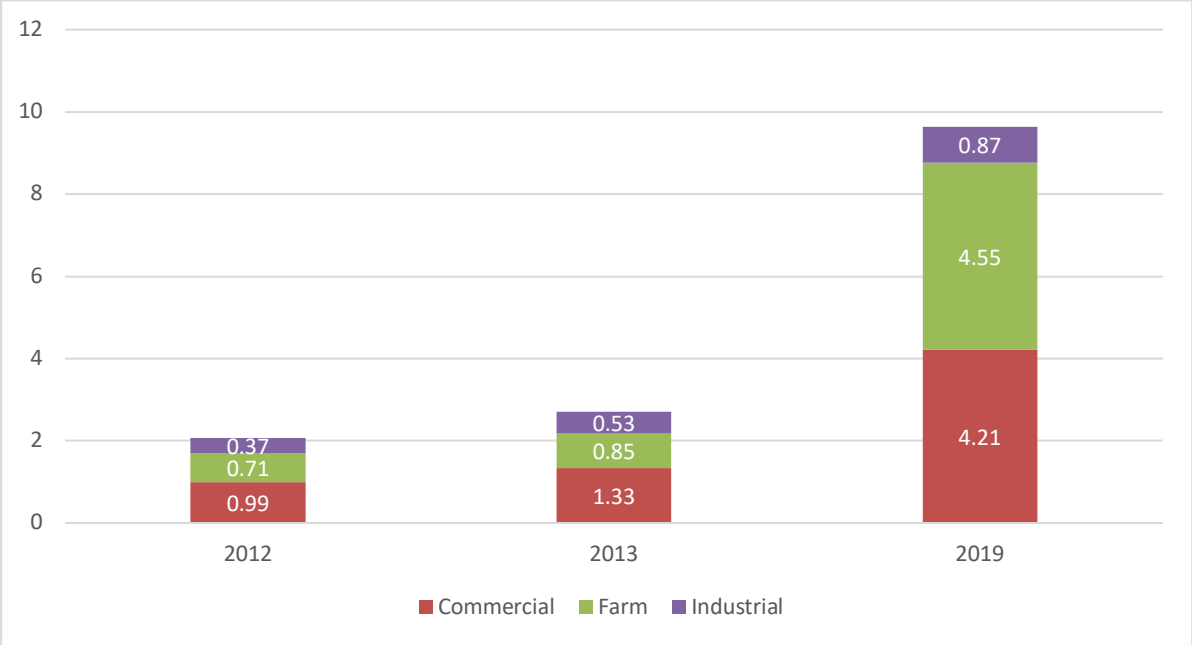
**Figure 6: AD operational capacity by region broken down by food and non-food waste excluding industrial sites (million tonnes)**




Source: NNFCC database 2019

Figure 7 shows capacity over time by site type.

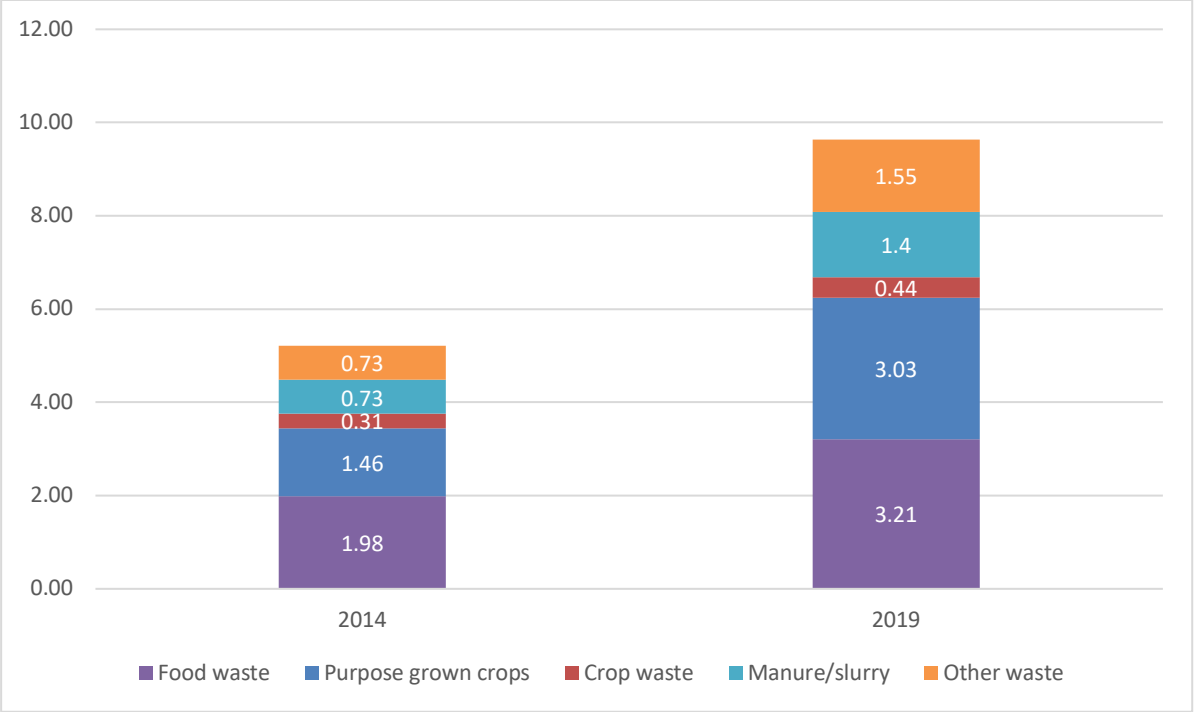
**Figure 7: AD operational capacity over time by site type (estimated million tonnes)**




Source: NNFCC database 2019, WRAP reports 2012 and 2013

Figure 8 shows operational capacity over time broken down by feedstock.

**Figure 8: AD operational capacity over time by feedstock (estimated million tonnes)**




Source: NNFCC database 2019, WRAP reports 2015

## 3.5 AD feedstock

There was an estimated total feedstock of 8.0 million tonnes for 2018 (excluding industrial sites) of which an estimated 2.66 million tonnes was solid separated food. For 2018, amongst the surveyed sample, the median site feedstock was 40,000, the minimum was 1,700 and the maximum was 89,663 (n=38).

The method used for arriving at this estimate is described in Appendix 1. Table 2 shows how these estimates compare to previous years. The 2012 and 2013 reports excluded industrial sites co-located with drinks manufacturers, breweries and distilleries but included other industrial sites.

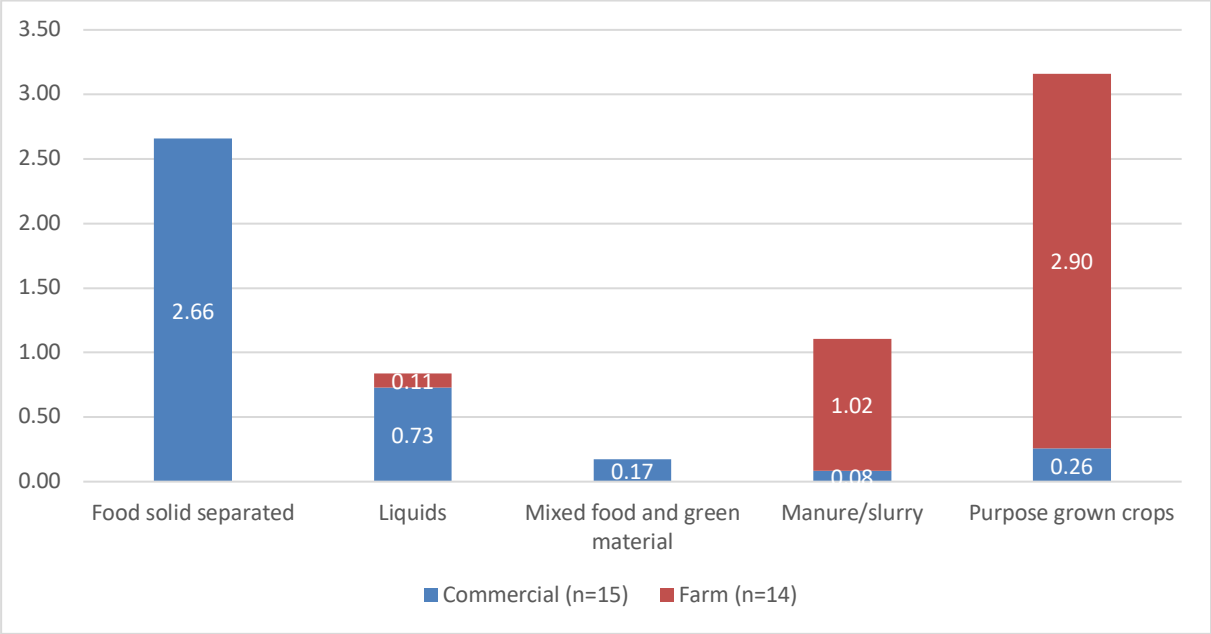
**Table 2: Grossed AD feedstock over time and mean per site**

| Year | Number of sites | Grossed feedstock estimate for England (million tonnes) | Estimated mean feedstock per site |
|---|---|---|---|
| 2018 | 339 (excluding industrial sites) | 8.0 | 23,607 |
| 2013 | 90 | 2.1 | 23,778 |
| 2012 | 70 | 1.5 | 21,429 |

Source: survey data 2018, NNFCC database 2019; 2012 and 2013 previous WRAP organics reports

Figure 9 shows the tonnage of different types of feedstock in 2018 for commercial and farm sites[5]. The distribution is similar to 2012.

**Figure 9: AD feedstock type (grossed estimate, million tonnes)**

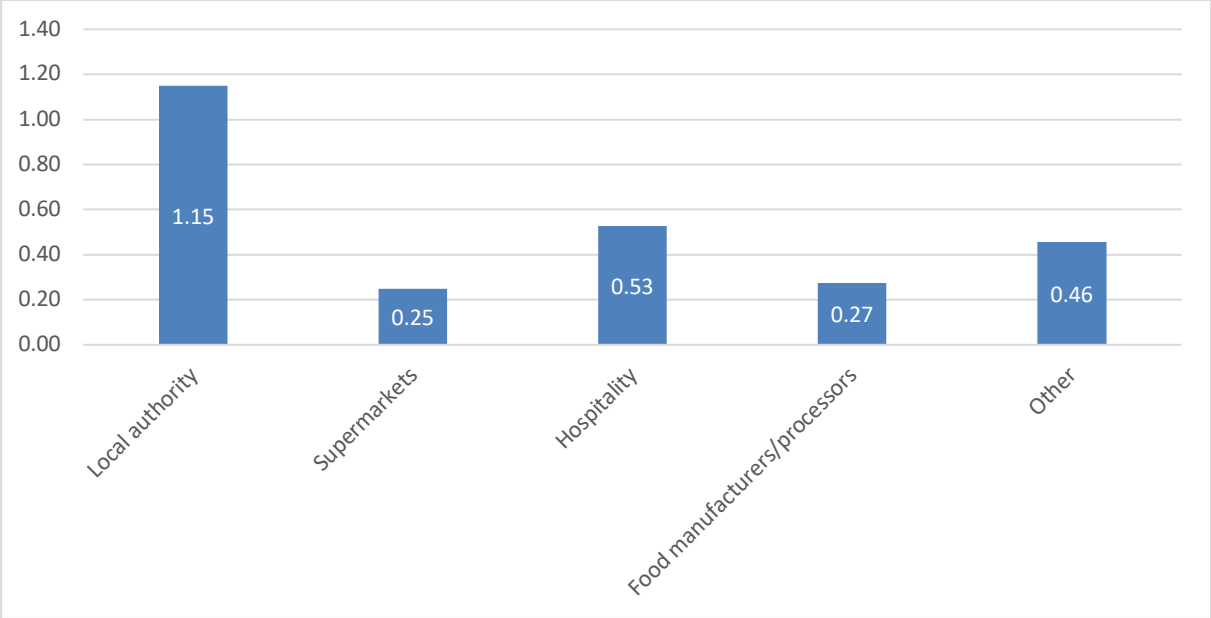



Source: Survey data 2018

Figure 10 shows the source of feedstocks of food (solid separated) for 2018 at commercial AD sites. The 0.46 million tonnes estimated to come from 'other sources' is based upon data from one large AD site only. The nature of the source was not specified but online research into this company suggests they receive their feedstock from an intermediary who collect waste from a number of sources.

**Figure 10: Source of food solid separated feedstock at commercial AD sites (grossed estimate. million tonnes)**

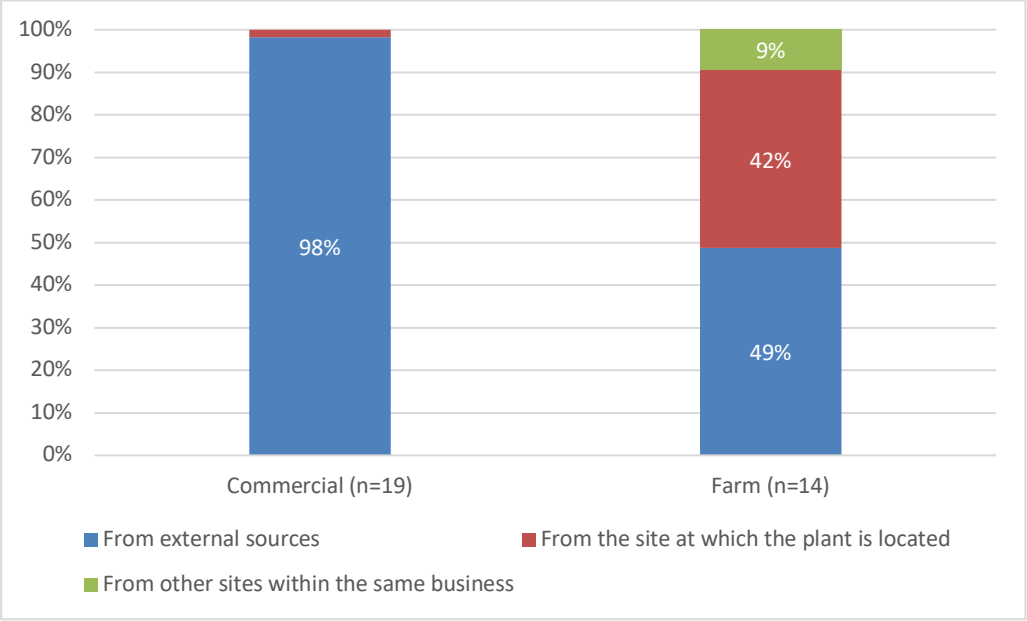
*[5] The figures also included 0.07 million tonnes of 'other' feedstock each for commercial and farm AD sites which was too small to see on the figure.*




Source: 2018 survey data (n=15)

Nearly all (98%) of commercial feedstock was sourced from external sources (survey sample) as shown in the figure below. About half of farm feedstock (49%) was sourced from external sites.

**Figure 11: AD feedstock source (%) by site type**




Source: 2018 survey data

## 3.6 Estimated spare capacity in the AD industry

Comparing the estimated feedstock of solid separated food (2.66 million tonnes) with the estimated operational capacity for food waste (3.12 million tonnes) for commercial sites (and excluding industrial sites), this suggests there is currently spare capacity for food waste of at least 500,000

tonnes. (This estimate uses the NNFCC operational capacity figures which may be a conservative estimate of operational capacity.)

Farm sites have an estimated total operational capacity of 4.55 million tonnes and are estimated to have taken 4.07 million tonnes of feedstock in total in 2018, suggesting they currently have spare capacity of at least 450,000 tonnes.

## 3.7 AD rejections

In a change from previous surveys[6], respondents were asked about rejections at three different stages of the process: at the gate (where feedstock is returned to the supplier); before feedstock enters the anaerobic digester; and during and after anaerobic digestion.

None of the farm respondents reported any rejections at any stage of the process. Industrial sites did not report any rejections at any stages of the process either (they were not asked about rejections at the gate as no industrial site reported taking feedstock from external sources).

Reported rejections at the gate were small but were identified amongst some commercial sites.

**Table 3: Rejections at different stages of the AD process (surveyed sites, reported % of feedstock)**

| Stage of the AD process | Number of site responses[7] | Mean | Min | Max | Median |
|---|---|---|---|---|---|
| Rejections at the gate, feedstock not accepted and returned to the supplier | 9 | 0.3% | 0.0% | 1.0% | 0.0% |
| Feedstock removed before it went into the anaerobic digester | 17 | 5.6% | 0.0% | 19.5%[8] | 5.0% |
| Feedstock removed during and after anaerobic digestion | 9 | 1.3% | 0.0% | 5.0% | 0.5% |

Source: 2018 survey data, commercial sites only

Respondents for four sites gave a reason why feedstock was returned to the supplier. One operator responding for three sites said this was because it was outside the input specification, the other respondent said this was due to gross contamination.

[6] Respondents were previously asked for the level of contamination they typically found per tonne of feedstock.

[7] *This is the number of valid responses. It excludes missing responses. Where 0% is cited, this was given as the response.*

[8] *The feedstock at the site reporting this high level of contamination was all sourced from local authorities. Three other sites also reported high levels of contamination (8%, 10% and 13%) but did not give details of the sources of their feedstock.*

For feedstock rejections before, during and after anaerobic digestion, the main source of rejected feedstock was given for eight sites. Responses from one operator for six sites said feedstock from supermarkets was the main source of the contamination. One respondent cited the local authority and one cited food manufacturers/processors.

A range of reasons were given by operators as to why the feedstock was rejected:

- It was not food waste (one operator responding for three sites)
- Gross contamination – mainly non compostable plastic (two respondents)
- Outside input specification (two operators responding for four sites)
- Wrong EWC code, wrong category of waste, health and safety (one operator responding for six sites)
- It included compostable bags (two respondents)

17 respondents specified where feedstock that was removed before, during and after anaerobic digestion was sent as shown in Table 4: Destination of AD feedstock removed before, during and after anaerobic digestion

**Table 4: Destination of AD feedstock removed before, during and after anaerobic digestion**

| Type of site | Number of surveyed (site) responses |
|---|---|
| Landfill | 8 |
| Energy from waste | 7 |
| Incineration | 1 |
| Returned to depackaging facility for further processing | 1 |

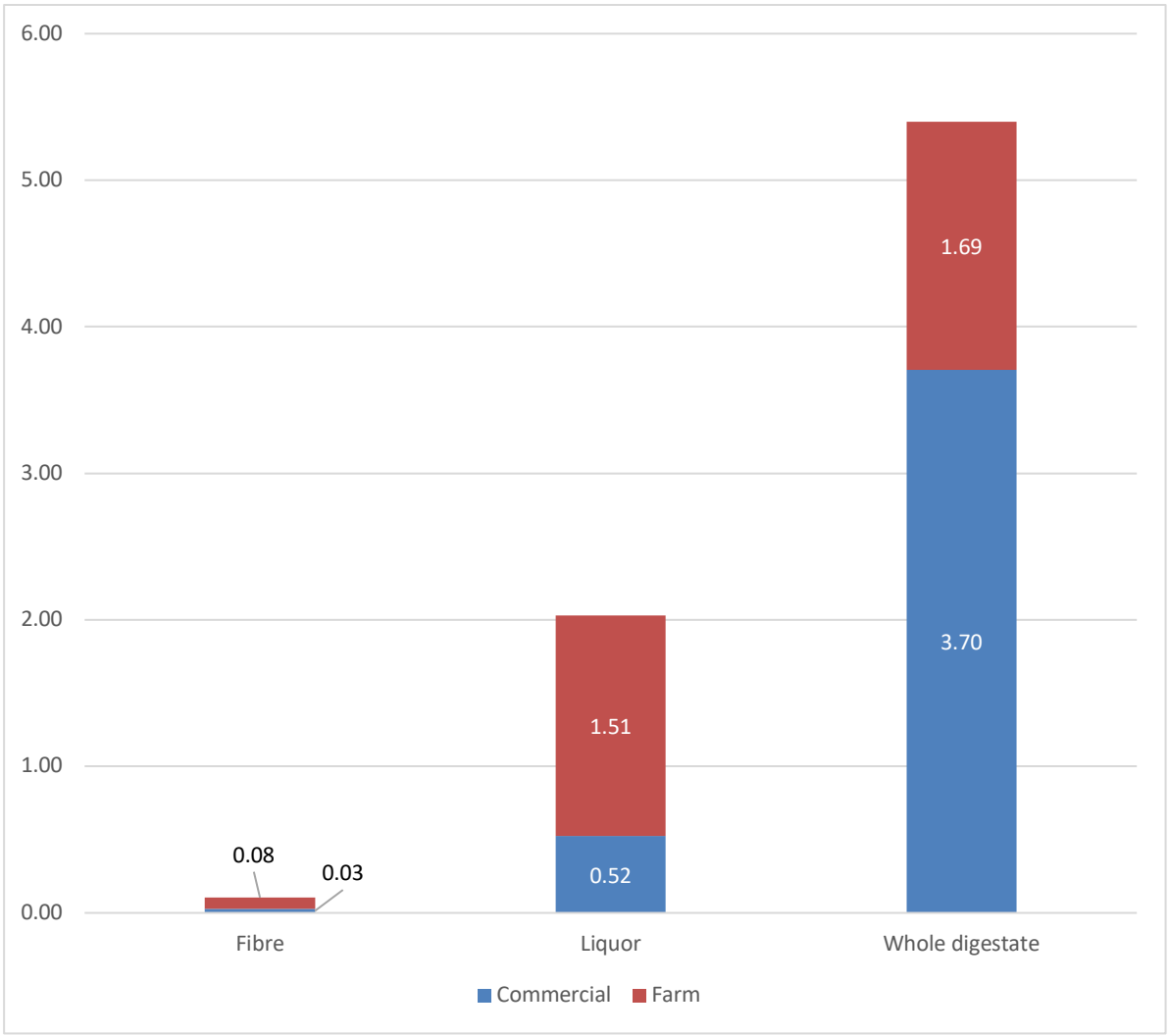
Source: 2018 survey data, commercial sites only

## 3.8 Digestate production

Using average ratios of digestate to input for commercial and farm sites (see Appendix 1 for details), a total grossed estimate for the production of digestate has been calculated of 7.5 million tonnes (for commercial and farm sites).

About half of survey respondents (46%) said that they split digestate into fibre and liquor. This was 30% for commercial sites and 81% for farm sites. Figure 12 shows the grossed estimated production of whole digestate, fibre and liquor by site type. Only two commercial sites gave a breakdown of the weight of fibre and liquor produced and as such the estimated totals of commercial fibre and liquor should be treated with caution. Seven farm sites gave a breakdown of the weight of fibre and liquor produced.

**Figure 12: Production of whole digestate, fibre and liquor by site type (grossed estimated million tonnes)**




Source: 2018 survey data

## 3.9 Digestate destinations and applications

Small numbers of respondents answered questions about digestate destinations. It does not therefore seem sensible to gross these figures.

Amongst commercial sites (n=11), operators paid users to remove nearly all (99%) of the whole digestate produced. The two farm site respondents both said they used all the whole digestate in their own business.

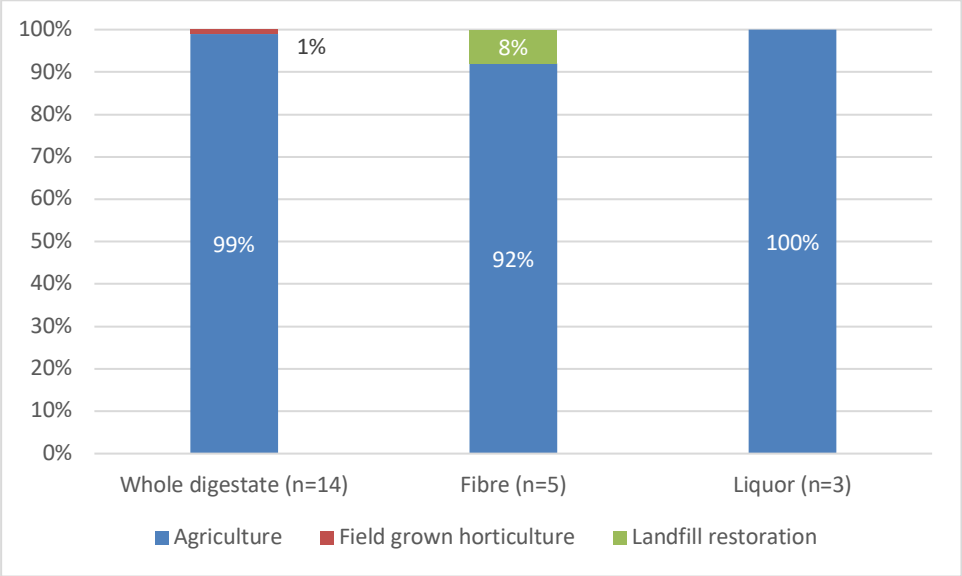
Two commercial sites gave data on the destination of separated fibre. In one case, this was all used by their own business. In the other case, the respondent reported that about half of the fibre was sold to users and they paid for the other half to be removed. Amongst farm AD sites (n=6), the majority (68% by weight) of separated fibre was provided free of charge to users off site. The remainder (32%) was used by the farm's own business.

Two commercial sites gave data on the destination of separated liquor. One of these was a water company and hence the majority was disposed of to sewers. The other respondent said that 70% was sold to users off-site and they paid the user to remove the remainder. Amongst farm AD sites (n=6), almost half (46% by weight) of separated fibre was provided free of charge to users off site and a

similar proportion (45% by weight) was used by their own business. They paid for the remainder (9%) to be removed by users.

Nearly all respondents (over 90%) said that digestate (whole, fibre and liquor) was applied to agriculture.

**Figure 13: Application of whole digestate, fibre and liquor (% of tonnes)**




Source: 2018 survey data

## 3.10 Digestate price

Small numbers of respondents gave a price for digestate in its different forms as follows (prices are ex works unless otherwise specified). This suggests there was a low price for digestate.

For whole digestate, the following prices per tonne were given:

- -£8.00 cost (1 industrial respondent)
- £1.50 for the product only (1 farm respondent)
- £2 for the product, transport and application (1 farm respondent)
- £3 for the product, transport and application (1 farm respondent)

For fibre, the following prices per tonne were given for agricultural destinations:

- -£2.80 cost (1 commercial respondent)
- £3.50 for transport only (1 commercial respondent)
- £5 (1 commercial respondent)

One commercial respondent gave a price of £20 per tonne for fibre for landfill restoration.

For liquor, one farm respondent gave a price of £5 per tonne for agricultural use.

## 3.11 PAS 110

There were 60 AD sites certified for PAS 110 in 2019 (source: REAL website). This compares to 51 sites in 2017 (REAL Annual report 2017).

Just under half (13 of 29) of operators who responded to this survey question said they were producing digestate that was certified to PAS110 and QP (quality protocol) compliant in 2018. The

majority (77%; 10 of 13) said this applied to all of the output rather than a part of it. This is a bit lower than 2012 (89%; 8 of 9).

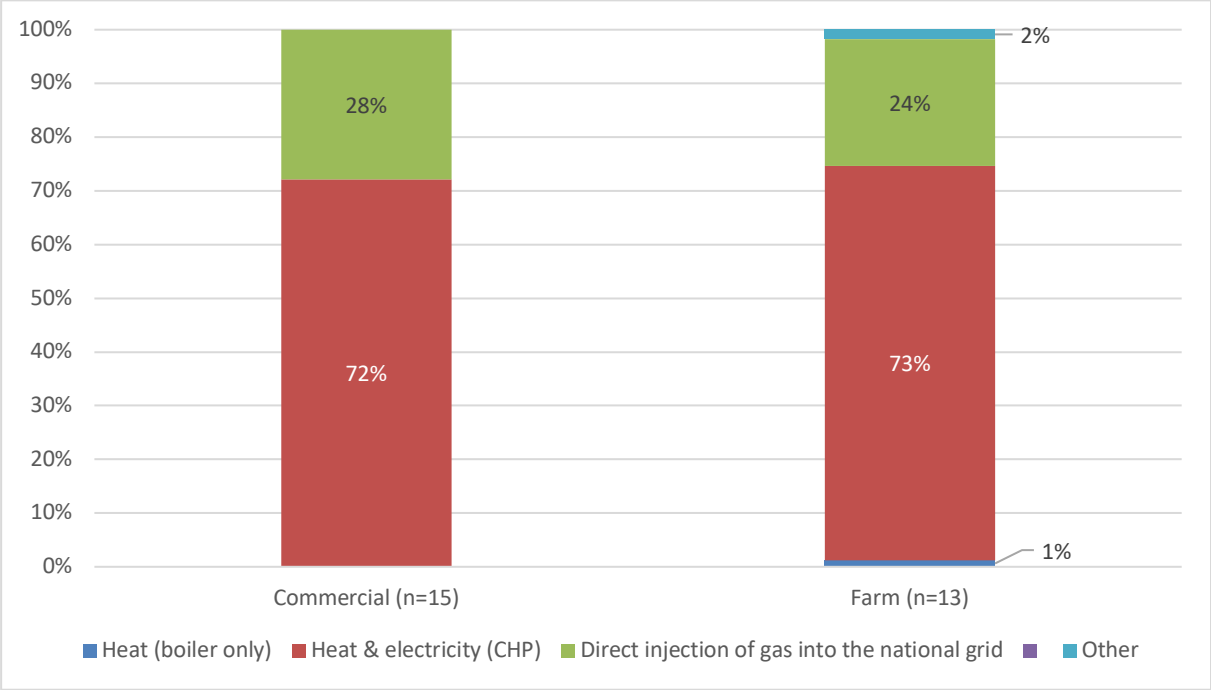
Operators were also asked if they thought that growing media derived from anaerobic digestion digestate should involve a grading system to differentiate out different qualities of growing media. Two thirds of respondents (67%; 14 of 21) said yes; a small number said no (14%; 3 of 21); and the remainder said they did not know.

## 3.12 Power outputs

Grossed figures for biogas yield have been calculated using ratios for biogas to feedstock for types of AD (commercial and farm) in the same manner as for grossed estimates of digestate (see Appendix 1). This gives a total estimate of 1,231 million $m^3$.

The figure below shows use of biogas by site type. This looks quite different to 2012 where over 90% of biogas was used for CHP across all site types.

**Figure 14: Use of biogas (% of biogas generated)**




Source: 2018 survey data

The majority of respondents (67%) did not export heat. They used it in the digestion process, for pasteurisation, for drying and some was wasted. A minority of respondents (6 of 39) said that they exported some heat off site. The proportions of heat exported given by these five respondents were: 10%; 40%; 60%; 66%; 75%. Large proportions of the electricity generated by sites were exported as shown in the table below.

**Table 5: Proportion of electricity exported reported by AD sites**

| Site type | Number of responses | Mean | Min | Max | Median |
|---|---|---|---|---|---|
| Commercial | 8 | 68% | 0.0% | 86% | 77% |
| Farm | 17 | 51% | 0.0% | 100% | 67% |

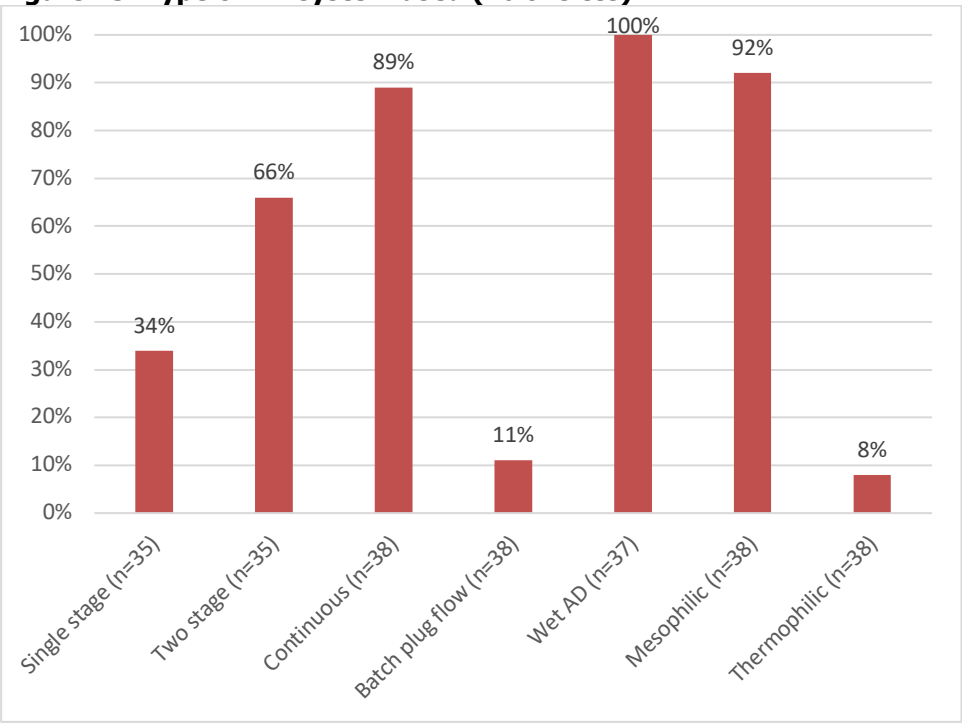
Source: 2018 survey data

A majority (63%) of 32 sites answering the question reported that they produced biomethane. Only 2 (10%) of 20 respondents reported that they sold the biomethane produced.

## 3.13 Type of AD system

The majority of sites reported using continuous, wet, mesophilic AD systems (as they did in 2012). There was a substantial decrease in the proportion reporting using a single (rather than two stage) AD system, with about a third using a single stage system in 2018 (compared to 67% in 2012).

**Figure 15: Type of AD system used (% of sites)**

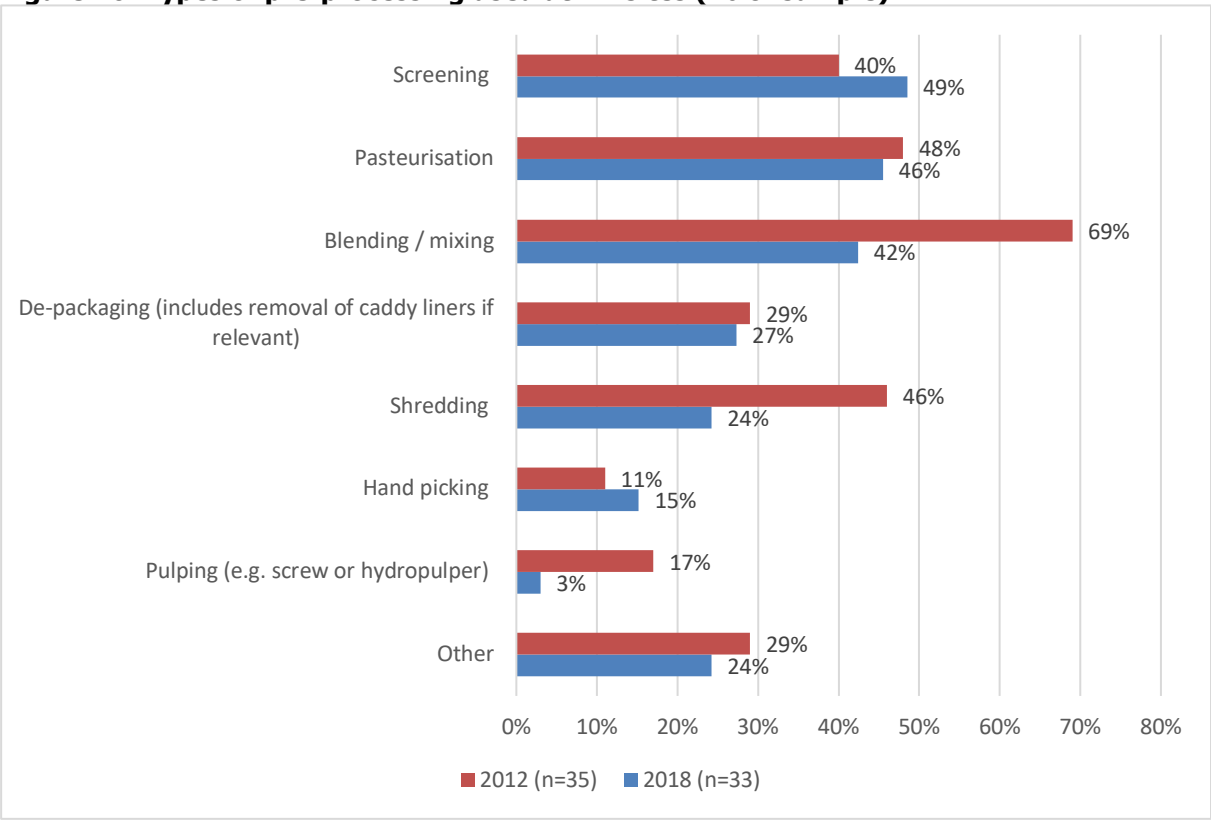



Source: 2018 survey data; 2012 WRAP report survey responses (the number answering each part of this question varied)

## 3.14 Processes used in the AD industry

The figure below shows the proportion of the sample undertaking different types of pre-processing. More than four in ten sites used screening, pasteurisation and blending/mixing in 2018. Fewer of the sites surveyed now use blending/mixing, shredding and pulping compared to sites surveyed in 2012.

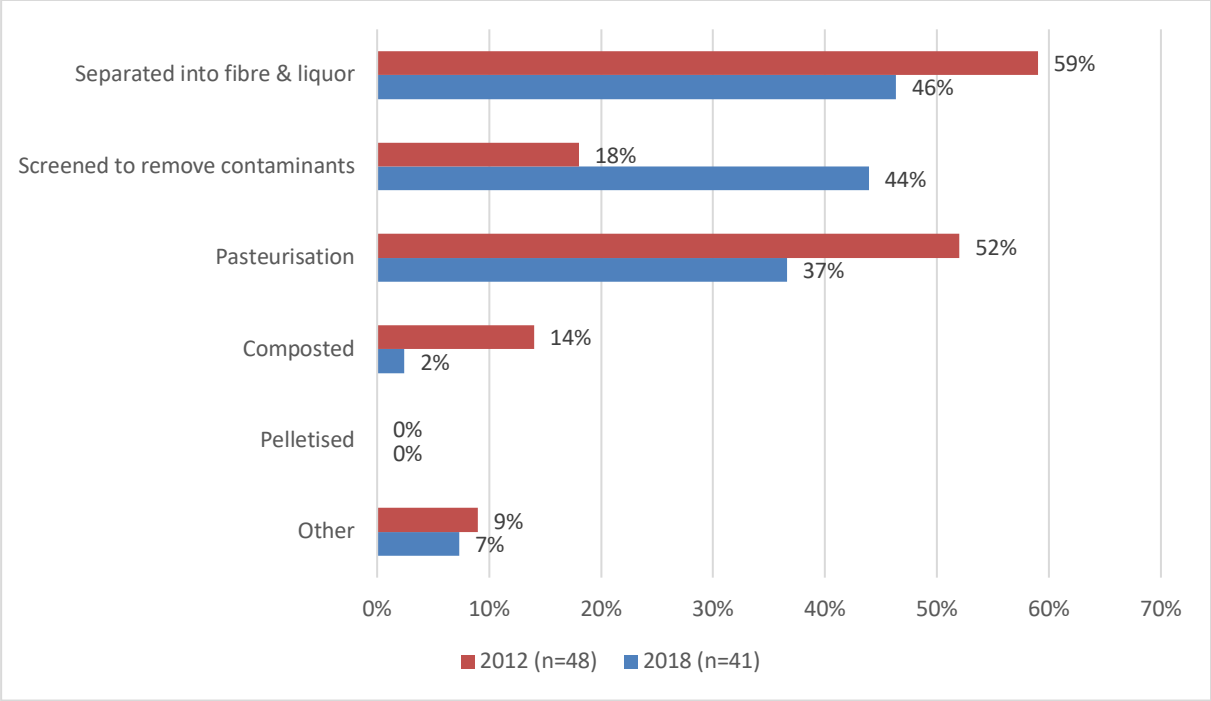
**Figure 16: Types of pre-processing used at AD sites (% of sample)**




Source: 2018 and 2012 survey responses

The figure below shows the types of processing undertaken once the digestate was produced. A small proportion (12%) of those surveyed said that no processing of the digestate was undertaken. This compares to just over half (54%) in 2012. Just under half of the total sample in 2018 (44%) reported screening to remove contaminants. However, when this was analysed for commercial sites only, this rose to 85% (17 out of 20) commercial sites said that they screened to remove contaminants.

**Figure 17: Digestate processing undertaken (% of sample)**



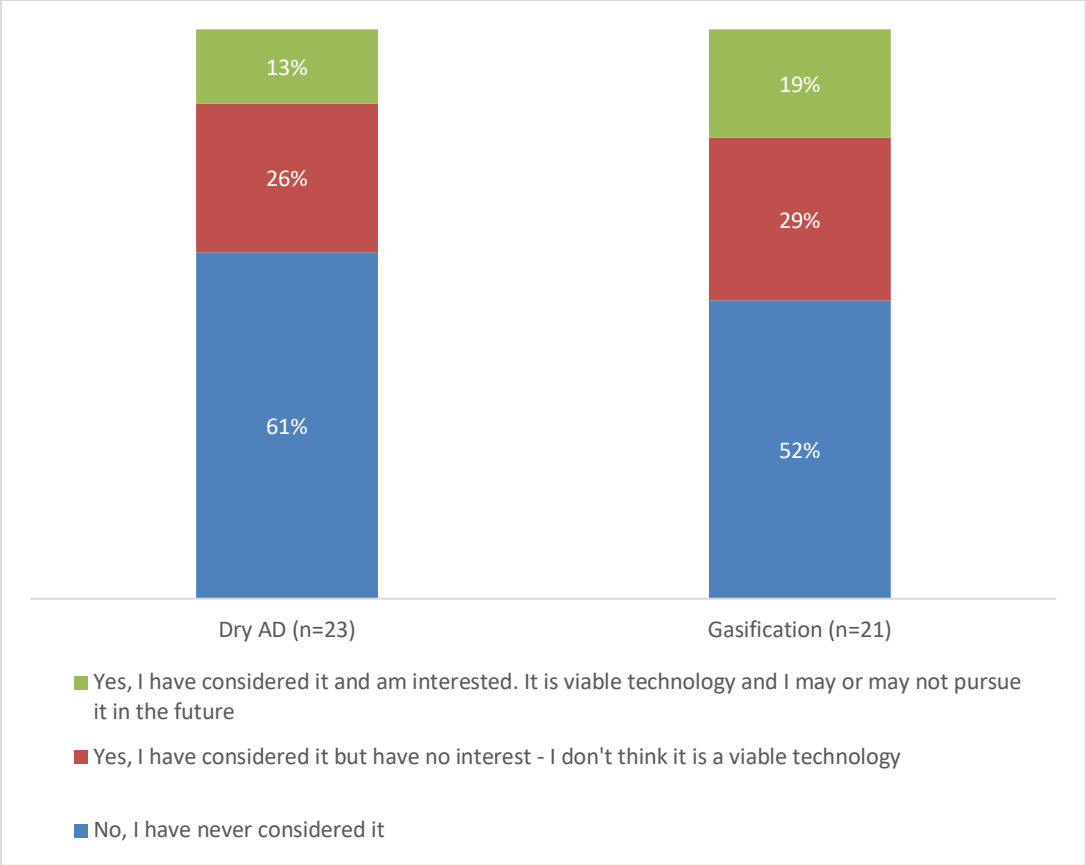

Source: 2018 and 2012 survey responses

After separation, 24% (4 of 17) of surveyed sites said they undertook further processing compared to 5% in 2012. Four respondents specified that this involved:

- Aerobic treatment (1 respondent)
- Fibre centrifuged (1 respondent)
- Drying off the liquor (1 respondent)
- Ultra filtration and reverse osmosis (1 respondent)

Small proportions of the sample (13%) and (19%) respectively had considered and were interested in dry AD and gasification. They might or might not pursue it in the future.

**Figure 18: Consideration of dry AD and gasification in the AD industry (% of sample)**




Source: 2018 survey data

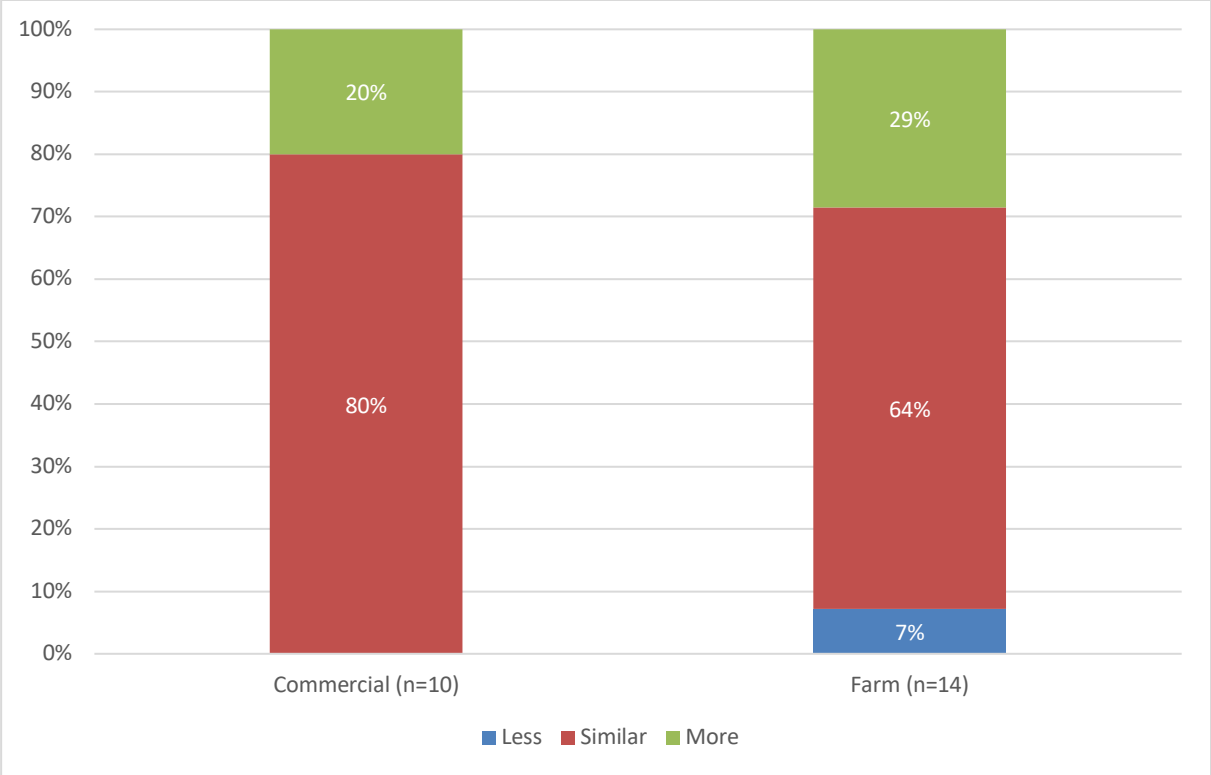
Over three quarters (78%) of respondents surveyed (n=32) said they had something in place to mitigate odours from their process.

Over six in ten (63%) of respondents surveyed (n=24) said they provide guidance or policies for the users of their product to help them spread and store the material properly.

## 3.15 Expansion in the AD industry

The majority of commercial and farm AD site operators surveyed expected their output for 2019 to be similar to 2018. Of those who expected to see an increase in the amount they processed, six respondents gave a mean estimated increase of 11%. Of the small proportion (4%) of operators who expected their 2019 output to decrease compared to 2018, one gave an estimated reduction of 5%.

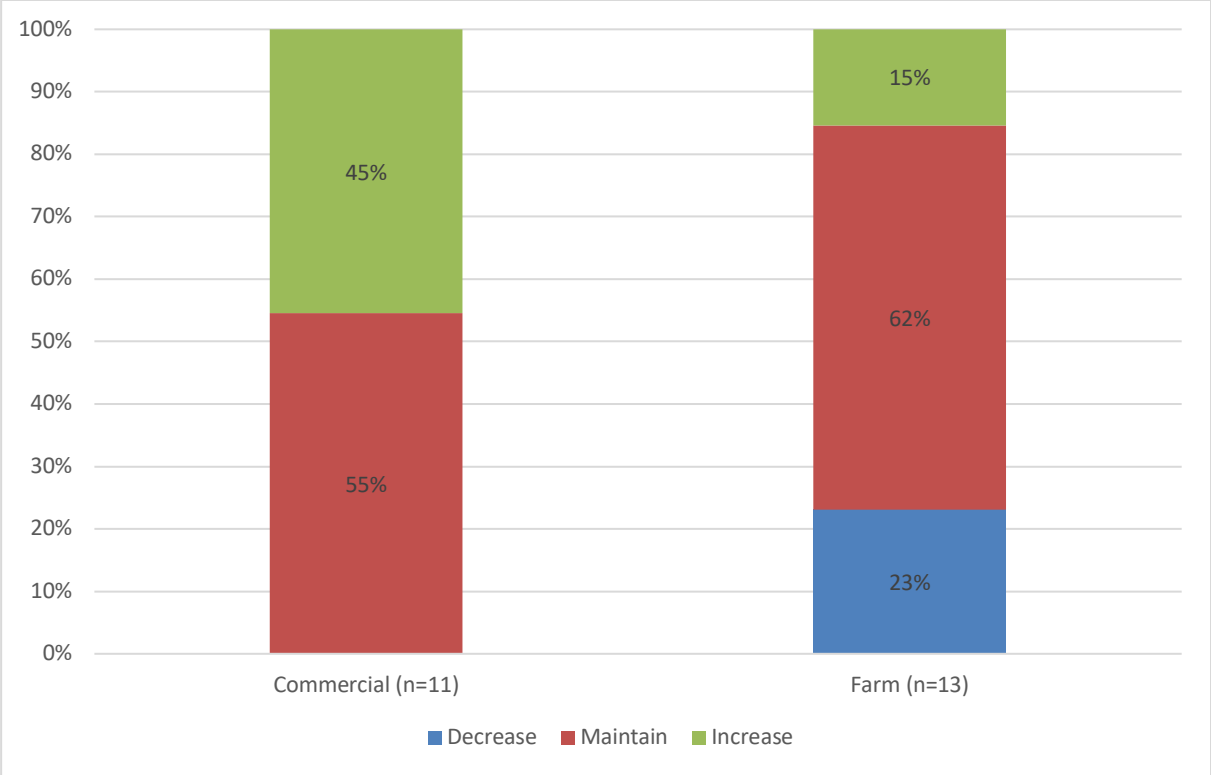
**Figure 19: Expectations of how 2019 output will compare to 2018 by site type (% of operators)**




Source: 2018 survey data

Almost half of commercial site operators (45%) said that they thought the amount they processed over the next five years would increase. A much smaller proportion of operators of farm sites (15%) said that they thought the amount they processed over the next five years would increase.

**Figure 20: Expectations of change to the amount processed in the next five years by site type (% of operators)**



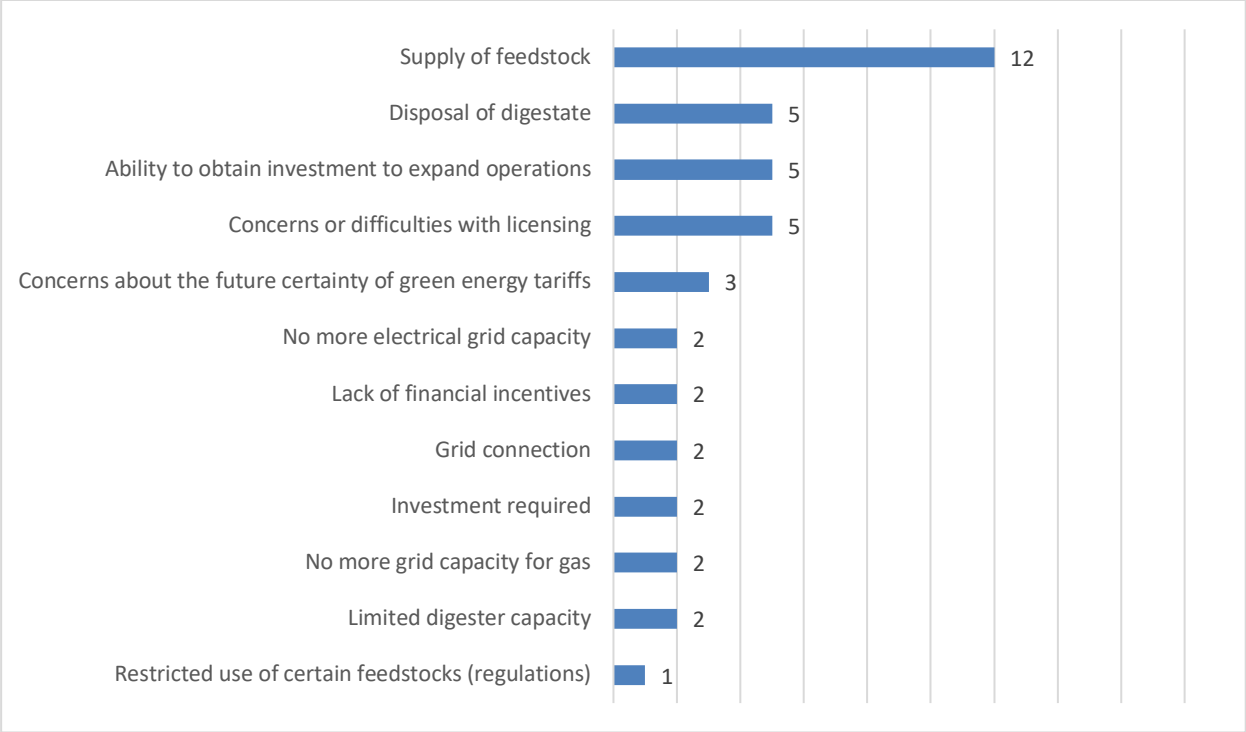

Source: 2018 survey data

Not all respondents gave a reason for their expectations. Six respondents who expected to see an increase in the amount they process referred to the policy context. Three of these mentioned the expected implementation of the Government Waste strategy and separate collections of bio-waste. Another respondent referred to: biomethane certificates, inflation of the tariff, Carbon Sequestration incentives and alternative feedstock inclusion. Another respondent mentioned population increase and need for commercial tonnage. Another respondent referred to food to landfill regulations and carbon reduction.

Four respondents who expected to see an increase in the amount they process referred to their own plans for increased production or expansion of the business. One of these specifically mentioned they were considering expansion of the plant to biomethane to grid.

However, nearly all (93%) operators surveyed (n=27) said they thought that there were specific and significant barriers to expanding the amount they process. The figure below shows what they identified these barriers to be (where specified). The data for this and subsequent figures is expressed as 'n' of operators rather than percentages due to the small number of responses. The supply of feedstocks was the most frequently identified barrier, identified by almost half of those who identified barriers (48%; 12 of 25).

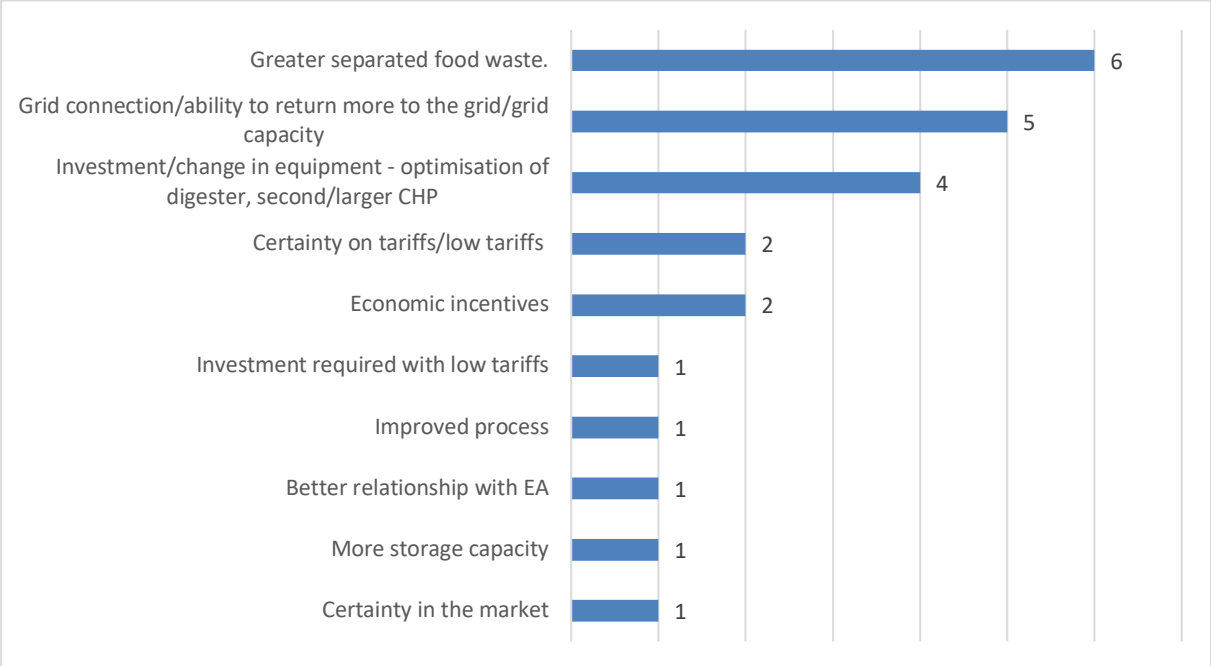
**Figure 21: Barriers to expanding the amount processed (n, operators identifying barriers)**




Source: 2018 survey data, n=25

The figure below shows the main factor identified by operators that would help them expand the amount processed. Six operators identified availability of feedstock as the main factor. Five responding operators referred to grid connections or capacity. Four operators identified a change or investment in equipment as the main factor that would enable them to expand.

**Figure 22: Main factor that would help expand the amount processed (n, operators)**




Source: 2018 survey data, n=20

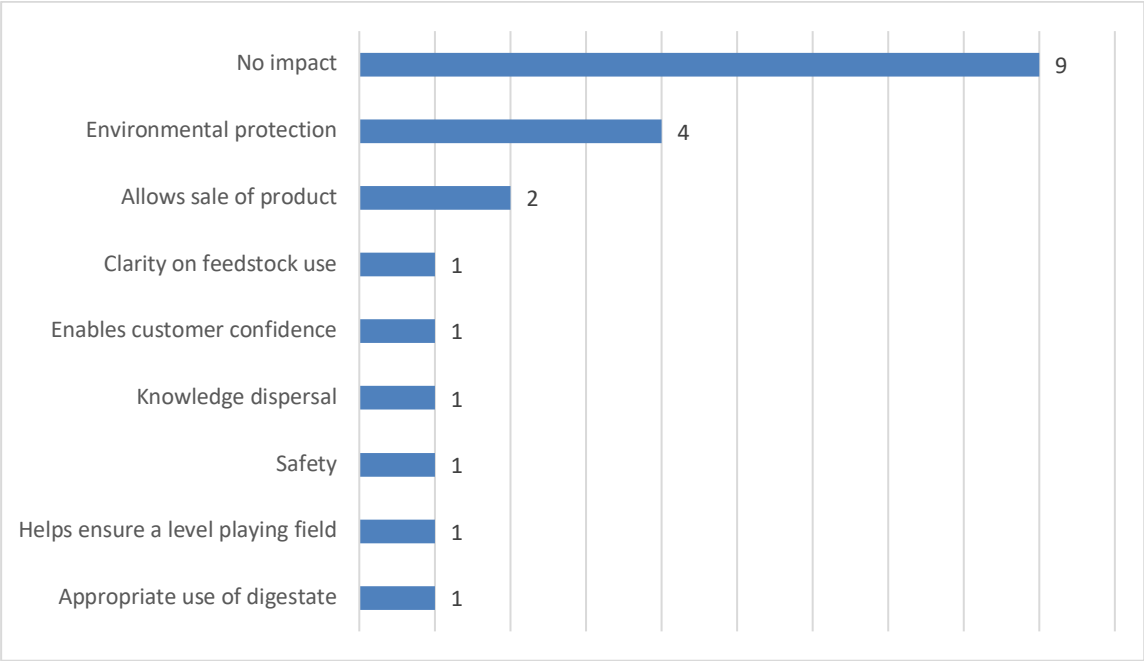
## 3.16 The impact of compostable packaging upon the AD industry

Amongst commercial operators only, the majority (64%; 7 of 11 operators) said that compostable packaging was having an impact upon their business. Those who said it was having an impact made comments relating to this increasing reject levels (and disposal costs) and causing problems in the AD process because it did not break down. Comments were made that operators have to treat compostable packaging in the same way as plastics and screen it out of the process.

## 3.17 Impacts of regulation upon the AD industry

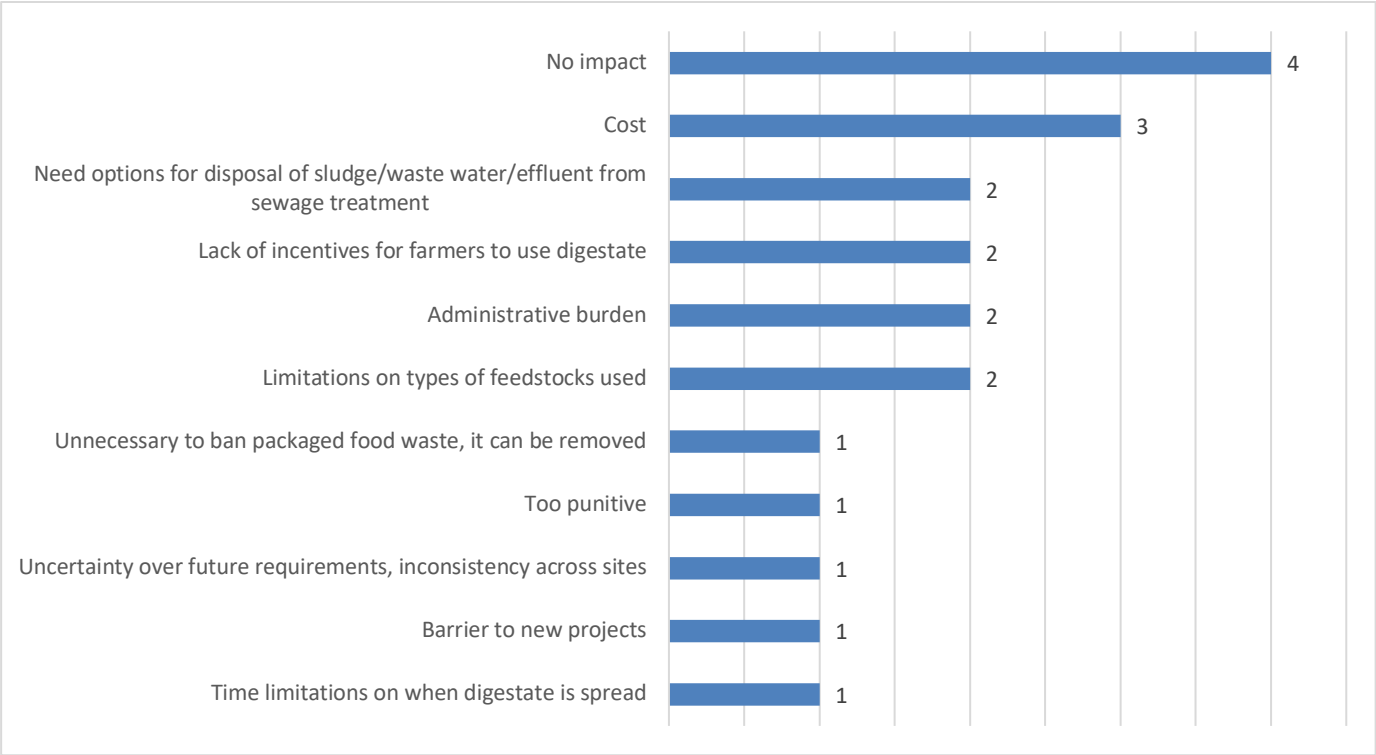
Figure 23 shows the reported positive impacts of regulation and Figure 24 the reported negative impacts of regulation by operators.

**Figure 23: Positive impacts of regulation (n, operators)**




Source: 2018 survey data, n=19

**Figure 24: Negative impacts of regulation (% of operators)**



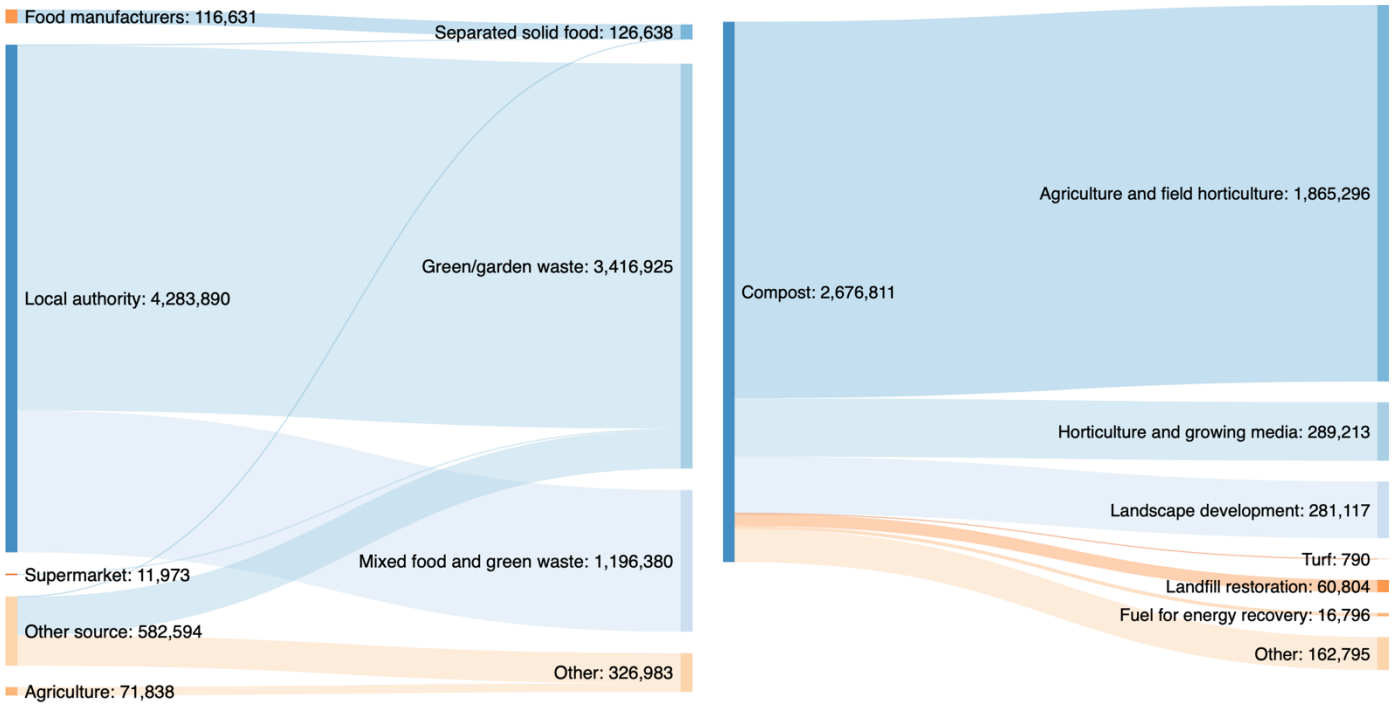

Source: 2018 survey data, n=19

# 4.0 Findings on the composting industry

## 4.1 Summary of grossed estimated figures for the composting industry

The diagram below gives an overview of the grossed estimated composting input and outputs in tonnes.

**Figure 25: Sankey diagram of grossed estimated composting input and outputs (tonnes)**

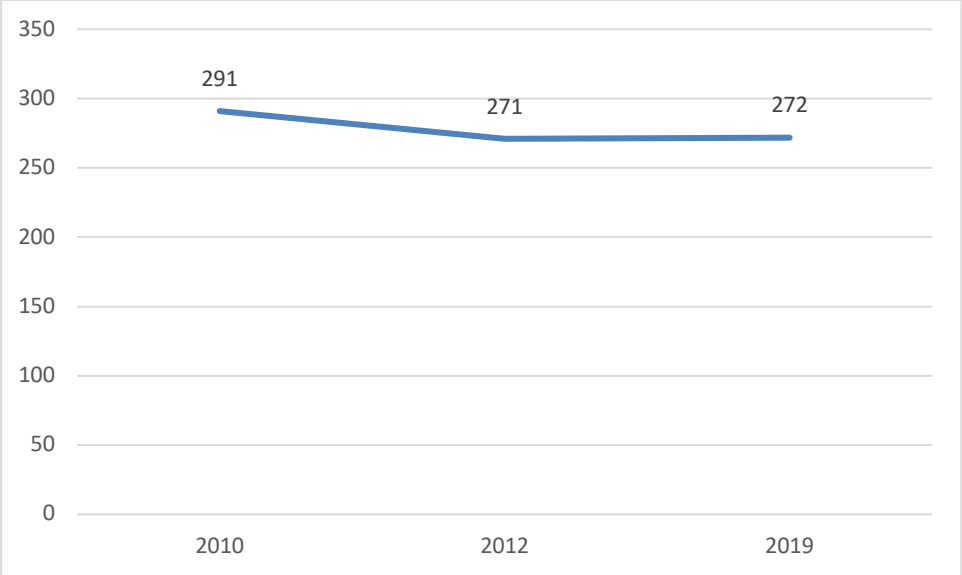



## 4.2 Number of composting sites

An estimated 272 permitted composting sites were identified in 2019[9]. The number of permitted composting sites has been relatively stable over time as the figure below shows.

**Figure 26: Number of permitted composting sites in England over time**

[9] A list of 284 permitted composting sites was created from permitting data originally provided by the Environment Agency (as discussed in section 2.1). Eleven of these sites have been identified to be non-operational either through fieldwork or further data provided by the Environment Agency. One was removed as a duplicate.




Source: Environment Agency data, WRAP reports

## 4.3 Types of composting

As noted in the appendix detailing the methodology (see Table 17), there was a smaller proportion of sites using IVC in the 2018 sample compared to 2012. Stakeholder views were that they might have expected the number of IVC sites to reduce. This is because of the policy focus upon *separated* food waste collections which are more suitable for AD than IVC and also because AD typically has lower gate fees than IVC due to the RHI and FITs incentives. So it is possible that the sample distribution may be reflective of the composting site population as a whole in this respect. Data for the composting industry has not been broken down by site type (IVC/open windrow) because the small number of sites undertaking IVC (7) means differences may not be definitive.

All of those who answered the question about whether composting processes were undertaken in series or in parallel, did so in series (n=29).

## 4.4 Employment in the composting industry

65 sites reported 298 full-time equivalent posts of employment. Just under a fifth (19%) of these was reported to be temporary employment. Using the mean employment for each capacity band of composting sites, this provides a gross estimated employment of 1,449 full time equivalent jobs. This compares to 1,076 in 2012. There was a higher modal employment of 2.5 employees per site in 2018 compared to 1 in 2012 (but 4 in 2010).

## 4.5 Operational capacity in the composting industry

Using the same method of grossing, operational capacity (the maximum working capacity taking into consideration planning, regulatory and physical constraints) has been estimated to be 6.8 million tonnes in 2018. This suggests that average site capacity has increased slightly.

**Table 6: Composting operational capacity**

| | Grossed estimated site operational capacity |
|---|---|
| 2018 | 6.8 million tonnes |
| 2012 | 6.1 million tonnes |

Source: 2018 survey data, WRAP report

## 4.6 Feedstock in the composting industry

Using the same approach to grossing, the estimated grossed composting feedstock in England for 2018 was 5.1 million tonnes. This suggests there is spare capacity of 1.7 million tonnes in the composting industry.

For 2018, the median site feedstock was 6,736, the minimum was 0 and the maximum was 108,156 (n=76). Using a combination of survey data and secondary data, 33 sites were reported to have received no feedstock in 2018.

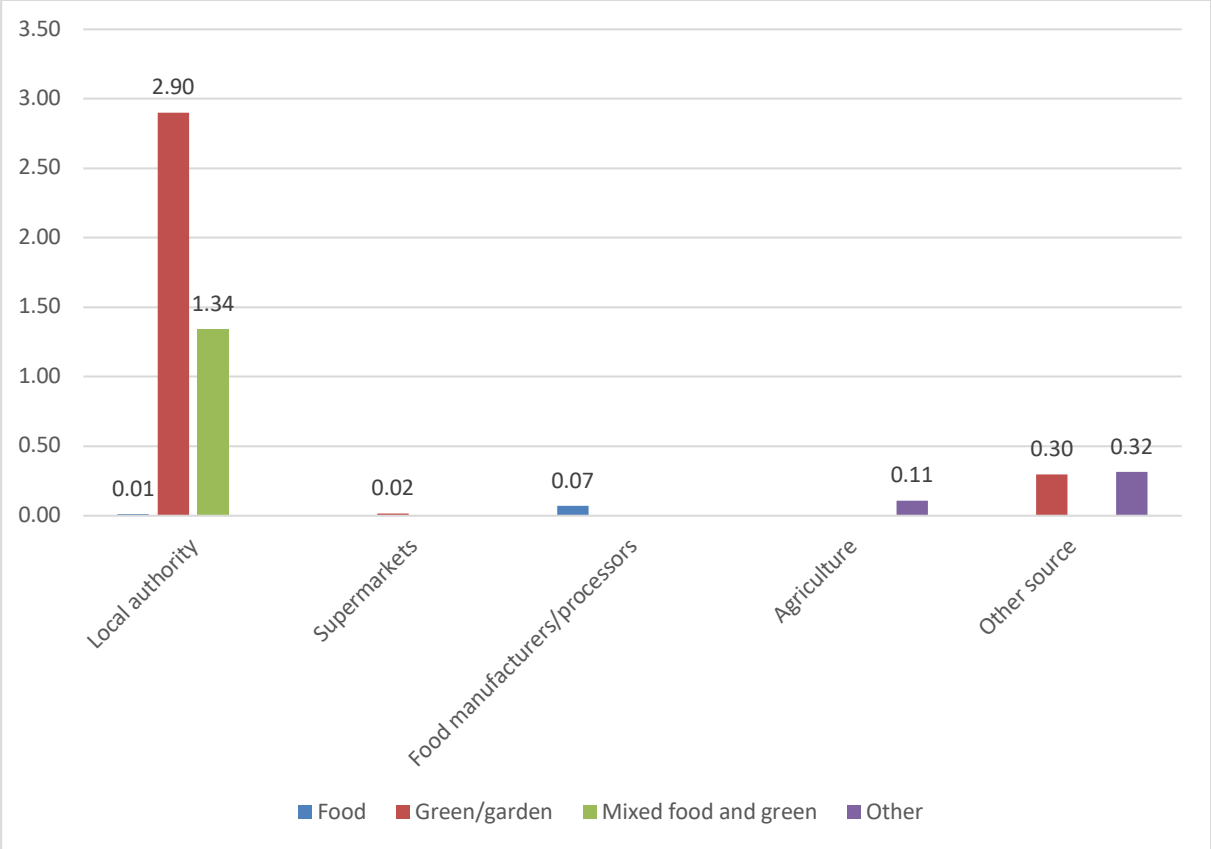
**Table 7: Grossed estimate of feedstock per composting site**

| | Number of permitted sites | Estimated grossed feedstock for England | Mean feedstock per site |
|---|---|---|---|
| 2018 | 272 | 5,100,000 | 18,692 |
| 2012 | 271 | 4,900,000 | 18,081 |

Source: 2018 survey data, WRAP report

The majority of composting feedstocks in 2018 were sourced from local authorities (84%). This is similar to 2012 (88%). The majority (72%) of all feedstock was green or garden waste. There was a similar profile of types of feedstock in 2012, other than that the proportion of food waste has gone down slightly (2% in 2018 compared to 5% in 2012). All agricultural feedstock reported in 2018 was manure (based on one site's response).

**Figure 27: Composting feedstocks by source and type (million tonnes)**




Source: 2018 survey data

## 4.7 Rejections in the composting industry

As for AD, respondents were asked about rejections at three different stages of the process: at the gate (where feedstock is returned to the supplier); before feedstock is composted; and during and after composting. Reported levels of rejections were low, although anecdotal evidence from stakeholders suggests these may be higher than reported.

There were no clear differences in levels of contamination at sites using IVC compared to those who were not using IVC.

**Table 8: Rejections at different stages of the composting process (surveyed sites reported % of feedstock)**

| Stage of the composting process | Number of responses | Mean | Min | Max | Median |
|---|---|---|---|---|---|
| Rejections at the gate, feedstock not accepted and returned to the supplier | 52 | 0.1% | 0.0% | 1.1% | 0.0% |
| Feedstock removed before composting | 52 | 0.4% | 0.0% | 2.0% | 0.5% |

| | | | | | |
|---|---|---|---|---|---|
| Feedstock removed during and after composting | 45 | 0.4% | 0.0% | 0.9% | 0.5% |

Source: 2018 survey data

Not all respondents answered further questions about the main source of contamination, the main reason for rejections and the end destination of rejected material. Thirteen respondents specified the main source of rejections. Nine respondents said that the main source of returned loads was high levels of contamination in loads received from local authorities. Four operators specified another source namely: landscape gardeners; skip waste; spot deliveries; and building contractors.

Where respondents gave a reason why feedstock was returned to the supplier (approximately a third who responded to this question), six said this was because it was outside the input specification. Six respondents said this was due to gross contamination (four said non compostable plastic and one said non plastic contamination). Two respondents said this was because it was not the target material.

For feedstock rejections before, during and after composting, the majority (84%; 21 of 24 who provided a response) said that the main source of contamination was local authority waste. Three respondents stated the main source was something else, of which two specified skip waste and landscape gardeners. The main reason given for rejections was contamination (60%; 16 of 27 who provided a response) and of these, seven specified that plastics was the issue. Six respondents said that the material was outside the input specification and one said it was not the target material.

About half (51%) of the sites surveyed[10] said that rejected material was sent for other processing and 30% of the sites surveyed said that rejected material was sent to landfill.

**Table 9: Destination of feedstock removed before, during and after composting**

| | **Number of surveyed (site) responses** | **% of surveyed (site) responses** |
|---|---|---|
| Landfill | 16 | 30% |
| Energy from waste | 3 | 6% |
| Incineration | 1 | 2% |
| Other processing | 27 | 51% |
| Other processing for recycling | 3 | 6% |
| Don't know | 1 | 2% |

*[10] A large proportion of these were operated by the same operator and they did not specify the nature of this 'other processing'.*

Source: 2018 survey data

## 4.8 Compost production

The grossed estimated compost produced was 2.7 million tonnes in 2018. This compares to 3.0 million tonnes in 2012. This suggests that less compost was produced per tonne of feedstock in 2018.

**Table 10: Grossed compost production**

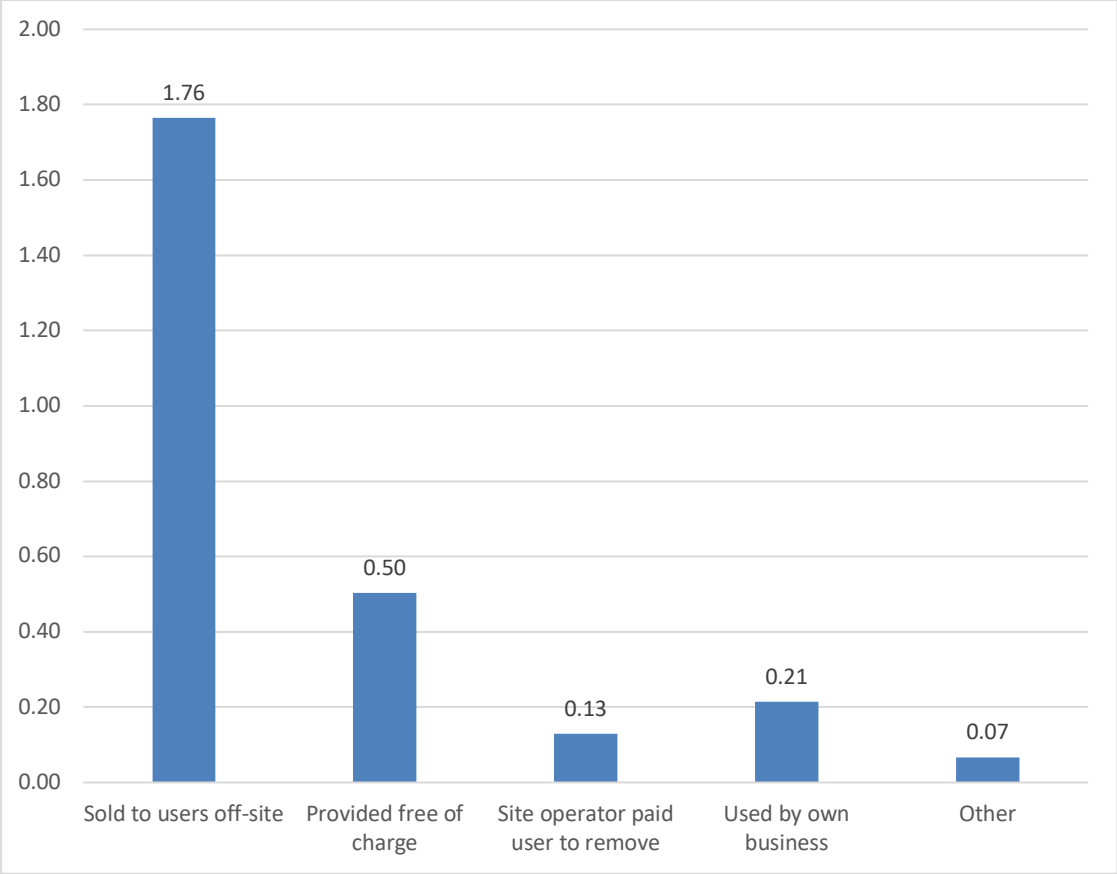
| | Number of permitted sites | Estimated grossed feedstock for England | Estimated grossed compost production | Estimated input converted to compost ratio |
|---|---|---|---|---|
| 2018 | 272 | 5,100,000 | 2,700,000 | 53% |
| 2012 | 271 | 4,900,000 | 3,000,000 | 61% |

Source: 2018 survey data, WRAP report

## 4.9 Compost destinations and applications

About two thirds (66%) of the compost produced was sold to users off-site. About one fifth (19%) was provided free of charge to others. The figure below shows the destinations by grossed estimated tonnes.

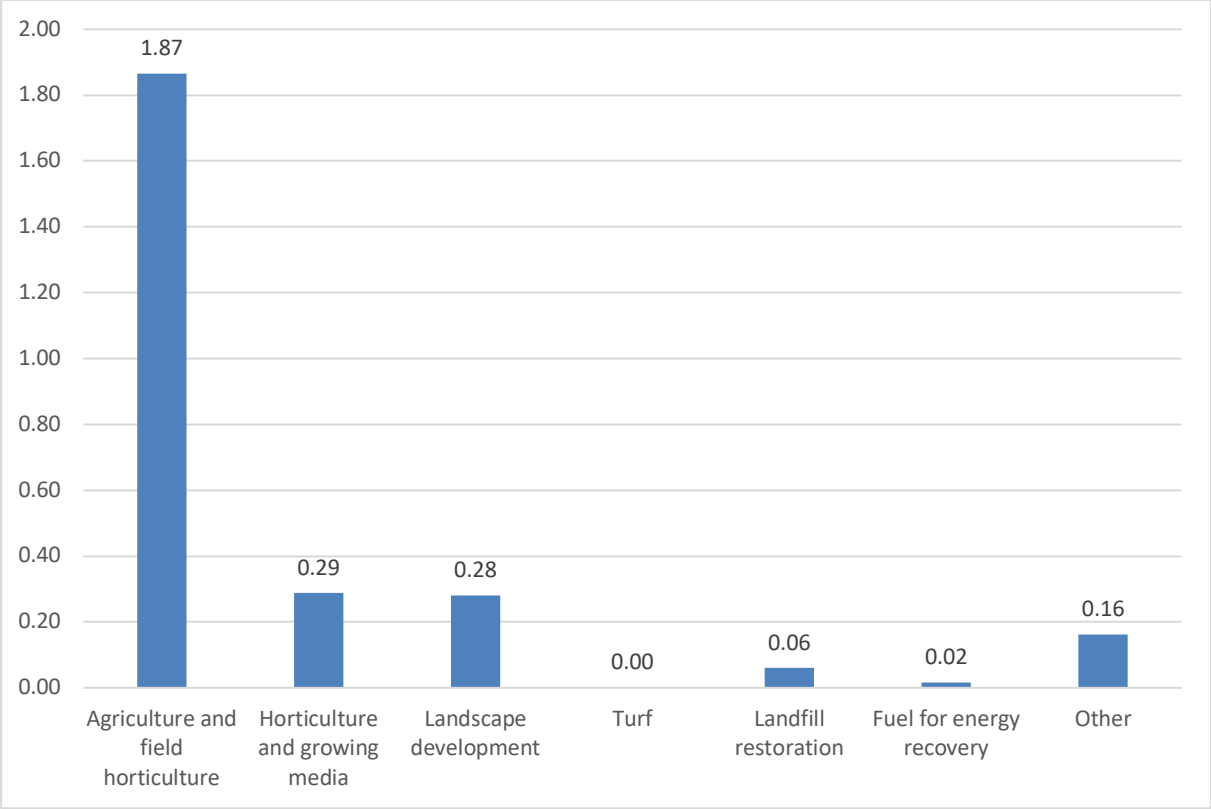
**Figure 28: Compost destinations (grossed estimated million tonnes)**




Source: 2018 survey data

The majority (70%) of the compost produced was reported to go to agriculture and field horticulture. About a tenth (11%) went to horticulture and growing media and the same amount to landscape development. This profile of compost applications is very similar to that reported in 2012.

**Figure 29: Compost applications (grossed estimated million tonnes)**




Source: 2018 survey data

## 4.10 Compost price

Where compost was sold, small numbers of respondents gave a price for compost in its different applications as shown in the table below.

**Table 11: Ex works price of compost by destination (£ per tonne)**

| Market | n | Mean | Min | Max | Median |
|---|---|---|---|---|---|
| Agriculture and field horticulture | 12 | £2.46 | £0.25 | £10 | £1 |
| Horticulture and growing media | 7 | £17.21 | £2.50 | £50 | £12 |
| Landscape development | 8 | £14.06 | £5 | £21 | £11 |
| Turf | 3 | £17.33 | £3 | £25 | £24 |
| Fuel for energy recovery | 1 | £5 | £5 | £5 | £5 |

Source: 2018 survey data

## 4.11 PAS 100

In 2019, there were 137 PAS 100 certified composting processes (covering approximately 136 composting sites) (REAL data). This is a small increase in the 128 sites reported to do so in the 2012

WRAP report. These sites produced 1.6 million tonnes of certified compost, of which the majority (78%) was principal grade compost. Table 13 shows the breakdown of applications of the certified compost by sites and tonnes.

**Table 12: PAS 100 certified compost**

| | **Tonnes** |
|---|---|
| Principal grade compost | 1,215,580 |
| Additional grade compost | 346,945 |
| *Total certified compost* | *1,562,524* |

Source: REAL 2019

**Table 13: Application of PAS 100 certified compost**

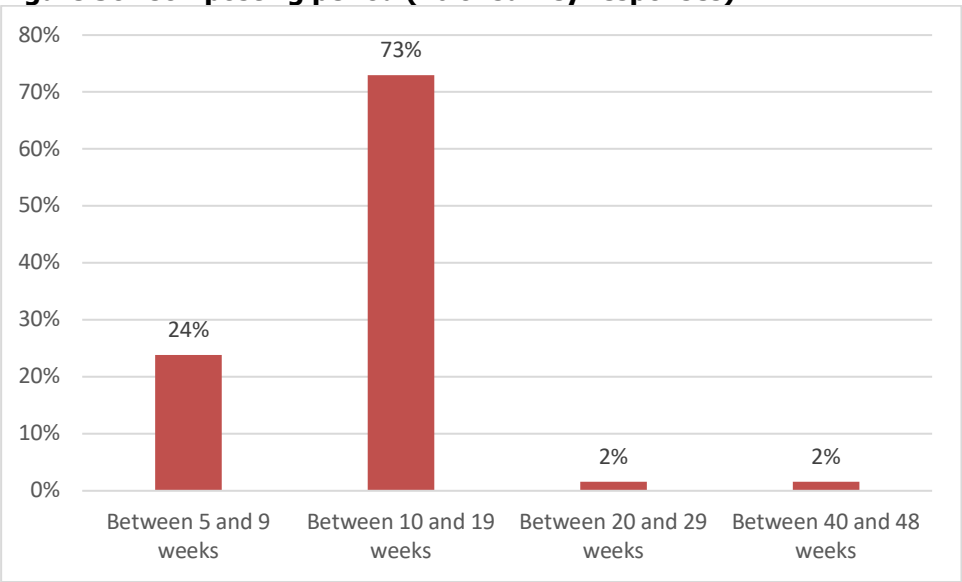
| **Markets for certified compost** | **number of sites** | **tonnes** |
|---|---|---|
| Agriculture and soil-grown horticulture | 52 | 477,160 |
| Agriculture and soil-grown horticulture, Domestic or professional horticulture | 26 | 296,405 |
| Agriculture and soil-grown horticulture, Domestic or professional horticulture, Land restoration and soft landscape operations | 25 | 362,100 |
| Agriculture and soil-grown horticulture, Land restoration and soft landscape operations | 14 | 197,861 |
| Domestic or professional horticulture | 6 | 72,628 |
| Domestic or professional horticulture, Land restoration and soft landscape operations | 3 | 17,500 |
| Land restoration and soft landscape operations | 7 | 63,008 |
| *Total* | *133* | *1,486,662* |

Source: REAL 2019 (4 processes did not report destination data)

## 4.12 Processes used by composting sites

Almost three quarters (73%) of respondents said that the composting period was between 10 and 19 weeks. The mean composting period was 13 weeks and the median was 14 weeks.

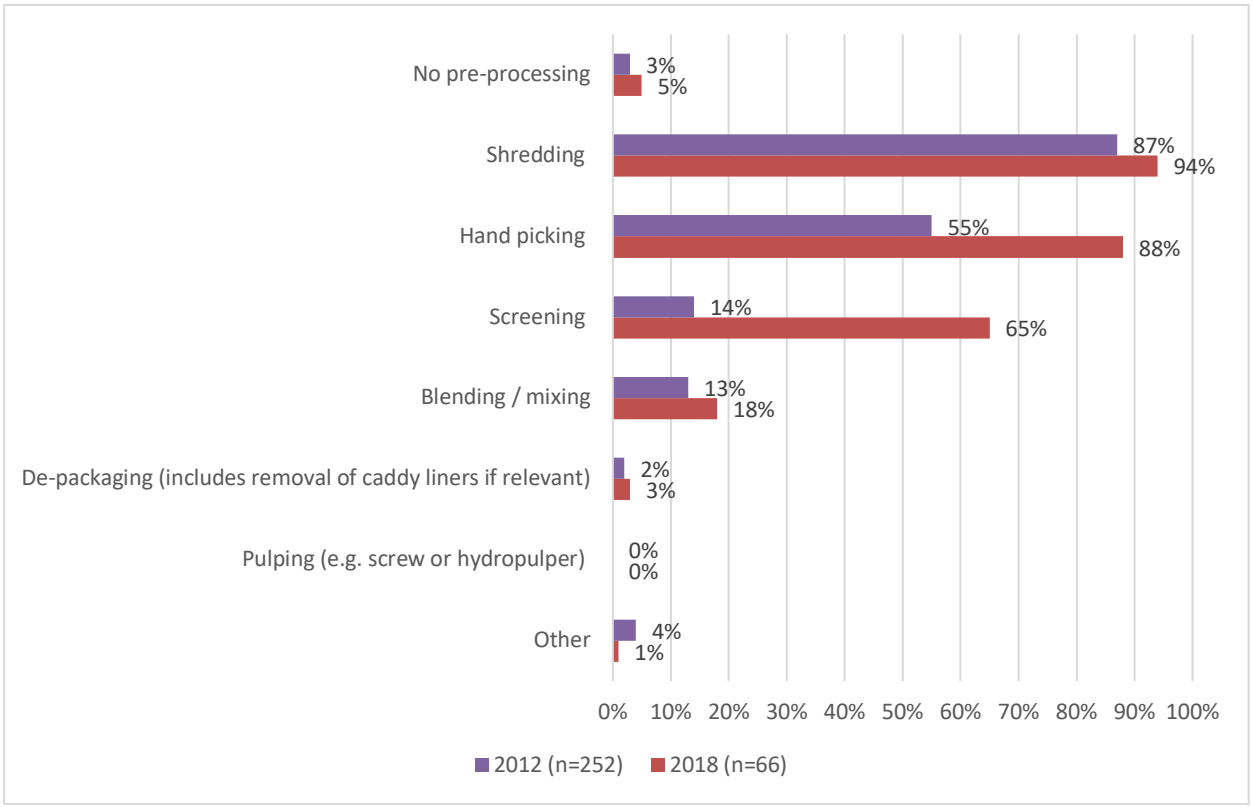
**Figure 30: Composting period (% of survey responses)**




Source: 2018 survey data, n=62

A small minority of sites did not undertake any pre-processing of feedstock. In 2018, large proportions used: shredding (94%); hand picking (88%); and screening (65%). The proportion of those using hand picking and screening has increased considerably compared to the 2012 survey (see Figure 31.

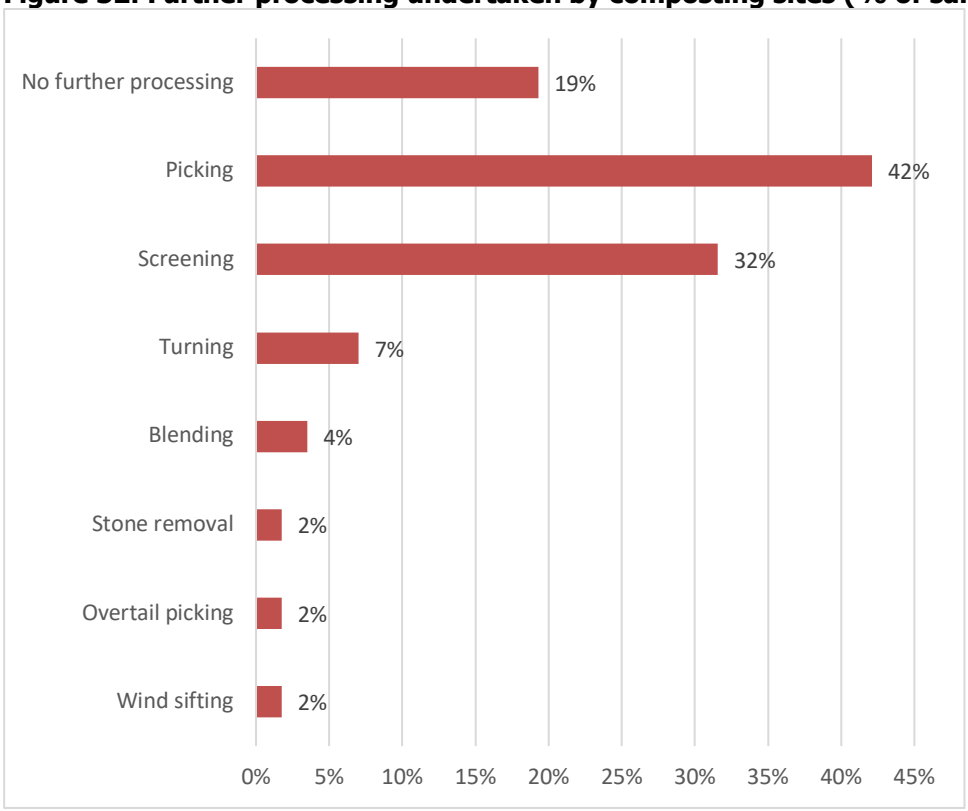
**Figure 31: Types of pre-processing undertaken by composting sites (% of sample)**




Source: 2018 survey data

About one fifth (19%) reported that they did not undertake any further processing of the compost. The most commonly undertaken types of further processing were picking (42%) and screening (32%).

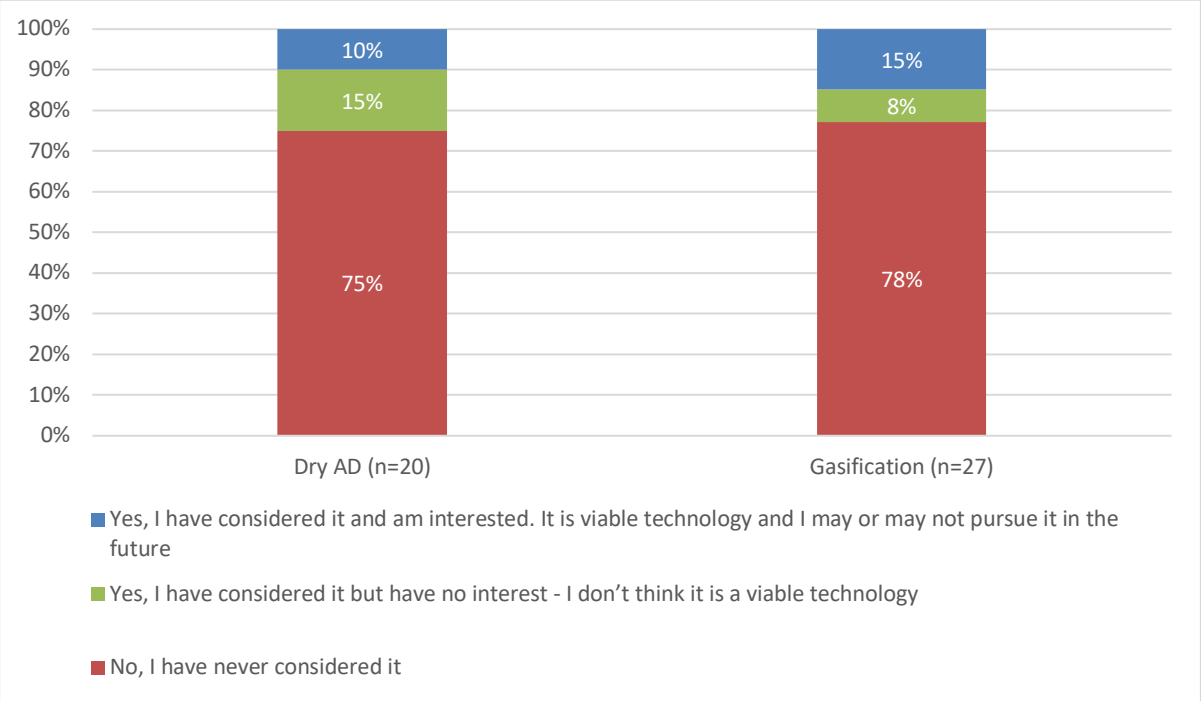
**Figure 32: Further processing undertaken by composting sites (% of sample)**



Source: 2018 survey data, n=57

The majority of the sample had never considered dry AD or gasification. Small minorities (10% and 15%) respectively had considered these technologies and thought they were viable and might or might not pursue them in the future.

**Figure 33: Consideration of dry AD and gasification (% of operators)**




Source: 2018 survey data

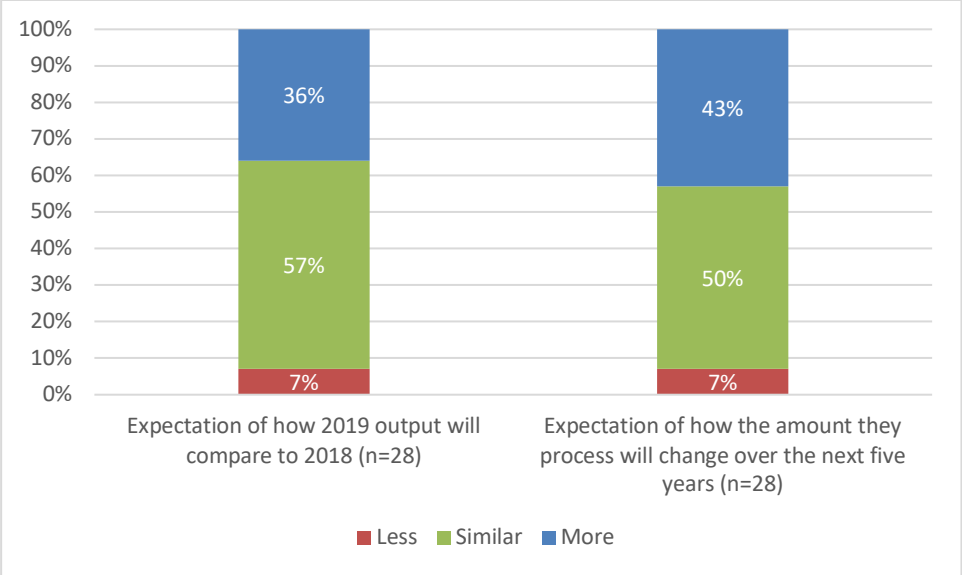
About half of the operators who answered the question (48%; 12 out of 25) said they had something in place to mitigate odours from their process.

The majority of operators who answered the question (70%; 16 out of 23) said they were providing guidance or policies for the users of their product to help them spread and store the material properly.

## 4.13 Expansion of composting production

There was a similar profile of responses about how operators expected output levels to change in 2019 compared to over the next five years as shown in Figure 34. Around half of operators expected output to be similar to 2018 production. About four in ten expected output to increase.

**Figure 34: Expectations of future output (% of operators)**



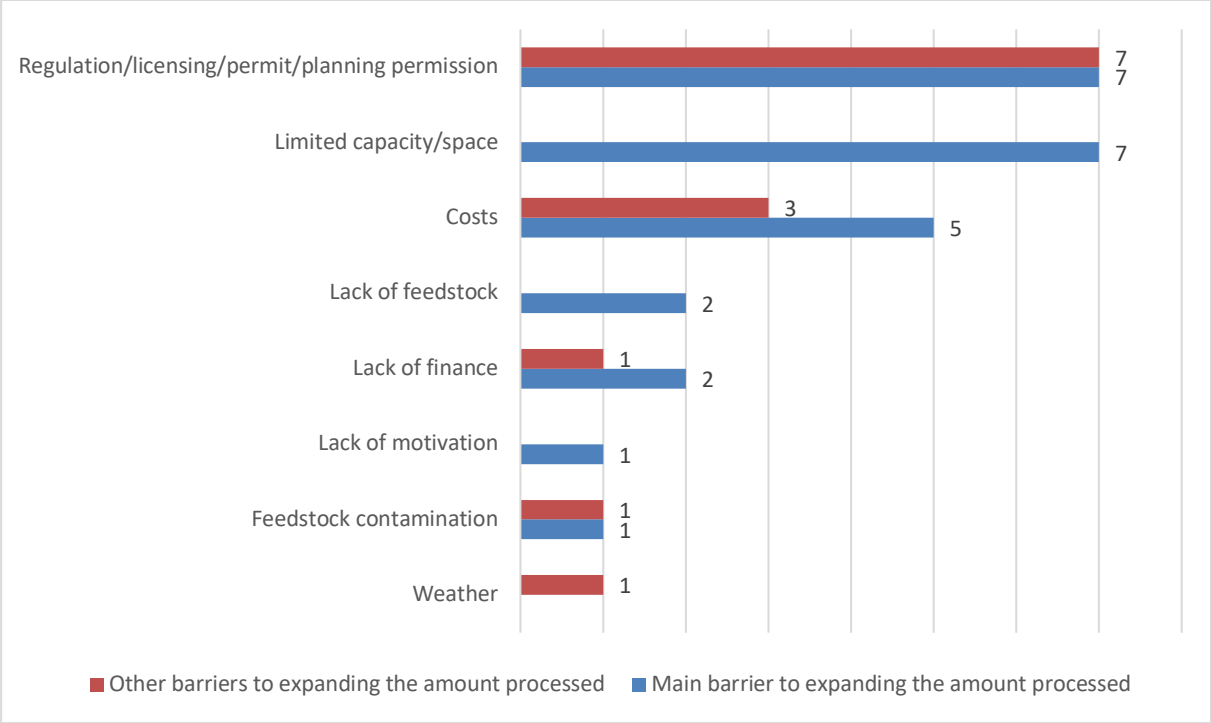

Source: 2018 survey data

There were a number of themes in the explanations given by those who gave a reason why they expected to see an increase in output (n=12). Six respondents mentioned they expected to have new customers including four specific mentions of new housing being built. Four respondents referred to government policy including specifically: government segregated collection of food and green waste (1 respondent); the biowaste directive (1 respondent); new legislation (1 respondent); and more dedicated household collections (1 respondent). Two respondents referred to factors relating to the site specifically: an increase in site infrastructure capacity (1 respondent); and greater efficiencies on site (1 respondent).

Amongst those who expected to see a reduction in output, a minority gave a reason for this. Two cited regulation or licensing difficulties as the reason. One other operator referred to the government focus on segregated food and green waste collections.

Figure 35 shows the barriers to expanding the amount processed by operators. The data for this and subsequent figures is expressed as 'n' of operators rather than percentages due to the small number of responses. The most frequently cited barriers to expansion related to regulation, permits and planning permission. Eight operators in total mentioned costs, although they referred to different specific costs including costs of operations, business rates, insurance, concrete, permits, transport, fuel and waste disposal. Limited space or capacity was also cited by seven.

**Figure 35: Barriers to expanding the amount processed (number of operators)**



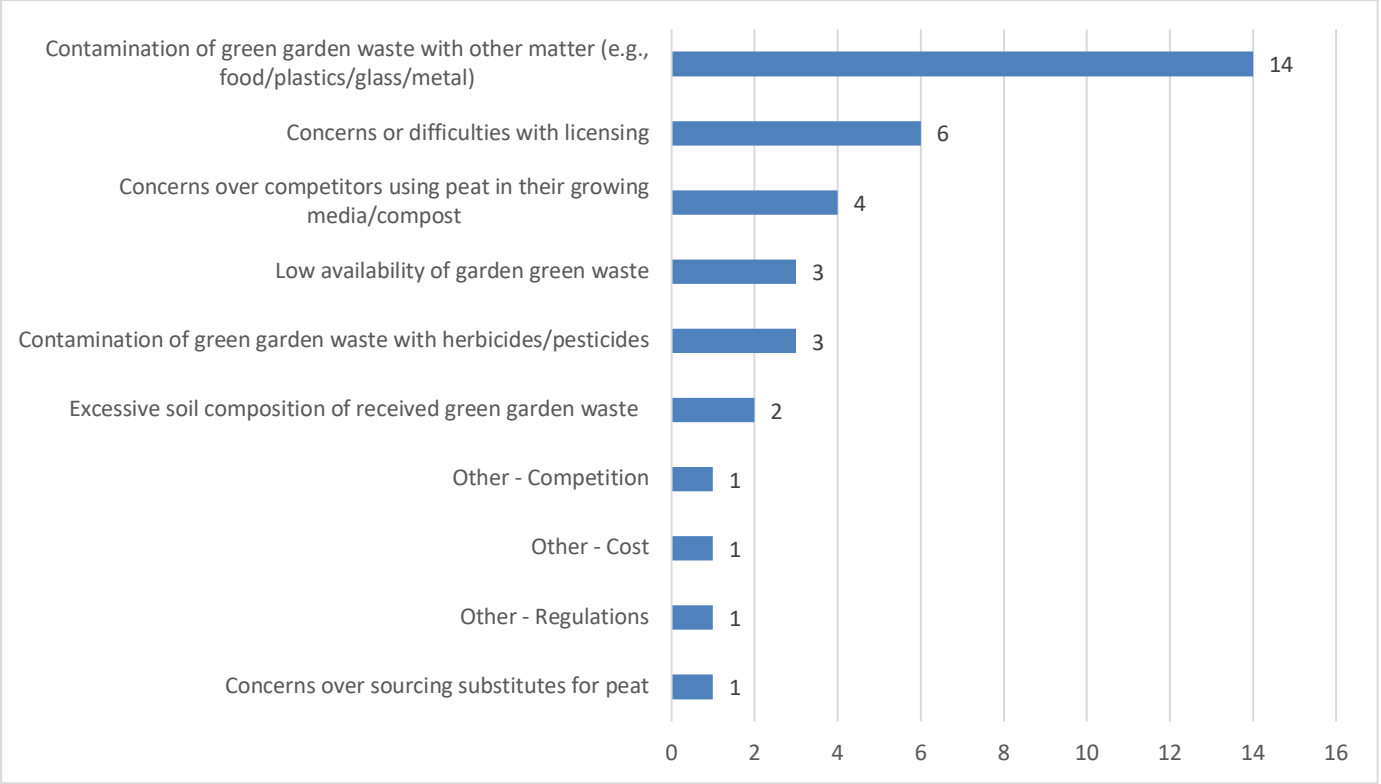

Source: 2018 survey data, n=24

Operators were asked what the main and other factors were that would help them to expand the amount processed. The responses (given by 17 operators, some of whom identified more than one factor) were quite disparate and consisted of:

- More feedstock (4 respondents)
- More space (3 respondents)
- Change in licensing/ regulation/permitting (3 respondents)
- Higher gate fees (2 respondents)
- Cleaner inputs/less contamination (2 respondents)
- Long term contracts (2 respondents)
- Use of dry AD (1 respondent)
- Local council contracts (1 respondent)
- Lower processing costs (1 respondent)
- Process efficiency (1 respondent)
- Funding (1 respondent)
- A larger centralised site (1 respondent)
- Positive media coverage (1 respondent)
- Carbon trading (1 respondent)
- Reduced business rates and insurance (1 respondent)
- Alternative uses for oversize material (1 respondent)

About two thirds (65%) of operators answering the question (n=23), said they thought there were specific and significant barriers to their use of green garden waste. Those who identified specific and significant barriers were asked to select the three most important barriers. The most frequently identified barrier was contamination of green garden waste with other matter and amongst the 14 operators who cited this, nine operators commented specifically that plastic contamination was the issue.

**Figure 36: Specific and significant barriers to using green garden waste (n of operators identifying barriers)**




Source: 2018 survey data

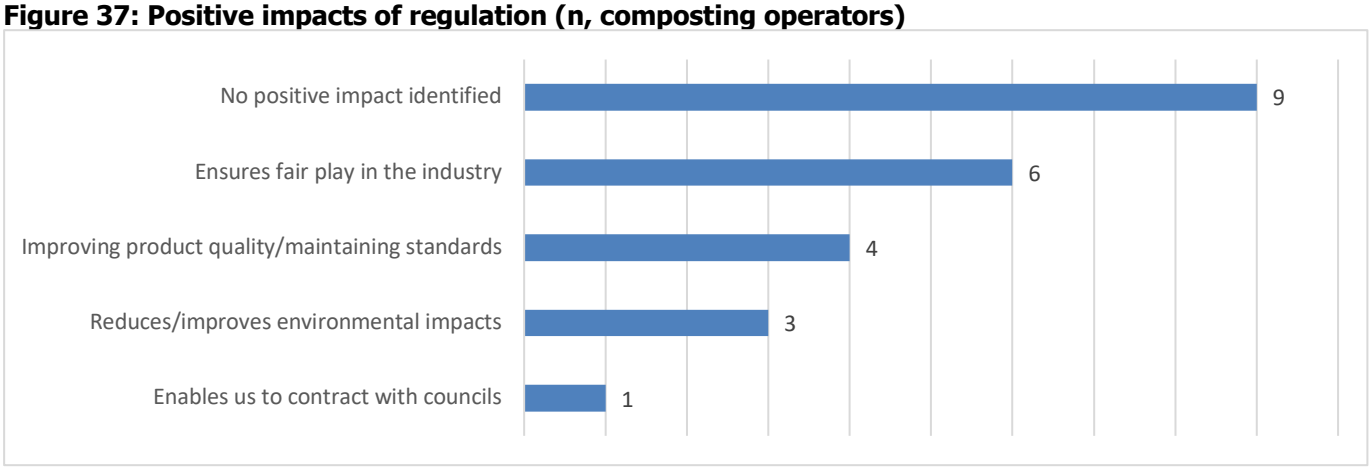
## 4.14 The impact of compostable packaging upon the composting industry

About half (54%; 14 of 26) of operators said that growth in the use of compostable packaging was having no impact upon their operations. Those who said it was having an impact made comments relating to this needing to be removed before or during composting. Some operators said they were running tests to establish whether this material would degrade. Two operators said it was having a positive impact: one because it meant there were additional feedstocks and less contamination; and the other because it had improved their composting process.

## 4.15 Impact of regulations upon the composting industry

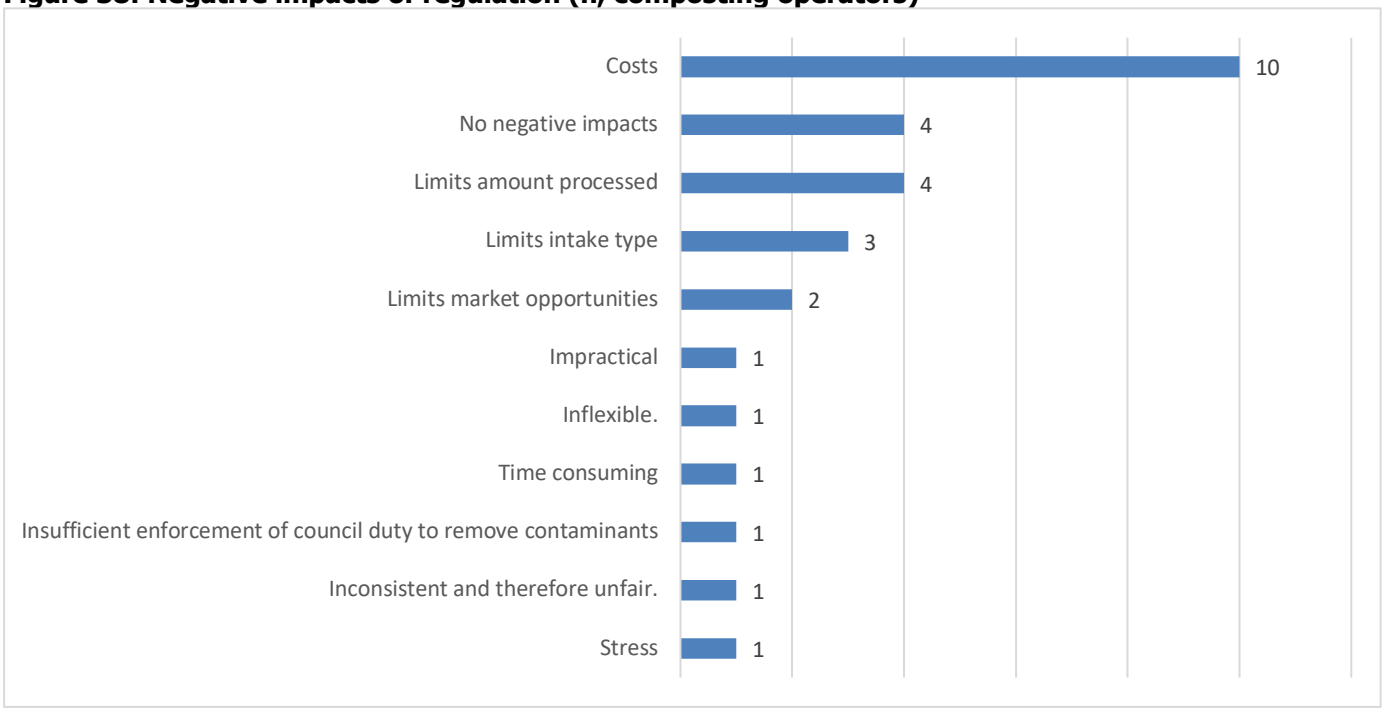
The figure below shows the reported positive impacts of regulation and Figure 38 the reported negative impacts of regulation by operators for those who responded to these questions. The main positive impacts identified were increasing product quality and ensuring fair play in the industry. The main negative impacts identified were costs and limitations to operations in terms of amount processed, type of inputs and ability to take advantage of market opportunities.

**Figure 37: Positive impacts of regulation (n, composting operators)**




Source: 2018 survey data, n=23

**Figure 38: Negative impacts of regulation (n, composting operators)**




Source: 2018 survey data, n=29

## 5.0 Conclusions

Conclusions on the AD and composting industries suggested by the survey:

- The AD industry has experienced considerable growth amongst all types of site (commercial, farm and industrial) and this expansion is expected to continue.
- The data suggest that there is spare capacity in the AD industry of at least 500,000 tonnes for food waste at commercial sites and 450,000 tonnes on farm sites.
- A large volume of purpose grown crops (3.2 million tonnes) is estimated to be processed by the AD industry.
- On average, 5-6% of feedstock is removed at AD plants before feedstock is put into the anaerobic digester. Compostable packaging was having an impact upon AD sites through

increasing reject levels (and disposal costs) and causing problems in the AD process because it did not break down.

- A much higher proportion of gas is now injected into the grid rather than used for CHP compared to previously.
- There has been little change in the composting industry since the last survey in terms of either the number of sites or the amount of feedstock processed.
- There is estimated to be capacity in the composting industry to take further feedstock (an additional 1.7 million tonnes).
- Whilst reported levels of contamination at composting sites were not that high, the proportion of sites using hand picking and screening has increased considerably compared to the 2012 survey. Contamination was the most frequently identified barrier to the use of green garden waste amongst composting site operators and this was often cited to involve plastic.
- The industry expects there to be growth in the amount of feedstock processed over the next five years by AD and composting operators.
- Almost half of AD operators who identified barriers to expansion specified the availability of feedstock as a barrier. Ability to obtain investment, concerns or difficulties with licensing and disposal of digestate were also identified by some AD operators as barriers to expansion. Other factors identified that would help some AD operators to expand were: grid connections or grid capacity; and a change or investment in equipment. Composting operators identified regulation, physical space and costs as the key barriers to expansion.
- There is very limited interest in moving to dry AD or gasification as a means of treating organic waste amongst both AD and composting operators.

# 6.0 Appendix 1: Full methodology

## 6.1 Dataset population

A comprehensive list of AD and composting sites was created for the survey by blending a number of existing data sources[11].

### ■ AD

For AD plants, a list of 366 operational AD plants in England (excluding the water industry) from the NNFCC database[12] was used as the starting point for defining the population. This includes permitted plants and those who have submitted planning applications (but not those who have neither of these).

The NNFCC database was cross-referenced with the AD sites on the Environment Agency permitted waste operations list[13] and the ABP[14] list to ensure there was full coverage of AD sites. Water companies on the Environment Agency list were not included except where they accept food waste at AD plants. The NNFCC database was also checked against the ADBA map[15].

Large operators[16] were flagged within the sample. These were identified by the project's advisory group and also through a review of Environment Agency Waste Data Interrogator data on waste received at sites.

### ■ Composting

For composting sites, using Environment Agency data, a maximum total permitted composting site population of 482 was identified. This was calculated in the following way.

The Environment Agency dataset for permitted waste operations (end of June 2019)[17] listed 206 sites using the site types:

- A22: Composting Facility;
- S0816 No 16: Composting in open windrows;
- S1203 No3: Composting in closed systems (less than 75 tonnes per day);
- S1207 No7: Composting in open systems;

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*11 Commercial databases (e.g. Experian) were unable to provide lists specifically of AD and composting sites as these fall within wider SIC codes (i.e. the organisations cannot be disaggregated from wider lists).*

*12 https://www.nnfcc.co.uk/publications/report-anaerobic-digestion-deployment-in-the-uk*

*13 A23: Biological Treatment Facility; S1210 No 10: On-farm anaerobic digestion – farm wastes only; S1212 No 12: Anaerobic digestion facility inc use of biogas; SR2010 No 15: Anaerobic digestion facility <75,000tpy; SR2010 No16: On farm digestion <75,000 tpy.*

*14 https://www.gov.uk/government/publications/animal-by-product-operating-plants-approved-premises*

*15 http://adbioresources.org/map*

*16 These consisted of: those with more than 6 sites; those identified by the advisory group as key companies; and those identified as potentially consisting of a relatively large proportion of feedstock via Waste Data Interrogator data.*

*17 https://data.gov.uk/dataset/e0e073d9-7dc7-4880-8203-f7e5ec913537/environmental-permitting-regulations-waste-sites-quarterly-summary*

- SR2010 No14: Composting biodegradable waste <500 tonnes total;
- SR2011 No1: Composting biodegradable waste<500 tonnes total.

The Environment Agency dataset for permitted industrial sites (end of June 2019)18 listed 276 sites undertaking biological treatment[19] (so this could include composting but may not always).

This latter list needed some further work to identify sites that fall within the composting category. It was cross-referenced against the AD list. Once sites already in the AD list were marked, the list was cross-referenced against the REAL list of certified composters to identify those that should definitely be included, as well as with 'compost/composting' in the site name. This identified a further 78 sites. The remainder (198) were included to be screened by telephone to check if they fell within the scope of the survey.

Large operators were flagged within the sample. These were identified by the project's advisory group and also through a review of Environment Agency Waste Data Interrogator data on waste received at sites.

- Contact details

A commercial database provider was used to append contact details to the sites listed in the AD and composting populations. However, they were unable to provide contact details (contact name, telephone number, email address) for all sites. For unmatched sites, online searches were undertaken to try to find contact details. There were still a number of sites (52) that for which contact details could not be secured. There were also a number of challenges in identifying the right person to speak to (and their contact details). This could be at the operator or at the site itself. Some sites had changed ownership or were no longer operating.

## 6.2 Mode of data collection

Two main methods of data collection were used: a more intensive approach with large operators and a targeted proforma approach with telephone support for the rest of the sample (referred to as the main sample). This methodology was informed by a comprehensive pilot of a number of approaches.

The method was flexible to suit respondents' preferences in order to maximise response. Given the low response to the pilot, the whole sample was contacted in the main phase rather than prioritising particular groups.

**Table 14: Steps in data collection**

| | **Large operators** | **Proforma for main sample** |
|---|---|---|
| Sample size AD | 13 | 371 |

*18 https://data.gov.uk/dataset/99ebf94f-5069-4470-9d27-09fe2d3a05c8/environmental-permitting-regulations-industrial-sites-quarterly-summary*

*[19] Using the codes: 5.4 A (1) a) (i) and 5.4 A (1) b) (i).*

| | Large operators | Proforma for main sample |
|---|---|---|
| Sample size composters | | 284 |
| Recruitment | Up to five telephone calls and emails to the contact identified and anyone they directed us to. | Up to three telephone calls requesting to speak to the person best able to provide the information required and requesting their email address. |
| Initial contact | Confirmed sites covered, sent proforma(s) via email, agreed time scales for completion and arrange interview. | Confirmed sites covered, sent proforma via email and agree timed scales for completion (allowed 1 week for completion) |
| Securing data | Data returned via proformas shortly before a face to face or telephone interview. Interview considered any gaps, queries gathered overall feedback. | Return of proforma. Chased: once by email the day before it was due; one telephone call the day after it was due with extension for a week; an email two days before the new due date; and a final telephone call the day after the due date. |
| Clarifications | Up to three telephone and email contacts to chase/clarify any outstanding data. | Up to three telephone and email contacts to chase/clarify any outstanding data in the proforma. |
| Flexibility | With large operators, this process was flexible to accommodate their preferences and organisational structure and systems. Telephone interviews rather than face to face/proforma were used where appropriate i.e. where the face to face interview would not work. | All respondents were offered the opportunity to provide data via telephone if they preferred. |

## 6.3 Maximising response

There was a considerable risk in terms of securing sufficient response to this study. The following steps were taken to help mitigate this risk.

- Incentive. Entry to a prize draw with two prizes of £100 of vouchers was offered.
- Building and maintaining awareness. The advisory group publicized the survey through their newsletters, mailing lists and events.
- Long data collection period. A reasonably long period (seven weeks) was allowed for the main data collection to help secure data.

- Emphasising confidentiality. Respondents were reassured that data would only be published in an anonymised or aggregated format.
- Report publication. During recruitment it was stated that the report was expected to be published and may be of interest to respondents.

## 6.4 Data collected

- AD

Data was collected from 51 of 371 AD sites (14% of sites). Very limited data was provided for six of these sites. Using data on capacity from the NNFCC database, this represents an estimated 18% of operational capacity.

30 operators reported on these 51 sites. The sample was a mix of single site operators (24) together with a smaller number of large operators (6) reporting on multiple sites.

The table below shows the proportion of commercial, farm and industrial sites in the sample and population. Sites have been classified as farm, commercial or industrial on the following basis.

- Sites were marked as industrial if they were marked as industrial on the online ADBA map.
- Sites were marked as commercial if they had a food waste feedstock requirement on the NNFCC database. These could include some sites based on farms.
- Sites were marked as farm if their feedstock requirement consisted only of manure/slurry, purpose grown crops or crop waste on the NNFCC database.
- The small number of sites that were left uncategorised as farm or commercial were checked against the online ADBA map and marked in line with the ADBA map categorisation.

The survey sample included a higher proportion of commercial sites compared to the population.

Similar proportions of commercial, farm and industrial sites were represented in the 2012 and 2013 reports. This means that differences between findings before they are grossed up are not obviously related to differences in the sample composition across different years.

**Table 15: Sample coverage by AD site type**

| Type of site | N sites surveyed | % sites surveyed | % population (NNFCC database) |
|---|---|---|---|
| Commercial | 24 | 47% | 23% |
| Farm | 22 | 43% | 68% |
| Industrial | 5 | 10% | 9% |

Source: survey data; NNFCC database 2019

The table below provides a breakdown of the AD sample and population by size using NNFCC database classifications:

- 'Large scale' refers to installations with an installed capacity of above 500kWe in accordance with the Feed-in Tariff large scale banding.
- 'Medium scale' refers to installations with an installed capacity of above 250kWe to 500kWe in accordance with the Feed-in Tariff medium scale banding.
- Small scale' refers to installations with an installed capacity of 250kWe and below in accordance with the Feed-in Tariff small scale banding.

The sample had a greater number of large sites and fewer small sites in comparison to the population.

**Table 16:Sample coverage by AD site size**

| Type of site | N sites surveyed | % sites surveyed | % population (NNFCC database) |
|---|---|---|---|
| Large scale | 25 | 50% | 30% |
| Medium scale | 19 | 38% | 40% |
| Small scale | 6 | 12% | 30% |

Source: survey data; NNFCC database 2019

**Composting**

Data was collected from 77 of 272 composting sites (27% of sites). Very limited data was provided for 10 of these sites.

Data was provided by 31 operators on 77 sites. The sample was a mix of single site operators (23) together with a smaller number of large operators (8) reporting on multiple sites.

The table below provides a breakdown of the sample by composting types with responses from the 2012 survey for reference[20]. The distributions were broadly similar, but there was a smaller proportion of sites using IVC in the 2018 sample compared to 2012.

**Table 17: Sample coverage by composting site type**

| Type of site | Number of sites surveyed in 2018 | % of total sites surveyed in 2018 | % of total sites surveyed in 2012 |
|---|---|---|---|

[20] *%s do not total 100 as sites could operate more than one type of composting.*

| | | | |
|---|---|---|---|
| Windrow open | 64 | 85% | 82% |
| IVC | 7 | 9% | 19% |
| Continuous block composting | 3 | 4% | 3% |
| Windrow under cover | 1 | 1% | 3% |
| Aerated static pile | 2 | 3% | 6% |
| Other | 1 | 1% | 14% |
| Total | 75[21] | 104% | 127% |

Source: survey data 2018; WRAP report 2012

## 6.5 Grossing up

Some of the key data points in the survey (inputs, outputs and employment) have been grossed up to provide estimates of these for the industry population for England (as in previous reports).

**AD**

The following approach has been taken to gross the AD feedstock figures provided by the sample for England as a whole. Mean ratios of operational capacity/feedstock have been calculated separately for farm based and commercial AD sites. Industrial sites have been excluded as feedstock data was only provided for two industrial sites. (The same approach to grossing was taken in 2012 but using permitted capacity/feedstock.) Operational capacity has been taken from the NNFCC database. To calculate grossed figures for feedstock type, the proportion of feedstock type by type of AD from the survey (commercial and farm) was applied to the grossed estimates of feedstock for each site and then these were aggregated.

**Table 18: Feedstock capacity ratios**

| Type of site | Surveyed sites with usable data | 2018 (England) mean ratio (operational capacity to input) | 2012 (UK) mean ratio (permitted capacity to input) |
|---|---|---|---|
| Commercial | 19 | 1.226 | 1.414 |
| Farm | 14 | 1.259 | 1.057 |

[21] *Information on the type of site was not given for two sites in proforma responses.*

Source: Survey data 2018, NNFCC database 2019; 2012 previous WRAP organics reports

To calculate grossed figures for digestate, digestate to input ratios (see Table 19) for each type of AD site in the sample have been applied to the estimated input data for the population. It was unexpected that the commercial ratio of digestate to input was above 1. This is due to four operators who have reported higher digestate figures than feedstock input. Two of these are large waste operators (covering data for three sites). One of these commented in interview that water was added. Two of these are water companies (providing data for six sites taking food waste). One of these commented that this discrepancy was explained through the addition of water. Stakeholders have indicated that it is valid to include these instances in the sample used for calculating grossed figures.

**Table 19: Digestate input ratios**

| Type of site | 2018 surveyed sites with usable data | 2018 (England) ratio (digestate to input) (commercial and farm only) | 2012 (UK) ratio (digestate to input) (all except liquid industrial) |
|---|---|---|---|
| Commercial | 18 | 1.084 | 0.866 |
| Farm | 9 | 0.804 | 0.877 |

Source: 2018 survey responses, 2012 WRAP report

To calculate grossed figures for biogas production, biogas to input ratios (see Table 20) for each type of AD site in the sample have been applied to the estimated input data for the population.

**Table 20: Biogas input ratios**

| Type of site | 2018 surveyed sites | 2018 (England) ratio (biogas to input) | 2012 (UK) ratios (biogas to input) |
|---|---|---|---|
| Commercial | 24 | 133 | 173 |
| Farm | 22 | 174 | 128 |

**Composting**

Composting figures have been grossed in the following way. The composting site population and survey sample populations have been stratified by permitted capacity size (Table 21). The permitted capacity bands were decided by considering the distribution of population and survey data, identifying category bands within these so that there were sufficient data points in each category. This decision also took into account that there were clusters of sites at 25,000 and 75,000 tonnes. The category bands do not correspond exactly with the bands used in the previous surveys because

there would not have been enough data points in each i.e. the method is the same but with fewer size bands.

**Table 21: Composting capacity bands**

| Tonnes capacity | Sample, n | Sample, % |
|---|---|---|
| <=5,000 | 29 | 39% |
| 5,001-24,998 | 2 | 3% |
| 24,999-35,000 | 18 | 24% |
| 35,001-50,000 | 2 | 3% |
| 50,001-75,000 | 17 | 23% |
| >75,000 | 6 | 9% |

The Environment Agency composting site population data accessed was not complete and so assumptions had to be made about some sites in the population. There were 33 composting sites on the data file with missing permitted capacity data. Three of these were surveyed. They reported permitted capacities of 5,000, 8,000 and 12,000. An assumption has therefore been made and the 5,001-35,000 mean has been applied to the 33 composting sites with missing permitted capacity data.

There were a further 10 sites identified as permitted composting sites but not included on the population file. Another 50 sites were originally missing but some data was identified on these. This showed that these were a mix of types of sites including some non-operational sites and so it was not possible to make any meaningful assumptions about them. No data has therefore been included for the 10 missing sites.

To gross composting feedstock, mean feedstock in the survey sample has been calculated for permitted capacity bands. The means for feedstocks have then been applied to the composting site population to calculate a grossed total estimate of composting site feedstock. The same approach using mean values for capacity bands has been used to gross compost production and employment.

As for AD, to calculate grossed figures for feedstock type and source, the proportion of feedstock type and source in each capacity band has been applied to the grossed estimates of feedstock for each site and then these have been aggregated. The same approach has been used for grossed estimates of compost destinations and application.

## 6.6 Waste Data Flow comparison check with grossed survey estimates

As a check on the likely accuracy of the grossed estimates, total local authority organic waste recorded on Waste Data Flow has been compared with the survey estimate of total local authority waste processed by AD and composting sites as shown in the table below. This suggests that the

sample is overestimating inputs. This figure is primarily driven by the composting data (4.3 million tonnes of the total estimated 5.2 million tonnes of local authority feedstock) and suggests that the composting (but not necessarily the AD) figures are likely to be overestimates. It is worth noting that this also occurred in the 2012 survey but in that report this was explained by the fact that one data source used a calendar year and the other a financial year. The same 2018 calendar period has been used for both figures in this report so this does not explain the discrepancy. The discrepancy is likely to be explained by survey data limitations as discussed in the next section and also possibly by limitations in the secondary data used as a baseline to gross the figures.

**Table 22: Total local authority organic waste survey estimates and WDF data**

| | **Local authority feedstock (AD and composting) (grossed survey estimate)** | **WDF local authority organic waste** |
|---|---|---|
| 2018 | 5,400,000 | 4,600,000 |
| 2012 | 5,400,000 | 4,900,000 |

## 6.7 Data limitations

The data and estimates provided are reliant on the accuracy of the data provided by respondents. Most of the data was provided through self-completed proformas, although some telephone interviews were also completed. Telephone checks on some self-completed information were undertaken for quality assurance purposes.

Some data were not provided by some respondents. Not all sites provided responses to all questions. In addition, some responses have been removed where the respondent has misunderstood the question.

The combination of a relatively low response and instances of missing data, means that the number of respondents for each question can be quite small and as such the data should be considered indicative rather than representative.

In most cases, time series comparisons are made with 2012 because a more complete dataset is given in this report (than the 2013 and 2014 reports). Where it seems helpful, data from the 2013 report and 2014 report (which was based on secondary data only) are also included for comparative purposes. Percentages have been reported to allow comparisons with data from previous years.

## 6.8 Secondary data

As discussed previously, secondary data was used to create dataset populations for this study. Some secondary sources have also been used to provide data points in the report. Table 23 lists all secondary data sources used and the purpose for which they have been used.

**Table 23: Secondary data sources used**

| Secondary data source | Data points used | How this has been used |
|---|---|---|
| Environment Agency Environmental Permitting data https://data.gov.uk/dataset/e0e073d9-7dc7-4880-8203-f7e5ec913537/environmental-permitting-regulations-waste-sites-quarterly-summary | Permitted composting sites | Constructing the dataset population.<br>Reporting on number of permitted composting sites. |
| NNFCC AD database (purchased, not available publicly)<br>https://www.nnfcc.co.uk/publications/report-anaerobic-digestion-deployment-in-the-uk | Number of AD sites (operational and planned), operational capacity, site type | Constructing the dataset population<br>Reporting on number of AD sites, operational capacity and site type. |
| Digest of UK Energy Statistics for AD https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes#2018 | Electricity generation capacity (MWe) | This has not been used to date as figures are only available at a UK level. |
| REAL online list of sites and 2017 annual report http://www.biofertiliser.org.uk/producers<br>http://www.qualitycompost.org.uk/producers<br>http://www.biofertiliser.org.uk/pdf/CertSchemes_Annual_Report_2017_final.pdf | Number of AD and composting sites certified to PAS 110 and PAS 100 | Reporting on number of PAS 100 and 110 sites. |
| Environment Agency Waste Data sets | Permitted capacity | Used in composting grossing |
| Environment Agency Waste Data Flow https://www.wastedataflow.org/home.aspx | Tonnes of local authority waste collected | A check to validate grossed estimates of tonnes of feedstock. |

## 7.0 Appendix 2: Reflections on the survey response rate

The response rate to this survey was disappointing despite using a tested, flexible approach with considerable resource and drawing on the support of known bodies such as REA, ADBA, ESA. The reasons for this have been reflected upon to help inform any future similar studies. The following reasons have been identified:

- Survey fatigue. The population of interest already have to provide data to other bodies including the Environment Agency.

- It was difficult to source contact details (either through commercial databases or online searches) for some operators or sites (particularly smaller farm-based AD sites) with the implication that there were challenges getting in contact with some companies – there were very few instances where an appropriate contact name was known prior to contact.
- Some operators/sites do not answer the phone.
- Due to the election period and purdah, it was not possible to state that the work was being undertaken for Defra which would have added weight to our request.
- For large operators, it could be quite time consuming to return data for multiple sites.
- Database information on who operated which sites was not always clear and took some detective work to identify the right company to speak to.

For any future studies, it is recommended that the questionnaire length is reduced by as much as 50% to limit the time required of larger operators. If there are any opportunities to combine this data collection with any other existing exercises or to maintain a contacts list, this would also be recommended.

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