



An ETI Perspective

Public Perceptions of Bioenergy



CONTEXT



Bioenergy from biomass and waste already plays a significant role in delivering low carbon heat, power and transport fuels in the UK, and ETI analysis consistently highlights the continued importance of developing the bioenergy sector to deliver cost-effective emissions reductions. Until recently bioenergy production has been dominated by waste feedstocks, but demand for more sustainable UK-grown and imported biomass to support emissions reduction targets has risen and, to further increase supplies of UK-grown biomass, more energy crops and forestry need to be planted.

The extent to which the bioenergy sector expands will be dependent, in part, on levels of public support as this can impact planning applications for new developments and influence policy making and the willingness of farmers and foresters to produce additional biomass feedstocks. The ETI's public perceptions of bioenergy survey has been carried out for the past three years to develop a better understanding of public opinion towards bioenergy and the factors that influence it.

KEY HEADLINES



- Respondents have consistently supported government-led action to tackle greenhouse gas emissions. In 2017, over half of respondents (58%) thought that the government should do more to reduce emissions, with only 6% believing that the government should reduce efforts to lower emissions.
- Support for producing bioenergy from both biomass and waste has been consistently strong across all three surveys with the highest levels of support recorded in the most recent survey. Across the three surveys between 72% and 77% of respondents supported the use of biomass, and 81-84% supported the use of waste for bioenergy production.
- Bioenergy is associated with several positive features. The ability to generate energy from waste has consistently been the positive feature most selected by respondents. The ETI's broader analysis highlights the importance of using waste feedstocks effectively to deliver emissions savings. In order to help achieve this, the ETI is investing in a 1.5 MWe waste gasification demonstration plant with syngas clean-up.
- In all three surveys, competition for land and having to import biomass because not enough is produced in the UK have been perceived by respondents as the main negative features of bioenergy. Our 2016 report explored these views in more detail and concluded that using a mix of imported and domestic feedstocks could be publically acceptable, such that the UK is not overly reliant on imports and can maintain at least current levels of food self-sufficiency¹.
- The government has consistently been the most popular choice to lead the development of the bioenergy sector, but a greater number of respondents trust scientists/academics or experts in the field, independent consumer or industry watchdogs, and environmental interest groups to provide reliable information on the sector. This suggests it will be crucial for different groups to work together to increase awareness and understanding of bioenergy while developing the sector in the UK.

1. Evans, H and Newton-Cross, G. (2016). Public Perceptions of Bioenergy [online]. Available at: www.eti.co.uk/insights/public-perceptions-of-bioenergy-in-the-uk

WHY BIOENERGY?

Bioenergy is a hugely valuable source of low carbon renewable energy because it can be stored and used flexibly to produce heat, power, liquid and gaseous fuels. Combined with Carbon Capture and Storage (CCS), it has the potential to deliver negative emissions which the ETI anticipates are needed to deliver a cost-effective 2050 low carbon energy system. The ETI's internationally peer-reviewed Energy System Modelling Environment (ESME)², a national energy system design and planning capability, suggests that bioenergy, in combination with CCS, could provide around 10% of projected UK energy demand (~130 TWh/yr) whilst delivering net negative emissions of approximately -55Mt CO₂ per year in the 2050s. This is roughly equivalent to half the UK's emissions target in 2050 and reduces the need for other, more expensive, decarbonisation measures. Using bioenergy in this way could reduce the cost of meeting the UK's 2050 greenhouse gas (GHG) emissions reduction target by more than 1% of gross domestic product (GDP). Even in the absence of CCS, bioenergy is still a cost-effective means of decarbonisation and should play an important role in meeting the UK's 2050 emissions target.

Delivering ~130 TWh/yr of bioenergy by the 2050s will require around three times more feedstock (on an energy basis) than is currently used. While there are opportunities to use residual waste feedstocks more effectively in the UK, their availability is limited meaning that the majority of this increase will need to be sourced from imported and UK-grown biomass feedstocks.



2. ETI (2017). ESME [online]. Available at: www.eti.co.uk/programmes/strategy/esme

THE SURVEY

The ETI's public perceptions of bioenergy survey has been carried out online by YouGov for the past three years.

- In 2015, the survey was carried out between 21st and 24th August. Sample size: 3,105 GB adults.
- In 2016, the survey was carried out between 7th and 12th September. Sample size: 5,307 GB adults.
- In 2017, the survey was carried out between 15th and 18th August. Sample size: 3,232 GB adults.

Survey findings have been weighted and are representative of all GB adults (aged 18+). Unless otherwise stated, results presented are from the 2017 survey.

Any percentages calculated based on fewer than 50 respondents do not represent a wide enough cross-section of the target population to be considered statistically reliable.

An insights paper on public perceptions of bioenergy based on the 2016 survey results, along with the questionnaire from each survey, are available on the ETI website^{1,3}. The questionnaire was developed by the ETI and reviewed by specialists in social science research⁴.

3. The full results from each survey will be available on the ETI's Knowledge Zone in late 2017 [online]. Available at: www.eti.co.uk/programmes/bioenergy

4. The ETI is grateful for the feedback provided by Matt Lipson (Energy Systems Catapult), Darrick Evensen and Christina Demski (University of Cardiff), and Anna Wilson (YouGov).

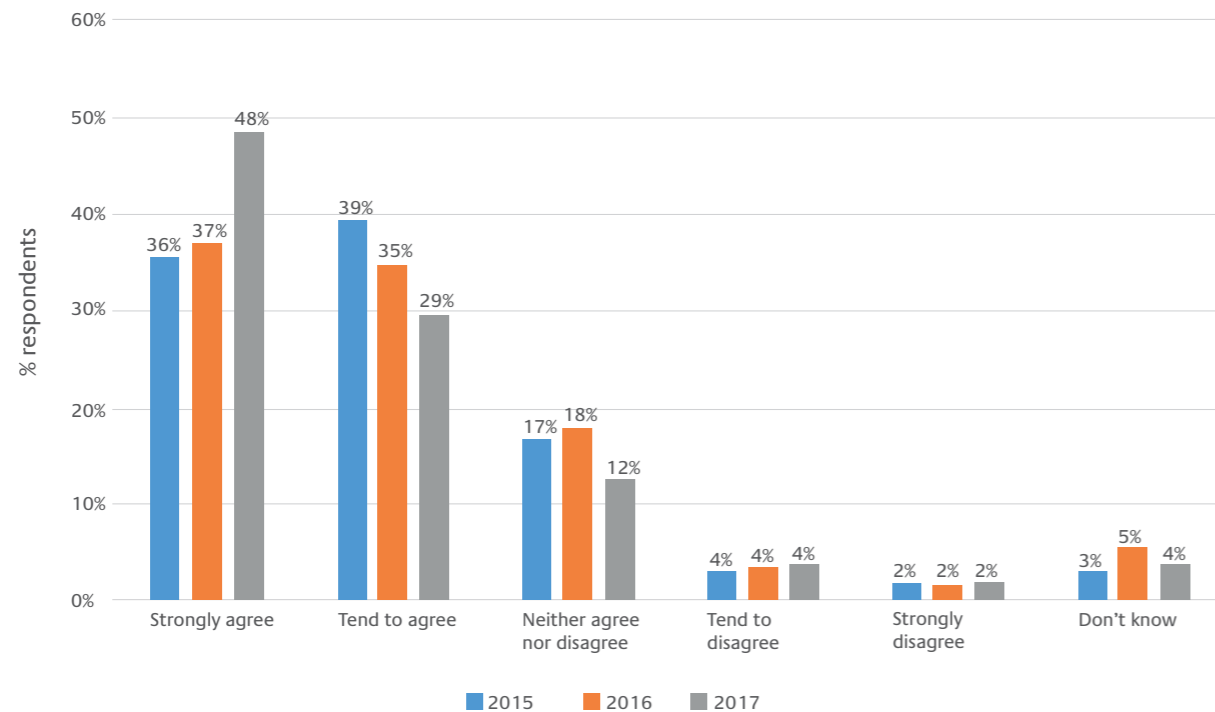
5. BEIS (2017). Energy and Climate Change Public Attitudes Tracker – Wave 21. Question 21 [online]. Available at: www.gov.uk/government/statistics/energy-and-climate-change-public-attitude-tracking-survey-wave-21

The public support action to reduce emissions

Over 70% of respondents in each survey agreed that the UK should be trying to reduce greenhouse gas emissions (Figure 1) with 49% of respondents in 2016 and 58% in 2017 of the view that the UK government should be doing more to tackle emissions. Support for emissions reductions was most widely held amongst younger respondents – in 2017 88% of 18-24 year olds thought the UK as a whole should be trying to reduce greenhouse gas emissions with 73% believing that the government needed to do more in this area. On a similar theme in a separate survey – the Department for Business, Energy and Industrial Strategy (BEIS) Energy and Climate Change Public Attitudes Tracker, a quarterly survey of energy and climate change views launched in March 2012 – 71% of respondents in May 2017 stated that they were 'very' or 'fairly' concerned about current climate change⁵.



Figure 1: Q. To what extent do you agree or disagree with the following statement? 'The UK should be trying to reduce greenhouse gas emissions'.



Producing bioenergy from both biomass and waste in the UK has received consistent, strong support

72-77% of respondents have supported producing bioenergy from biomass across all three surveys, with 81 - 84% supporting bioenergy from waste over the same period. Levels of opposition to using biomass and waste have been consistently low at 1-3% each (Figure 2).

Figure 2a: Q. In general, to what extent do you support or oppose the use of **biomass** to produce bioenergy in the UK?

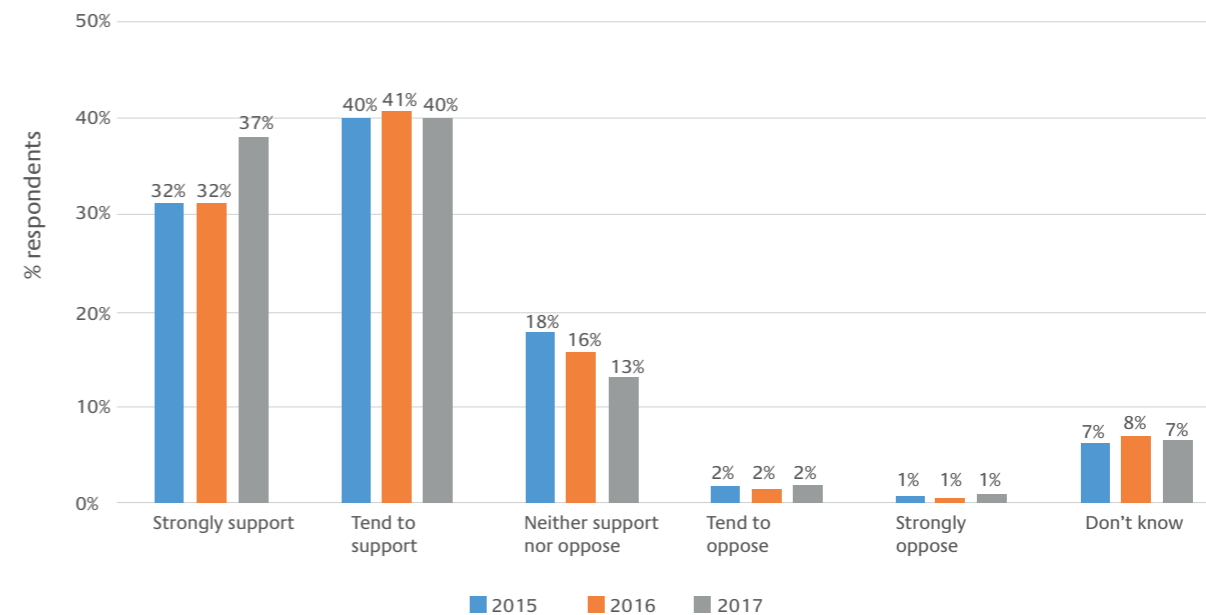
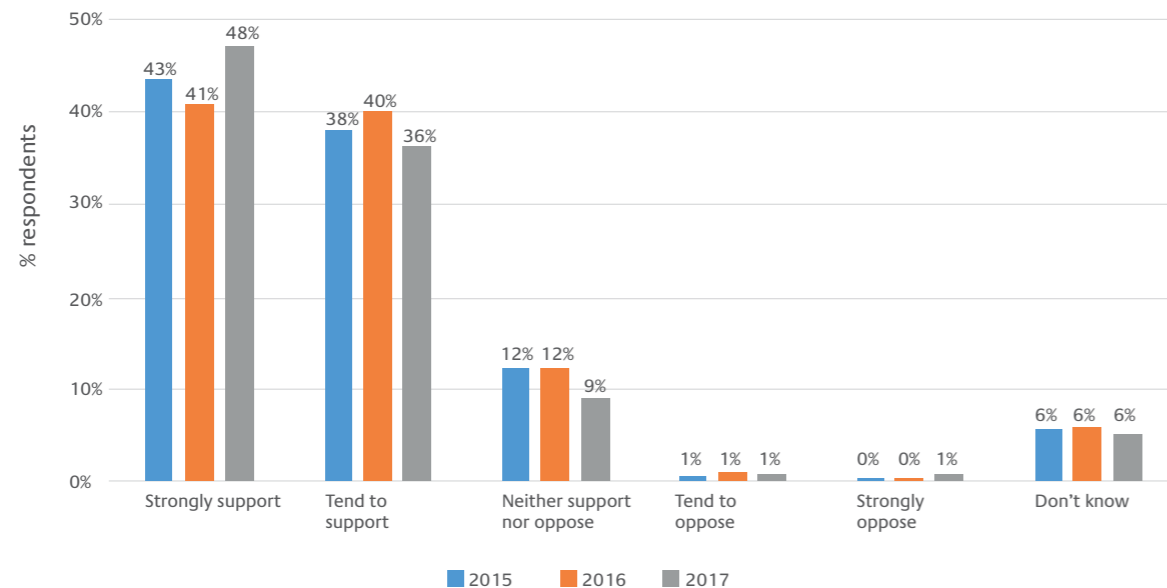




Figure 2b: Q. In general, to what extent do you support or oppose the use of **waste** to produce bioenergy in the UK?



When compared to other renewables, bioenergy is well supported. In 2017, support for all forms of renewables was higher than in 2016, with over 70% of respondents stating that they supported the use of each technology they were questioned about^{6,7}. Strong support for renewable technologies is consistent with findings from the BEIS Energy and Climate Change Public Attitudes Tracker, where support for using renewable energy has always been between 74% and 82%⁸.

6. Bioenergy from biomass, bioenergy from waste, offshore wind energy, onshore wind energy, solar panels on roofs, solar panels in fields and marine turbines.
 7. For 2016 results see Figure 2 in the ETI's Public Perceptions of Bioenergy insight paper [online]. Available at: www.eti.co.uk/insights/public-perceptions-of-bioenergy-in-the-uk
 8. BEIS (2017). Energy and Climate Change Public Attitudes Tracker – Wave 22. Question 3 [online]. Available at: www.gov.uk/government/statistics/energy-and-climate-change-public-attitudes-tracker-wave-22



In the ETI's 2016 and 2017 surveys, bioenergy from waste and solar panels on roofs were the two most popular technologies (each supported by 84% of respondents in 2017). In 2017 this was followed by offshore wind turbines (81%), then bioenergy from biomass (77%) which received similar levels of support to marine turbines (76%). Solar parks (panels in fields) and onshore wind energy were the least supported technologies but, in 2017, even these gained support from 73% and 72% of respondents respectively.

There is some awareness of the flexibility of biomass, both in terms of what it can be produced from and what it can produce. Similar to the 2016 results, in 2017 more respondents associated bioenergy production with waste feedstocks such as agricultural waste (50%), than they did with virgin biomass feedstocks such as crops (33%) and forestry (22%). In terms of output, bioenergy was most commonly associated with electricity and heat production (identified by 48% and 45% of respondents), followed by fuels (41%) and gas (35%). However, a quarter of respondents stated that they didn't know what forms bioenergy could take.

When asked whether they had ever heard of bioenergy prior to taking the survey, in 2017 77% of respondents said that they had heard of bioenergy but 62% said that, although they had

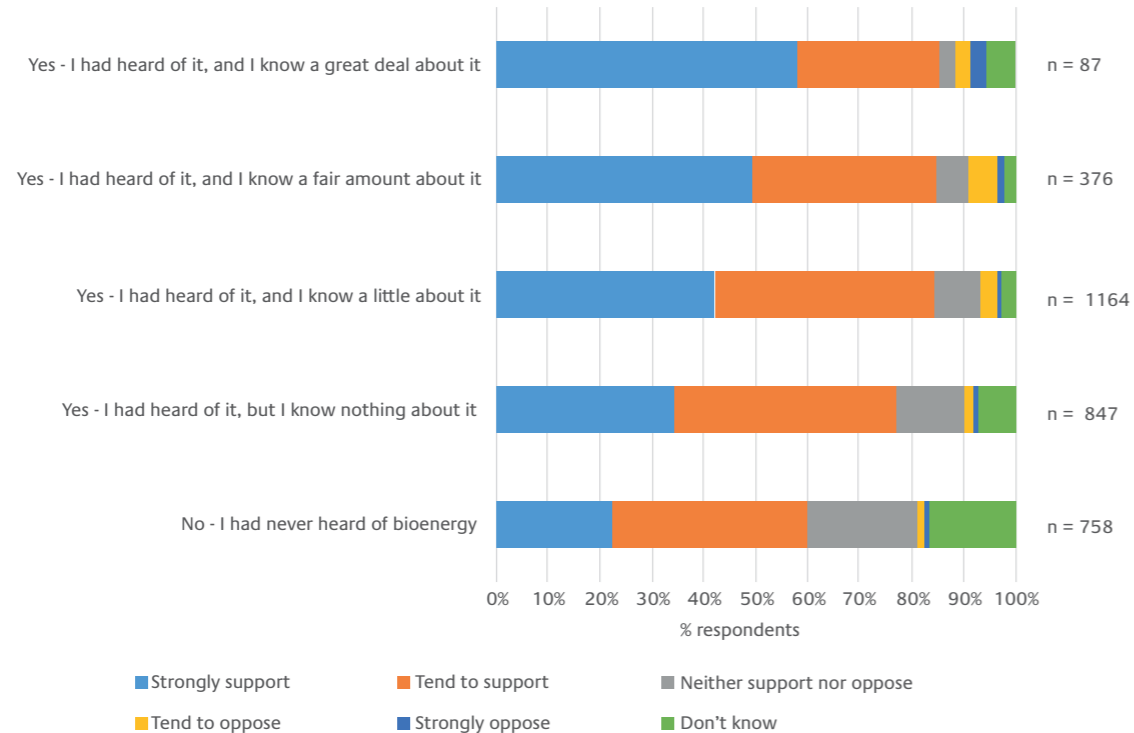
heard of bioenergy, they knew only a little or nothing about it. A similar pattern was seen in the previous year's survey when 73% of respondents had heard of bioenergy but 61% said they knew little or nothing about it.

In another similar pattern to the 2016 survey, when comparing respondents' knowledge of bioenergy (prior to the survey) with their level of support for bioenergy from biomass in 2017, Figure 3 shows that support for bioenergy was higher amongst respondents who knew something about it prior to taking the survey, with the proportion of respondents who strongly supported bioenergy from biomass increasing with level of knowledge. However, greater knowledge of bioenergy results in more polarised opinions with higher levels of opposition reported amongst those who knew a fair amount or great deal about bioenergy, though due to the small number of people who said they opposed bioenergy from biomass, the difference between levels of opposition across the knowledge categories cannot be said to be statistically significant⁹.

9. For 2016 results, see Figure 6 in the ETI's Public Perceptions of Bioenergy insight paper [online]. Available at: www.eti.co.uk/insights/public-perceptions-of-bioenergy-in-the-uk



Figure 3: Q. In general, to what extent do you support or oppose the use of biomass to produce bioenergy in the UK? Results shown by level of pre-existing knowledge of bioenergy (where n = number of respondents in each knowledge category).



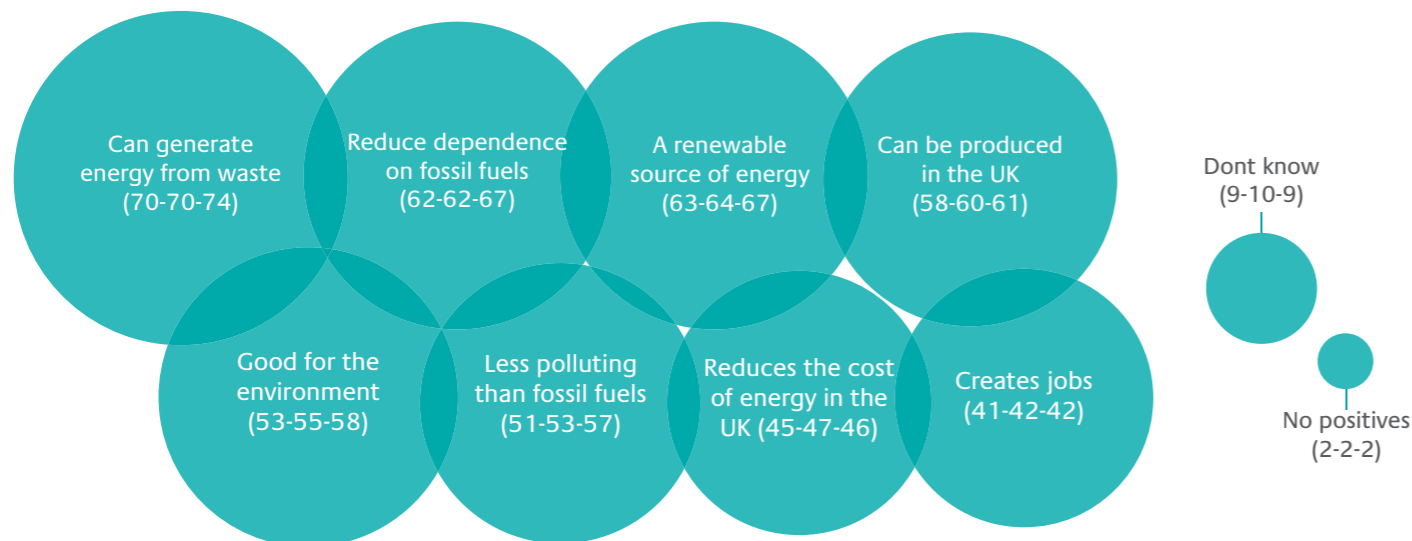
Bioenergy is associated with several positive attributes...

To understand more about the positive and negative perceptions of bioenergy, respondents were given two lists of options and asked to select all that they felt were positive and negative features (Figures 4 and 5). Respondents associated bioenergy with several positive features. In 2017, of the 89% of respondents who selected at least one positive feature, on average each selected 5.3 positive features. Only 2% of respondents thought bioenergy had no positive features. In a separate question, when asked specifically whether they agreed or disagreed that using bioenergy can contribute towards reducing the UK's greenhouse gas emissions, 66% of respondents agreed with only 5% saying they disagreed.





Figure 4: Q. In general, which, if any, of the following would you say are **positive** features of bioenergy? Please select all that apply. (Figures in brackets represent the percentage of respondents who selected each option in 2015, 2016 and 2017 respectively)



In each survey, the most commonly selected positive feature was that bioenergy can generate energy from waste. Using residual waste that would otherwise be landfilled is an important part of delivering cost-effective greenhouse gas emission reductions. The ETI's bioenergy programme has

examined the use of waste in the UK energy system and identified gasification with syngas clean-up as an important, scenario-resilient technology, because it can use waste and biomass resources to deliver a range of end products including heat, power, gaseous and liquid fuels.



The ETI is investing in a 1.5 MWe waste gasification with syngas clean-up demonstration power plant, near Wednesbury, West Midlands. More information on gasification technology and the ETI's demonstration project can be found in our recent insights paper, 'Targeting new and cleaner uses for wastes and biomass using gasification'¹⁰.

The ETI is also investing in a project to demonstrate the impact of water washing on the properties of biomass feedstocks, with a particular focus on improving the quality of waste wood such that this resource can be used by a wider range of end users¹¹.

...but two areas of concern have consistently been raised

Across all three surveys, increased competition for land and having to rely on imported biomass (because not enough is produced in the UK) have been the top two negative features selected by respondents (Figure 5). Additional analysis in 2016 and 2017 showed that these concerns were prominent regardless of a respondent's level of support for bioenergy¹².

To deliver the 130 TWh/yr of bioenergy in the 2050s that ETI's ESME suggests is needed to transition cost-effectively to a low

carbon energy system, both imported and UK-grown biomass will be required alongside waste materials. The ETI's Refining Estimates of Land for Biomass identified up to 1.4 Mha of land that could be used in the UK to deliver around half the biomass requirements needed to meet that target. Reaching this goal without impacting UK food production will require improvements in land productivity as well as a reduction in food waste throughout the supply chain¹³.

In 2016, the public perceptions survey asked additional questions to develop a better understanding of attitudes towards biomass imports and UK land. While it was clear that respondents did not want the UK to be entirely reliant on imported feedstocks (58% stated that their opinion would worsen if this were the case), 72% said their opinion of bioenergy would improve or stay the same if the UK used a roughly equal mix of imported and UK-grown feedstocks¹⁴. In relation to competition for UK land, the 2016 results did suggest that this was a concern, but there was also a desire amongst respondents to use land most productively and not always reserve it exclusively for food production¹.

10. Evans, G. (2017) Targeting new and cleaner uses for wastes and biomass using gasification [online]. Available at: www.eti.co.uk/insights/targeting-new-and-cleaner-uses-for-wastes-and-biomass-using-gasification

11. For more information on this project visit: www.eti.co.uk/programmes/bioenergy/biomass-feedstock-improvement-process-project

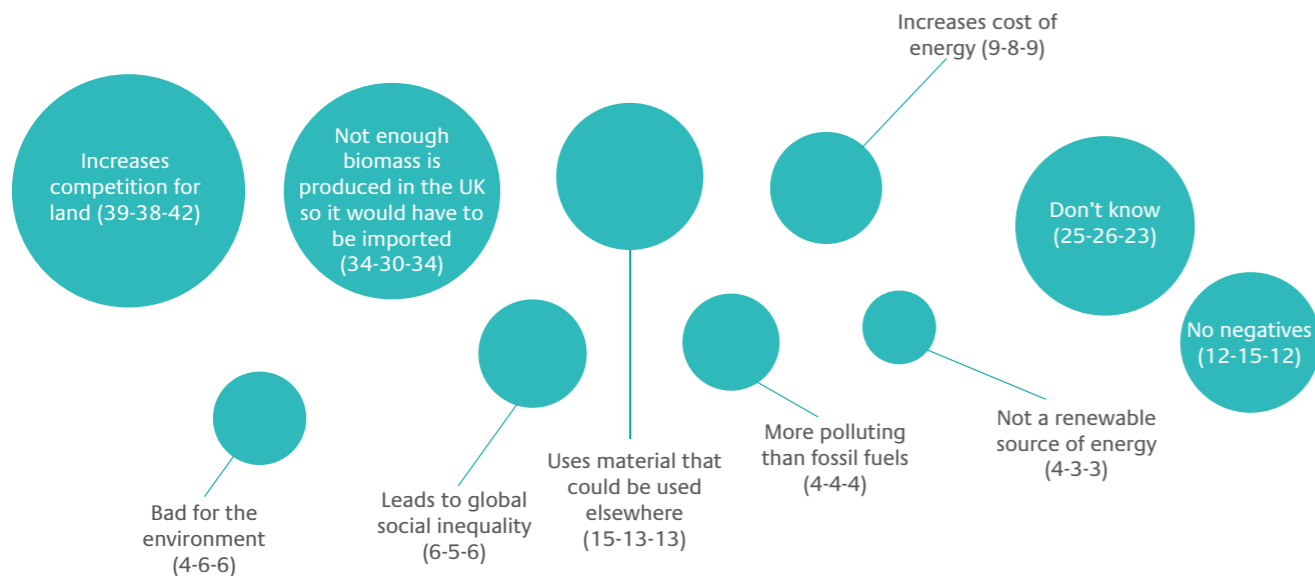
12. For more detail from the 2016 survey, see Figure 11 in the ETI's Public Perceptions of Bioenergy insight paper. Available at: www.eti.co.uk/insights/public-perceptions-of-bioenergy-in-the-uk

13. ETI (2017). An ETI Perspective – Increasing UK biomass production through more productive use of land [online]. Available at: www.eti.co.uk/library/an-eti-perspective-increasing-uk-biomass-production-through-more-productive-use-of-land

14. In 2017, 75% of respondents said their opinion of bioenergy would improve or stay the same if the UK used a roughly equal mix of imported and UK-grown feedstocks. 65% of respondents said their opinion of bioenergy would worsen if the UK was entirely reliant on imported feedstocks.



Figure 5: Q In general, which, if any, of the following would you say are **negative** features of bioenergy? Please select all that apply. (Figures in brackets represent the percentage of respondents who selected each option in 2015, 2016 and 2017)



Delivering 130TWh/yr bioenergy in the 2050s

When asked about the scale of bioenergy installations they would like to see developed, none of the three surveys found a correlation between the size of an installation and the extent to which its use was supported by respondents. While medium sized installations were the most supported there was little difference between the levels of support for large biomass power stations (38% in 2017) and small-scale domestic boilers (40% in 2017).

Bioenergy is the largest source of renewable energy in the UK and it is the only low-carbon energy source which is currently used to produce heat, power and transport fuels. New bioenergy developments can currently apply for financial support under the Contracts for Difference scheme¹⁵ (power only – for advanced conversion technologies, anaerobic digestion and biomass combined heat and power), the Renewable Heat Incentive¹⁶ (heat or biomethane production) and the Renewable Transport Fuels Obligation¹⁷. However, these policies do not in themselves set a level of ambition or direction for the bioenergy sector as a whole.

Delivering a bioenergy sector of the scale ESME suggests is needed (130 TWh/yr bioenergy in 2050s) and producing this energy in ways which make effective use of resources to drive energy system-level emissions reductions, requires an understanding of the role of bioenergy in the wider energy system, and a strategy for increasing sustainable feedstock availability and technology deployment.

When asked who they think should be the main leader of the bioenergy sector, the government has been the most popular answer in all three years (Figure 6). However, when it comes to choosing who they would trust to provide reliable information about bioenergy, scientists/academics or experts in the field have consistently been the most trusted, and Figure 7 shows that the 2017 survey saw a marked increase in the percentage of respondents stating that they would trust them (up from 53% in 2015 and 51% in 2016 to 61% in 2017). Figure 6 also shows that there has been an increase, from 15% to 21%, in respondents who think that academics or environmental scientists should lead the direction and expansion of the sector. Overall, these results suggest that different organisations need to work together to develop awareness and understanding of bioenergy while expanding the sector.

15. BEIS (2017). Contracts for Difference [online]. Available at: <https://www.gov.uk/government/publications/contracts-for-difference/contract-for-difference> [Accessed 27 July 2017].

16. Ofgem (2017). Non-domestic Renewable Heat Incentive [online]. Available at: www.ofgem.gov.uk/environmental-programmes/non-domestic-rhi [Accessed 27 July 2017].

17. DfT (2017). Renewable Transport Fuels Obligation (RTFO) order [online]. Available at: www.gov.uk/government/collections/renewable-transport-fuels-obligation-rtfo-orders [Accessed 27 July 2017].



Figure 6: Q. The use of bioenergy in the UK is increasing. Some people believe that the direction and expansion of the bioenergy sector should be led by an organisation. Which ONE, if any, of the following do you think should be the main leader of the bioenergy sector? (* The full description for this option was 'Not applicable – no one should lead the direction and expansion of the bioenergy sector')

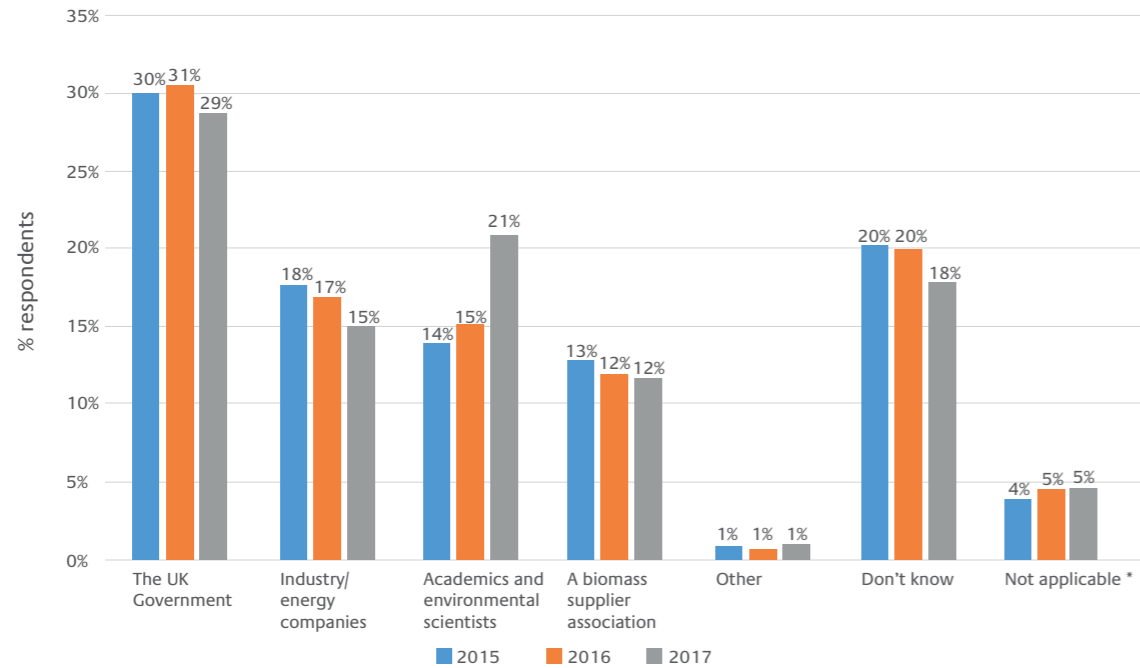
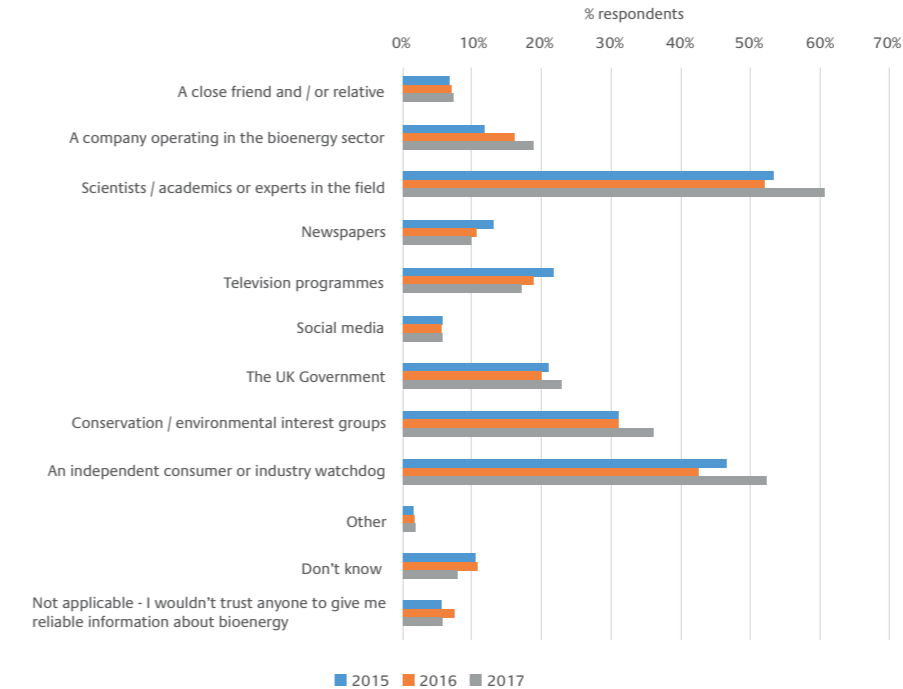


Figure 7: Q. Please imagine you were interested in finding out more information on bioenergy. Which, if any, of the following would you trust to give you reliable information?



When asked about the extent to which they trust organisations operating in the bioenergy sector, less than half (44%) of respondents said that they trusted those organisations¹⁸ but when provided with a list of options to improve the trustworthiness of these organisations, over half of respondents said they would trust organisations more if they were: part of an accreditation scheme (ensuring good standards are met) (54%), had directors who were held clearly accountable for environmental compliance (52%) or if the organisation had to reimburse green subsidies if they failed to maintain good environmental and performance standards (51%).

18. 19% said that they did not trust organisations operating in the bioenergy sector, while 37% said that they didn't know

NEXT STEPS



The ETI's survey results show that, while most people have heard of bioenergy, the majority know very little about it. Given that support for bioenergy is reportedly higher amongst those who know more about it, raising awareness of bioenergy and its potential role in reducing carbon emissions could play an important part in maintaining and building public support. This awareness raising should be led by organisations who the public trust to provide reliable information – most importantly scientists, academics and other experts in the field and information from these individuals and organisations should be accessible and engage a wide stakeholder audience¹⁹.

While the ETI's Public Perceptions of Bioenergy survey has consistently indicated that there is strong support for bioenergy from both biomass and waste, and that respondents associate bioenergy with several positive features, concerns about land use competition and an over-reliance on imported biomass should not be forgotten and will need to be monitored and addressed by industry leaders. This will be particularly important over the next few years as the UK prepares to leave the EU, and the UK agricultural sector and UK consumers face uncertainty over agricultural support and future food supplies. However, the replacement of the Common Agricultural Policy (CAP) provides an opportunity to restructure farming support in a way which

encourages the sustainable growth of the UK biomass sector. This could place a value on the wider environmental benefits growing second generation energy crops can make to the farming landscape, such as improved biodiversity and soil carbon sequestration, particularly when transitioning from arable land²⁰.

Finally, as the bioenergy sector expands, understanding public perceptions towards bioenergy will continue to be important and, as the sector develops, this understanding will need to broaden into other areas of bioenergy value chains, such as CCS.

19. An overview of Research Councils UK (RCUK) funding of bioenergy research can be viewed here: www.rcuk.ac.uk/research/xrcprogrammes/energy/energyresearch/bioenergy/

20. Milner, S., Holland, R. A., Lovett, A., Sunnenberg, G., Hastings, A., Smith, P., Wang, S. and Taylor, G. (2016). Potential impacts on ecosystem services of land use transitions to second-generation bioenergy crops in GB. *GCB Bioenergy*, 8: 317–333. doi:10.1111/gcbb.12263

FURTHER READING



ETI publications can all be accessed on the ETI's website: www.eti.co.uk



Public Perceptions of Bioenergy in the UK 2016

<http://www.eti.co.uk/insights/public-perceptions-of-bioenergy-in-the-uk>



Insights into the future UK Bioenergy sector, gained using the ETI's Bioenergy Value Chain Model (BVCM)

<http://www.eti.co.uk/insights/bioenergy-insights-into-the-future-uk-bioenergy-sector-gained-using-the-etis-bioenergy-value-chain-model-bvcm>



An ETI Perspective - Increasing UK biomass production through more productive use of land

<http://www.eti.co.uk/library/an-eti-perspective-increasing-uk-biomass-production-through-more-productive-use-of-land>



An ETI Perspective - Opportunities for rural job creation in the UK energy crops sector

<http://www.eti.co.uk/library/an-eti-perspective-opportunities-for-rural-job-creation-in-the-uk-energy-crops-sector>



Targeting new and cleaner uses for wastes and biomass in gasification

<http://www.eti.co.uk/insights/targeting-new-and-cleaner-uses-for-wastes-and-biomass-using-gasification>



Consumer challenges for low carbon heat

<http://www.eti.co.uk/insights/smart-systems-and-heat-consumer-challenges-for-low-carbon-heat>



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