Department for Environment Food & Rural Affairs

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Crops Grown For Bioenergy in England and the UK: 2016

About this release

This release contains information on the area of non-food crops grown in the UK in 2016 including:

- Areas of oilseed rape, sugar beet and wheat used for producing biofuels and maize for use in anaerobic digestion.
- Areas of miscanthus, short rotation coppice and straw crops grown as plant biomass.

Key Messages

- In 2016, 132 thousand hectares of agricultural land in the UK were used to grow crops for bioenergy.
- The area of crops grown for bioenergy equated to just over 2% of all arable land in the UK in 2016.
- 53% of land used for bioenergy in 2016 was for biofuel (biodiesel and bioethanol) for the UK road transport market.
- 217 million litres of biofuel for the UK road transport market were produced from UK grown crops in 2016.

Figures relating to biofuel used for road transport in 2016/17 (year runs mid-April to mid-April) are provisional based on data currently available. These show that, of the total volume of renewable fuel supplied in 2016/17, 96% (1,476 million litres) has so far been demonstrated to meet the sustainability requirements (see Annex B for more details).

A dataset has been published alongside this statistics release and is available here.

The next update to this statistical release is anticipated in autumn 2018 and will be published here.

Revisions

Section 1: volumes of biofuels supplied to the UK road transport market in 2015/16 have been revised to reflect the final estimates. Section 2: figure 8, the volume of miscanthus used in UK power stations 2009/10 has been revised to include 29 thousand tonnes of miscanthus and wood mix not previously accounted for. Figure 10 has been updated to reflect latest information.

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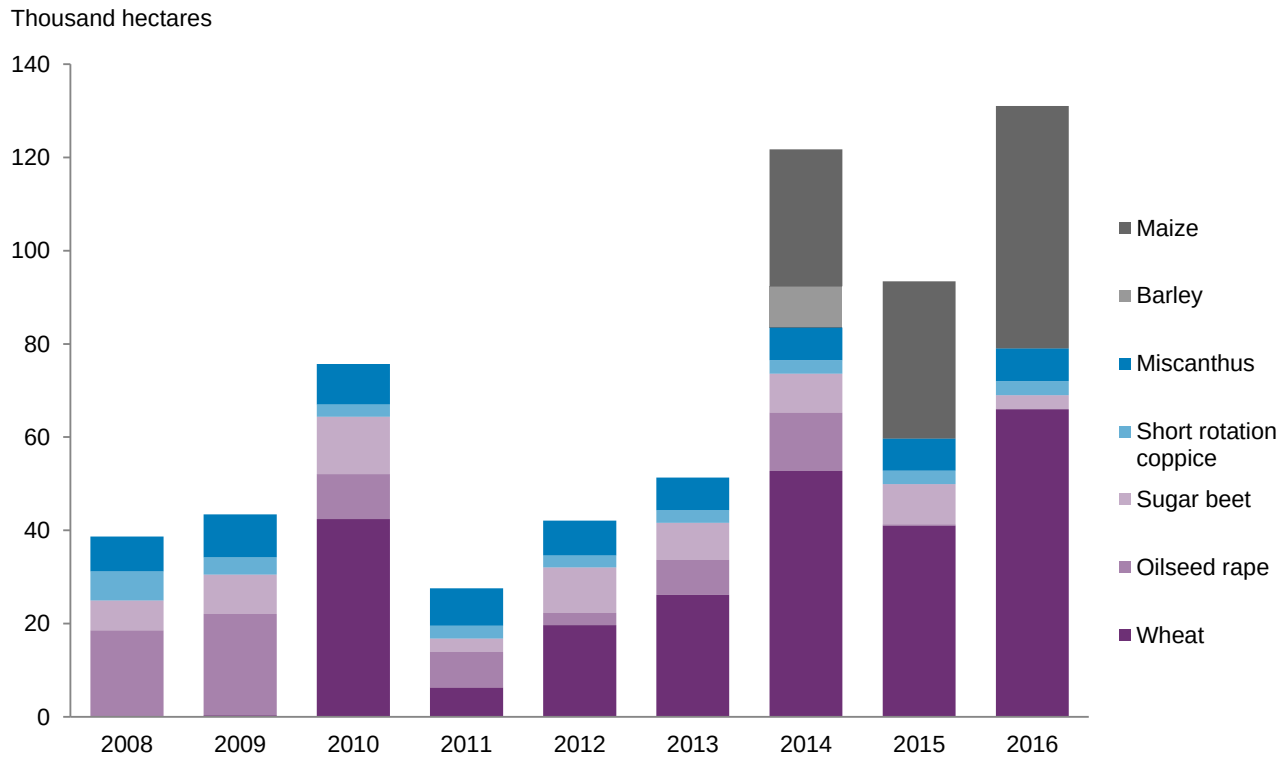
Overview of agricultural area used for bioenergy crops

Figure 1: Total area of crops grown for bioenergy, 2008 - 2016[(a)]



Sources: Department for Transport RTFO data, UK Agricultural departments' June Survey/Census of Agriculture.

(a) Data for maize used as feedstock for anaerobic digestion only available from 2014.

- 132 thousand hectares of agricultural land was used for bioenergy crops in the UK in 2016 comprising: 66 of wheat, 52 of maize[1], 3 of sugar beet, 7 of miscanthus, 3 of short rotation coppice. Also included in the total is a small amount (500 hectares) of corn (maize) used to produce bioethanol.

- Arable land[2] used for bioenergy crops in the UK increased by 41% in 2016 to the highest level so far recorded. It equated to 2.2% of the total arable area.

- Just over half (53%) of land used for bioenergy in 2016 was for biofuel (biodiesel and bioethanol) crops for the UK road transport market with the remainder used mostly for heat and power production.

- In terms of the crop area used for biofuel, the sugar beet area decreased by nearly 60% in 2016 compared to 2015, while the area of wheat increased by just over 60% in the same period.

A detailed breakdown of all figures for 2008 to 2016 can be found in Table A of the crops for bioenergy dataset.

[1] Maize used as a feed stock for anaerobic digestion.

[2] Arable area is defined as the area of arable crops, uncropped arable land and temporary grassland.

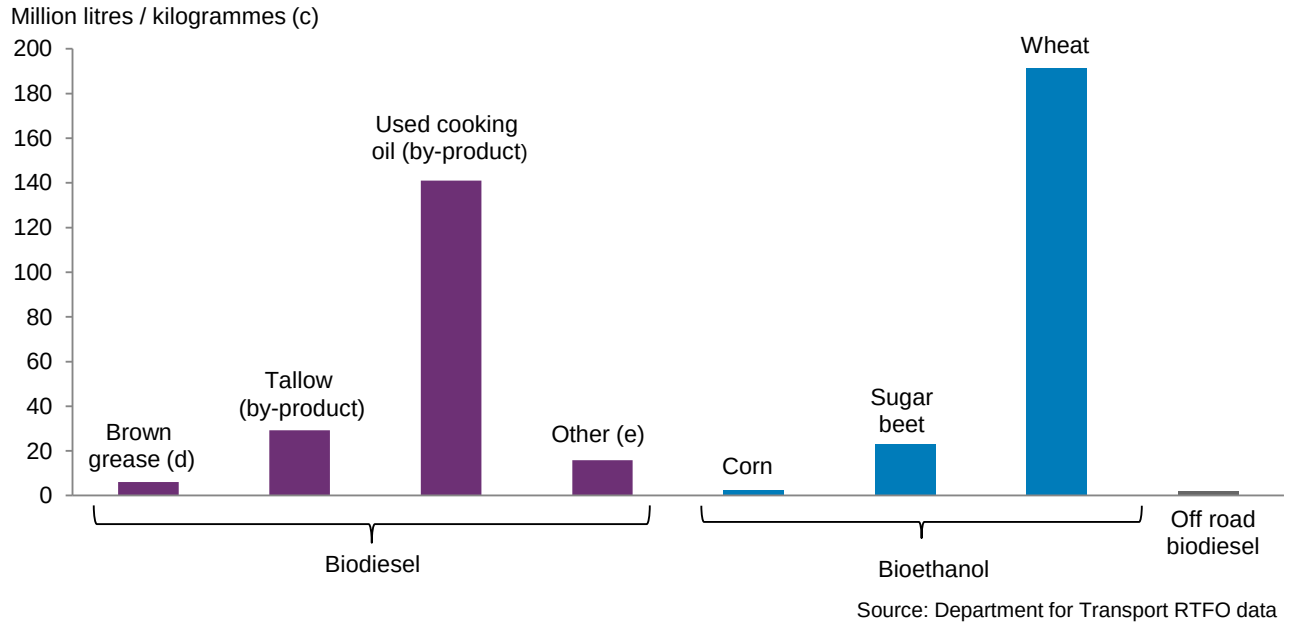
1. Biofuels

1.1 UK grown crops used for production of biofuels for supply to the UK road transport market

Figure 2 summarises UK sourced biofuels reported under the Renewable Transport Fuels Obligation (i.e. the biofuels used in the UK that are made from UK feedstocks). For more information on the Renewable Transport fuels Obligation (RTFO) see Data Sources on page 25.

Crops and by-products have been included to show differing proportions of feedstocks.

Figure 2: Volume of UK sourced biofuels supplied to the UK road transport market by crop type and waste / residue, 2016/17[(a)(b)]



Source: Department for Transport RTFO data

(a) 2016/17 figures are as of 2nd November 2017 and are subject to revision.
(b) Year relates to 15th April 2016 - 14th April 2017.
(c) Biodiesel, bioethanol and pure vegetable oil volumes are reported in litres and biogas volumes are reported in kilograms.
(d) Brown grease is fat and oil removed from grease traps and sewers.
(e) "Other" is food waste, soapstock acid oil contaminated with sulphur and rapeseed residue (high in Erucic Acid content).

- The total volume of UK sourced biofuels used in the UK in 2016/17 was 411 million litres / kilogrammes. This was an increase of 6% compared to the volume of UK sourced biofuels in 2015/16.

- Compared to 2015/16 the volume of UK sourced biodiesel for UK road transport increased by 2% to 192 million litres, mainly driven by an increase in the use of food waste and brown grease. For bioethanol the increase was 11%, to 217 million litres, with rises in the volumes of wheat and corn (maize) contributing to this.

A detailed breakdown from 2008/09 can be found in Table B of the crops for bioenergy dataset.

1.2 Implied crop areas based on supply of biofuel to the road transport market

Table 1 and Figures 3 to 5 focus on the arable crops used as feedstocks and translate the biofuel volumes reported under the Renewable Transport Fuels Obligation (RTFO) into equivalent UK crop areas. These crop areas are only based on biofuel from UK grown crops sold into the UK road fuel market and so do not include UK grown crops which are processed into biofuels and then exported (and not re imported), go to markets other than road transport, or are exported to be processed into biofuels elsewhere.

Conversion factors for litres to tonne of crop can be found on page 26, Annex A.

Table 1: Total UK crop areas used for biofuels (biodiesel and bioethanol) supplied to the UK road transport market, 2008/09 - 2016/17

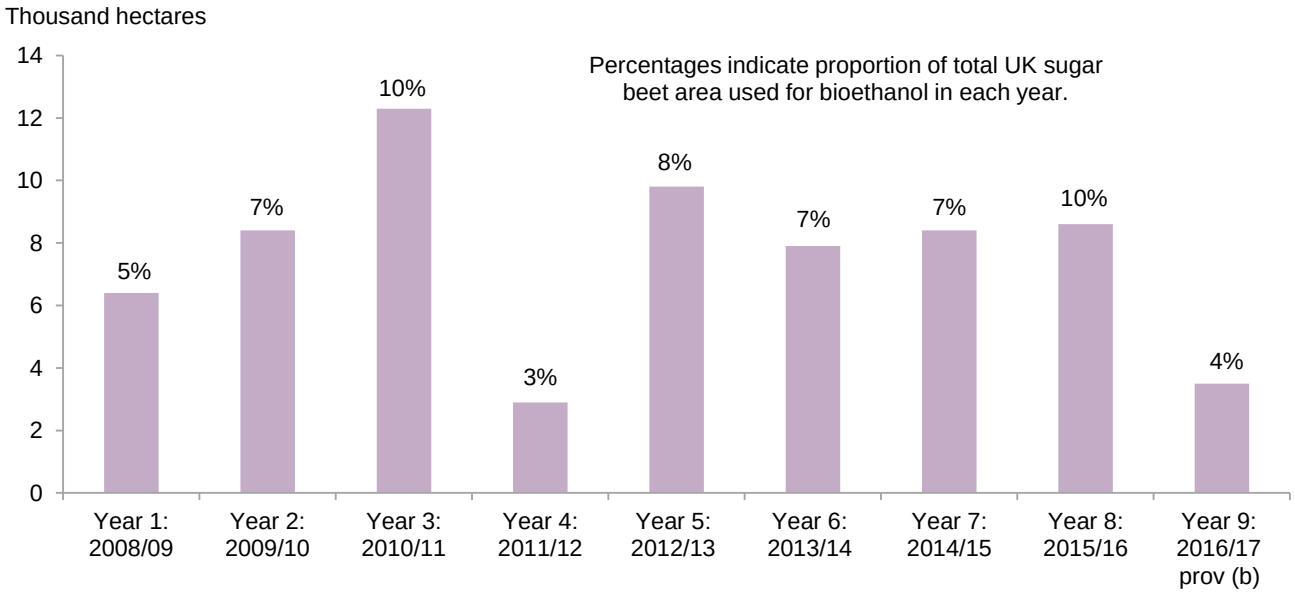
All UK crops used as biofuels (RTFO Year: 15th April - 14th April)	Total volume of biofuels from UK grown crops (million litres)	Implied tonnage of crop ('000 tonnes)[a]	Implied area '000 ha	% of UK total arable area[b]
Year 1: 2008/09	67.6	471	25.0	0.4%
Year 2: 2009/10	95.5	700	30.5	0.5%
Year 3: 2010/11	202.9	1 039	64.4	1.1%
Year 4: 2011/12	52.6	295	16.8	0.3%
Year 5: 2012/13	111.8	733	32.0	0.5%
Year 6: 2013/14	138.2	787	41.6	0.7%
Year 7: 2014/15[c]	271.3	1 226	82.5	1.3%
Year 8: 2015/16[d]	195.5	963	49.9	0.8%
Year 9: 2016/17 (prov)[d][e]	217.1	756	70.1	1.2%

(a) Based on conversions from the Department for Transport and The National Non-Food Crops Centre (details provided in Table 1) and Defra crop yield statistics.
(b) UK arable area is defined as the area of arable crops, uncropped arable land and temporary grassland. Data from the 2008 June Survey of Agriculture have been used in conjunction with RTFO year 1 (2008-2009). Subsequent years follow the same pattern.
(c) Includes bioethanol from UK grown barley and corn (maize) processed as part of a trial.
(d) Includes bioethanol from UK grown corn (maize).
(e) 2016/17 figures (Year 9) are as of 2nd November 2017 and are not final.

- In 2016/17 just over 70 thousand hectares of UK crops were used for biofuels supplied to the UK road transport market which equates to 1.2% of the total arable area of the UK.

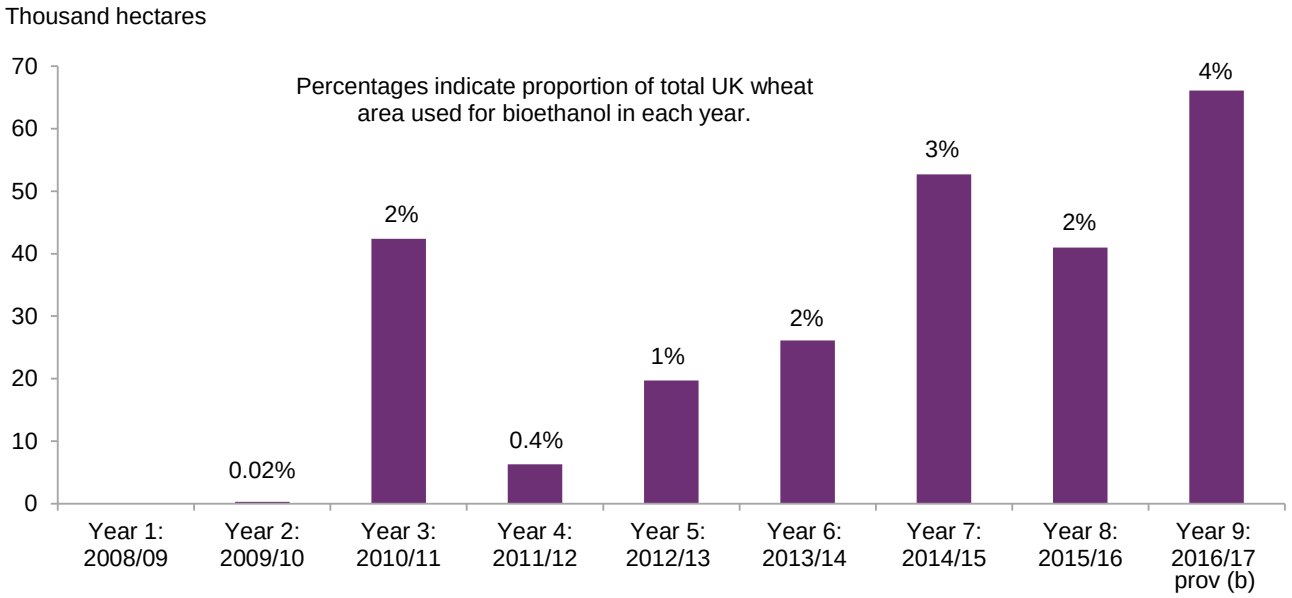
- The area of crops for biofuels saw an increase of 40% between 2015/16 and 2016/17 although this only translated to an 11% increase in the volume of biofuel produced (195 million litres in 2015/16 rising to 217 million litres in 2016/17). This disparity reflects a change in the balance of sugar beet and wheat used and lower crop yields in 2016, which saw a return to more typical levels following record highs for some crops in 2015.

Figure 3: UK sugar beet area[(a)] used for bioethanol supplied to the UK road transport market 2008/09 - 2016/17



Sources: Department for Transport RTFO data, Agriculture in the United Kingdom

Figure 4: UK wheat area[(a)] used for bioethanol supplied to the UK road transport market 2008/09 - 2016/17

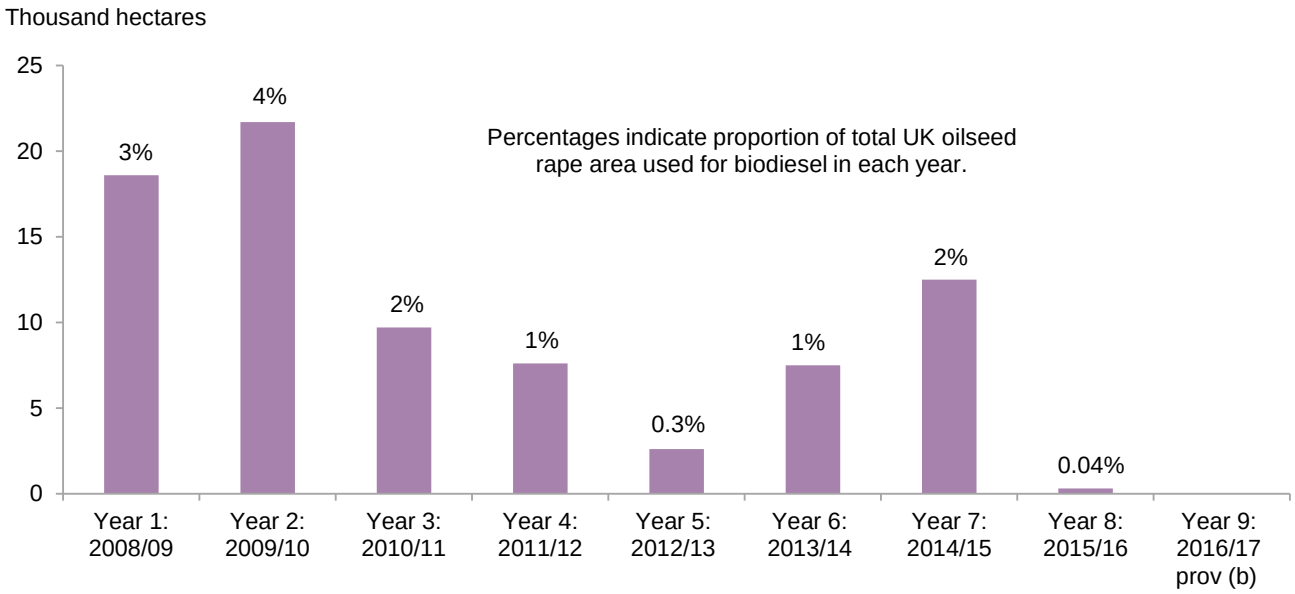


Sources: Department for Transport RTFO data, Agriculture in the United Kingdom

(a) Source: yield data and total crop areas, Defra, Agriculture in the United Kingdom and June Survey of Agriculture. Data from the 2008 survey / publication have been used in conjunction with RTFO year 1 (2008-2009). Subsequent years follow the same pattern.
(b) 2016/17 figures (Year 9) are as of 2nd November 2017 and are not final.

- Around 3 and a half thousand hectares of sugar beet were used in the production of bioethanol for the road transport market in 2016/17, a reduction in area of nearly 60% compared to 2015/16. More background on the sugar beet industry and its use for bioenergy can be found at Annex C
- An estimated 66 thousand hectares of wheat was used for bioethanol in 2016/17. This was an increase in area of 61% compared to 2015/16 (during which there was a temporary closure of one of the two UK plants).

Figure 5: UK oilseed rape area[(a)] used for biodiesel supplied to the UK road transport market, 2008/09 - 2016/17



Sources: Department for Transport RTFO data, Agriculture in the United Kingdom

(a) Source: Defra June Survey of Agriculture. Data from the 2008 survey have been used in conjunction with RTFO year 1 (2008-2009). Subsequent years follow the same pattern.

(b) 2016/17 figures (Year 9) are as of 2nd November 2017 and are not final.

- Provisional RTFO data indicates that no oilseed rape grown in the UK was used to produce biodiesel for the UK road transport market in 2016/17. This reflects a longer term shift in feedstock type with increasing use of wastes and less crop biodiesel compared to the early years of the RTFO.

- The most widely reported UK sourced feedstock for biodiesel in 2016/17 was used cooking oil (Figure 2).

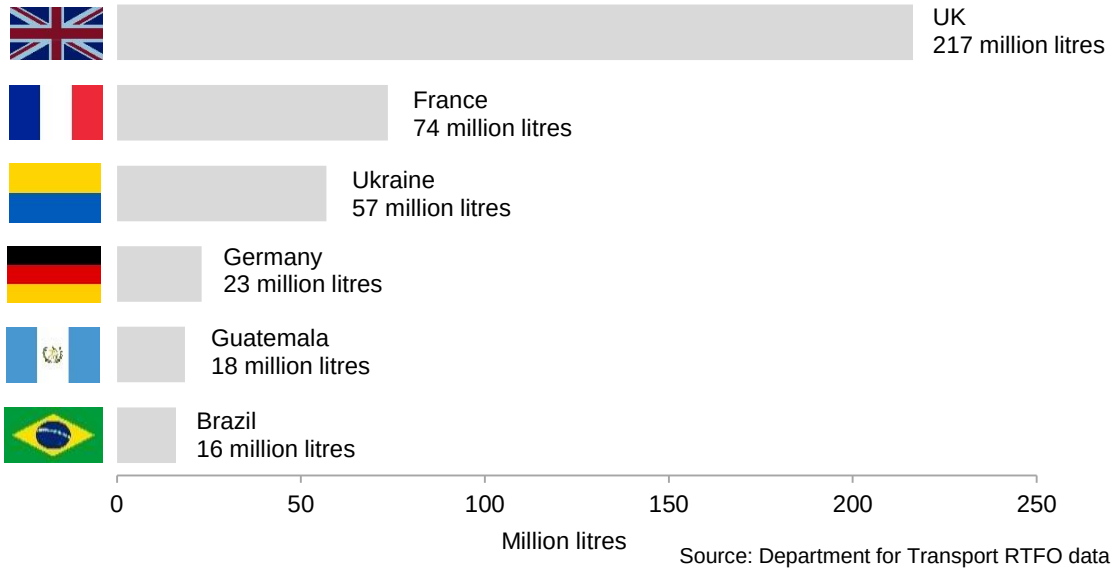
A detailed breakdown of wheat, sugar beet and oilseed rape can be found in Tables C, D and E of the crops for bioenergy dataset.

1.3 Biofuels from crops supplied to the UK for the road transport market 2016/17[3]

- In 2016/17, estimates indicate over half the crop derived bioethanol for road transport originated from crops grown outside the UK. An estimated 44% originated from crops grown in the UK, which was an increase on the 2015/16 percentage, largely driven by an increase in the volume of bioethanol derived from UK grown wheat.

- Figure 6 shows the top 6 countries supplying crop derived bioethanol to the UK. Volumes for all countries and types of crop feedstock can be found in Table F of the crops for bioenergy dataset.

Figure 6: Top 6 countries supplying crop derived bioethanol to the UK 2016/17[2]



Source: Department for Transport RTFO data

- There was no biodiesel produced from crop feedstocks in 2016/17. This is in line with the longer term trend of a decline in biodiesel derived from crops and an increasing use of waste feedstocks.

[3] 2016/17 figures (Year 9) are as of 2nd November 2017 and are not final.

1.4 Comparison of biofuels to all fuels used for road transport

Tables 2 and 3 compare the volume of biofuel used in UK road transport to the total of all fuels supplied for road transport for the last 2 years (data for Renewable Transport Fuels Obligation (RTFO) years 1 to 7 can be found in previous releases of these statistics at: https://www.gov.uk/government/collections/non-food-crops). They also show the proportion of biofuels that are UK sourced. The years run 15th April to 14th April.

Table 2: RTFO Year 8 (2015/16) verified figures for biofuel from UK feedstocks

	Million litres or kg[a]				
Fuel type	Volume UK sourced biofuels 2015/16	Total volume biofuels supplied to UK 2015/16[b]	Total volume of road transport fossil fuels supplied to UK 2015/16	UK sourced biofuels as a proportion of total biofuels supplied to UK	Biofuels as a proportion of total road transport fuels supplied to UK
Biodiesel of which:	188	733	28 412	26%	2.58%
Brown grease[c]	5				
Oilseed rape	0				
Tallow (by-product)	38				
Used cooking oil (by-product)	138				
Other[d]	8				
Bioethanol of which:	195	789	16 433	25%	4.80%
Corn	0				
Sugar beet	60				
Wheat	135				
Biomethane	1	1		100%	
Biomethanol	0	31		0%	
HVO	0	8		0%	
Off road biodiesel	2	3		79%	
Total	387	1 565	50 101	25%	3.03%[e]
Annual target[g]					4.75%

(a) Biodiesel, bioethanol and pure vegetable oil volumes are reported in litres and biogas volumes are reported in kilograms.

(b) Includes volumes of biofuel from other feedstocks in addition to those listed here e.g. palm oil.

(c) Brown grease is fat and oil removed from grease traps and sewers.

(d) "Other" is food waste and soapstock acid oil contaminated with sulphur.

(e) The difference in the percentage shown and the annual target is due to some Renewable Transport Fuel Certificates (RTFCs) being issued to double counting feedstocks. Biofuels produced from wastes, non-agricultural residues, non-food cellulosic material, and ligno-cellulosic material receive two RTFCs per litre/kg meaning suppliers using these feedstocks only have to supply half the volume to meet their obligation.

(g) Rising from 2.5% in 2008/09 to 4.75% from 2013/14 onwards. From 15 April 2013, the end uses covered by the Renewable Transport Fuels Obligation were amended to include non-road mobile machinery (including inland waterways vessels), agriculture and forestry tractors and recreational craft when not at sea (known collectively as NRMM). To keep the supply of biofuel broadly consistent the biofuel target level was changed from 5% to 4.75% based on data supplied by industry on the volume of low sulphur gas oil used for NRMM end uses.

- In 2015/16, 1,565 million litres of biofuel fuel were supplied to the UK which is 3.0% of total road and non-road mobile machinery fuel. 99.9% of this renewable fuel has been demonstrated to meet the sustainability requirement[4].

[4] The EU Renewable Energy Directive and Fuel Quality Directive sustainability criteria are:

Biofuels must achieve at least a 35% GHG emissions saving (this threshold will rise over time);
Biofuels may not be made from raw material obtained from land with high biodiversity value in or after January 2008.

- Of the 1,565 million litres meeting sustainability requirements[4], bioethanol comprised 50% of supply, biodiesel 47% and biomethanol 2%. There were also small volumes of biodiesel HVO, biogas and off road biodiesel.

Table 3: RTFO Year 9 (2016/17) provisional figures[(a)] for biofuel from UK feedstocks

	Million litres or kg[(b)]				
Fuel type	Volume UK sourced biofuels 2016/17	Total volume biofuels supplied to UK 2016/17[(c)]	Total volume of road transport fossil fuels supplied to UK 2016/17	UK sourced biofuels as a proportion of total biofuels supplied to UK	Biofuels as a proportion of total road transport fuels supplied to UK
Biodiesel of which:	192	682	29 246	28%	2.33%
Brown grease[(d)]	6				
Oilseed rape	0				
Tallow (by-product)	29				
Used cooking oil (by-product)	141				
Other[(e)]	16				
Bioethanol of which:	217	737	16 228	29%	4.54%
Corn	3				
Sugar beet	23				
Wheat	191				
Biomethane	0	1		0%	
Biomethanol	0	52		0%	
HVO	0	1		0%	
Off road biodiesel	2	3		77%	
Total	411	1 476	50 766	28%	2.95%[(f)]
Annual target[(g)]					4.75%

(a) 2016/17 figures (Year 9) are as of 2nd November 2017 and are not final.

(b) Biodiesel, bioethanol and pure vegetable oil volumes are reported in litres and biogas volumes are reported in kilograms.

(c) Includes volumes of biofuel from other feedstocks in addition to those listed here e.g. palm oil.

(d) Brown grease is fat and oil removed from grease traps and sewers.

(e) "Other" is food waste, soapstock acid oil contaminated with sulphur and rapeseed residue (high Erucic Acid content).

(f) The difference in the percentage shown and the annual target is due to some Renewable Transport Fuel Certificates (RTFCs) being issued to double counting feedstocks. Biofuels produced from wastes, non-agricultural residues, non-food cellulosic material, and ligno-cellulosic material receive two RTFCs per litre/kg meaning suppliers using these feedstocks only have to supply half the volume to meet their obligation.

(g) Rising from 2.5% in 2008/09 to 4.75% from 2013/14 onwards. From 15 April 2013, the end uses covered by the Renewable Transport Fuels Obligation were amended to include non-road mobile machinery (including inland waterways vessels), agriculture and forestry tractors and recreational craft when not at sea (known collectively as NRMM). To keep the supply of biofuel broadly consistent the biofuel target level was changed from 5% to 4.75% based on data supplied by industry on the volume of low sulphur gas oil used for NRMM end use.

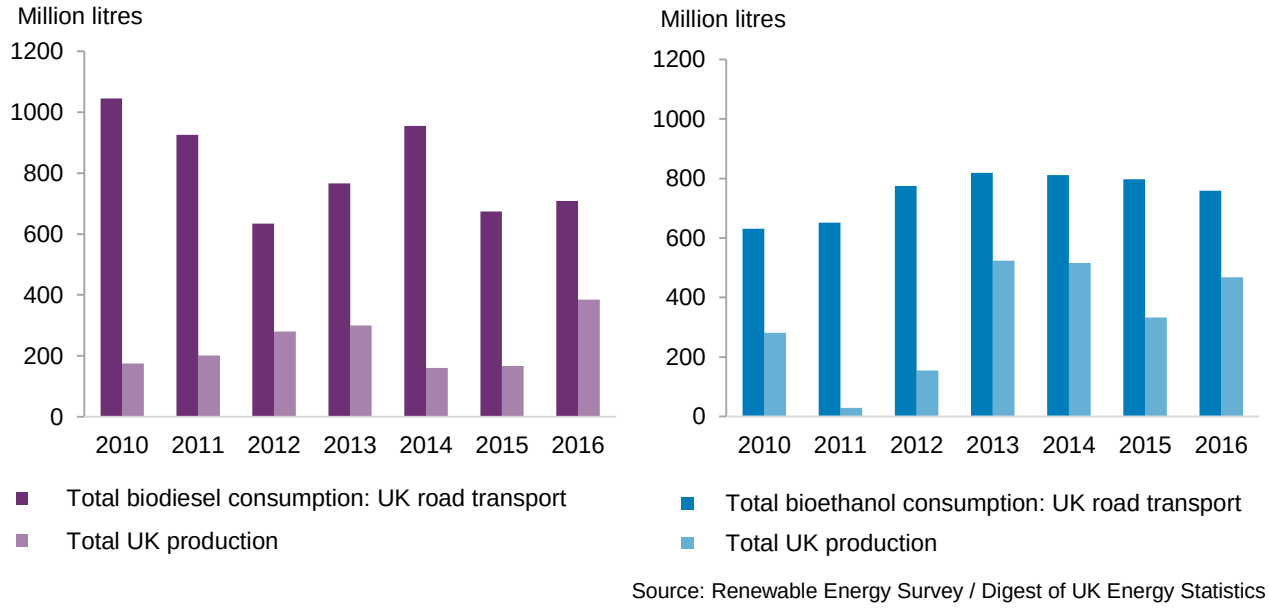
Biofuels may not be made from raw material obtained from land with high carbon stock such as forests or land that was undrained peatland in January 2008 unless strict criteria are met.

1.5 Renewable Energy STATistics (RESTATS) Questionnaire

The Department for Business, Energy and Industrial Strategy conduct an annual survey of large scale biofuel production (see Annex B for more details). The survey aims to determine total UK production of biofuels and, from 2012, included questions on the quantity and origin of crops used in UK biofuel production.

Because the survey covers all biofuel production (including that subsequently exported and for markets other than road transport) the data can help build a more complete picture of usage of UK crops for biofuel. Figure 7 compares total UK biofuel production to total biofuel supplied to the UK road transport market. Tables 4 and 5 give an estimate of the proportion of UK biofuel production from crop feedstocks and also the proportion of biofuel supplied by end use. The survey is based on calendar years.

Figure 7: UK biofuel production and biofuel supply to UK road transport market, 2010 - 2016



Source: Renewable Energy Survey / Digest of UK Energy Statistics

- At 385 million litres, UK production of biodiesel more than doubled between 2015 and 2016. This volume was around 70% of the estimated UK production capacity for biodiesel (541 million litres in 2016).

- Bioethanol production increased by 41% to 468 million litres in 2016, around half the estimated UK production capacity of 468 million litres.

Data from 2010 are available in Table G of the crops for bioenergy dataset.

Table 4: Renewable Energy Survey estimated UK biodiesel production and supply (from UK production), 2012 - 2016

	2012	2013	2014	2015	2016
% of UK biodiesel production derived from crop feedstocks	5%	44%	0%	0%	0%
% of those crop feedstocks known to be UK produced	98%	100%	0%	0%	0%
% of biodiesel supply to:					
UK road transport	99%	96%	73%	74%	83%
UK Non-Road Transport	0%	0%	1%	2%	0%
UK Heat and Power	1%	1%	1%	2%	2%
Exported[(a)]	n/a	3%	3%	22%	32%
Other	0%	0%	22%	0%	1%

(a) Proportion exported not included as a separate supply category in the 2012 survey.

Table 5: Renewable Energy Survey, estimated UK bioethanol production and supply (from UK production), 2012 - 2016

	2012	2013	2014	2015	2016
% of UK bioethanol production derived from crop feedstocks	100%	100%	100%	100%	100%
% of those crop feedstocks known to be UK produced	96%	91%	85%	97%	96%
% of bioethanol supply to:					
UK road transport	61%	63%	50%	95%	50%
UK Non-Road Transport	1%	6%	0%	5%	0%
UK Heat and Power	0%	0%	0%	0%	0%
Exported[(a)]	n/a	31%	50%	0%	50%
Other	38%	0%	0%	0%	0%

(a) Proportion exported not included as a separate supply category in the 2012 survey.

2. Plant biomass: miscanthus and Short Rotation Coppice

Miscanthus and Short Rotation Coppice (SRC) are grown as energy crops intended for the heat and electricity energy markets. They are burnt in power stations, combined heat and power units or heating systems.

2.1 Miscanthus areas

Table 6: Total area of miscanthus in England

Hectares

	2008	2009	2010	2011	2012	2013	2014	2015	2016
England	7 465	9 213	8 657	8 075	7 517	7 078	7 012	6 905	7 057
95% confidence interval	*+/- 1 097*	*+/- 2 348*	*+/- 950*	*+/- 807*	*+/- 475*	*+/- 486*	*+/- 555*	*+/- 514*	*+/- 526*
Number of growers	335	394	404	398	422	393	569	409	361

Source: Defra June Survey of Agriculture and Horticulture. Defra analysis to produce numbers of growers.

Figures prior to 2008 are only available through subsidy scheme information (see below). The Defra experimental stats release published in 2009 gives further details of these historic areas: http://webarchive.nationalarchives.gov.uk/20130315143000/http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-landuselivestock-nonfoodcrops-latestrelease.pdf

From 2008, official area estimates of miscanthus grown in England are available from the Defra June Survey of Agriculture[5]. A region breakdown for 2010, 2013 and 2016 is available in Table H of the bioenergy dataset.

- Miscanthus is grown on around 0.2% of the total arable area in England.
- Subsidy schemes provide a secondary source of area statistics. Under the Energy Crops Scheme (ECS) farmers could claim subsidies to assist with the establishment of miscanthus as part of the Rural Development Programme for England. The Energy Crops scheme closed in 2013 although planting for the scheme could be undertaken in 2013, 2014 and 2015 (more background can be found at Annex B)
- The total area of new plantings claimed under the subsidies since 2000 was around 10,000 hectares. This includes miscanthus being gown at locations other than traditional farms (for example, country parks, and universities). These locations may not be covered by the June Agricultural Survey, which recorded 7,057 hectares of miscanthus in 2016.

Full details of the areas of Miscanthus plantings under the Energy Crops Scheme in England can be found in Table I of the crops for bioenergy dataset.

[5] The apparent decrease in area from 2009 should be treated with caution as this may be due to the sampling variation in the survey (indicated by the confidence intervals), rather than a genuine decreasing area.

2.2 Miscanthus yields / production

Although research has been done on miscanthus yields, as yet no official estimates of achieved yields are available. Yields vary greatly depending on a number of factors such as planting method, species, site conditions, as well as the standard variations of region and annual weather conditions. The first year's growth is not suitable to harvest; annual harvesting takes place from the second year and can continue for 15-20 years.

Table 7: Miscanthus production based on upper and lower yield estimates[(a)]

Thousand oven dried tonnes

	2008	2009	2010	2011	2012	2013	2014	2015	2016
Lower estimate	75	92	87	81	75	71	70	69	71
Upper estimate	112	138	130	121	113	106	105	104	106

Source: Yield information taken from National Non-Food Crops Centre (NNFCC) miscanthus fact sheet at: http://www.nnfcc.co.uk/publications/nnfcc-crop-factsheet-miscanthus and on direct conversations with growers and end users.

(a) Estimates based on areas from the June Survey of Agriculture and Horticulture and yields of 10 and 15 oven dried tonnes per hectare

- Some industry experts estimate that current miscanthus yields average between 12-15 oven dried tonnes (odt) per hectare (equating to 15-18 fresh tonnes per hectare) although other industry bodies suggest a lower figure of 10 odt per hectare.

- The estimated annual volume of miscanthus produced in England based on both the upper and lower yield estimates from industry sources should be treated as broad estimates because of the yield uncertainties and the assumption that the whole of the area planted is productive, which will not be the case for recently planted crops[6].

2.3 Miscanthus usage

Usage data are collated by Ofgem as part of sustainability requirements under the Renewables Obligation. There are other outlets for using miscanthus including horse and livestock bedding, in small scale combined heat and power plants directly on farms for heating buildings and for domestic uses such as wood burners and open fires. Unfortunately, quantitative information on these end uses is not available.

- Approximately 35 thousand tonnes of miscanthus were used in UK power stations for electricity in 2015/16 (Figure 8) which was around half of all miscanthus produced in England in 2016, based on low end assumptions of yields.

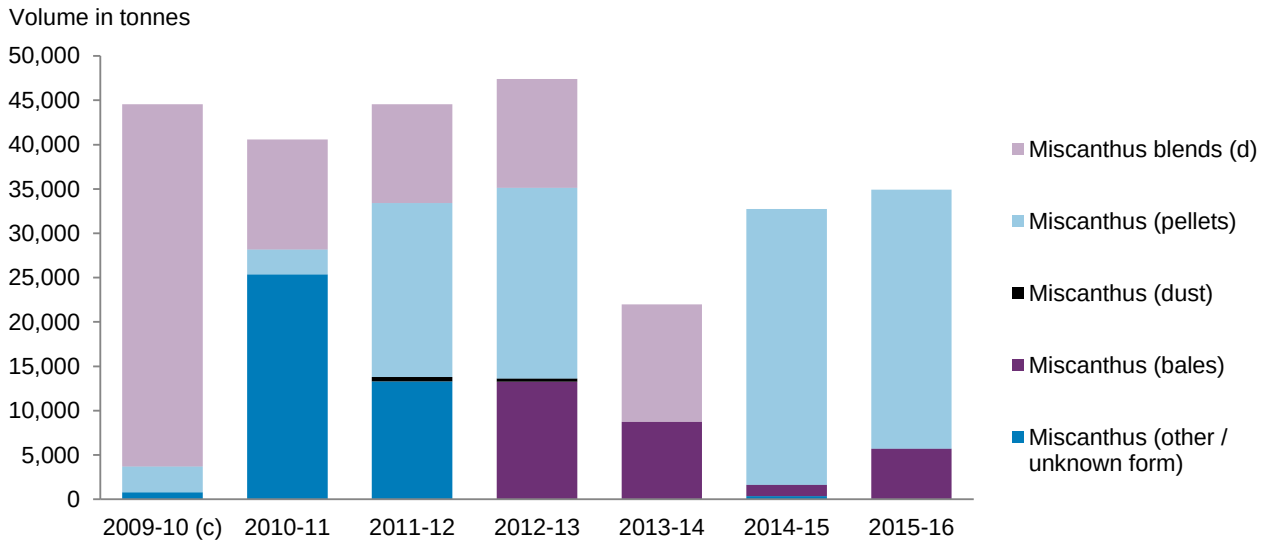
- The 2015/16 volume was a 7% increase on the previous year. 2014/15 was the first year when solid biomass and biogas stations with a total installed capacity (TIC) of 1MW or greater had to submit a sustainability audit which may have influenced the volume in that year[7].

[6] The first year's growth is not suitable to harvest; annual harvesting takes place from the second year and can continue for 15-20 years.

[7] Section 4, Renewables Obligation Annual Report 2014/15 https://www.ofgem.gov.uk/publications-and-updates/biomass-sustainability-dataset-2014-15

- The decrease in usage in 2013/14 reflects the Renewables Obligation Amendment Order which came into force in April 2013 and introduced a number of changes that reduced the incentive for power stations to use energy crops[8].

Figure 8: Miscanthus usage in UK power stations[(a)(b)]



Source: Ofgem Renewables Obligations dataset

(a) Tonnages are reported directly by the generating stations so it is not known whether these are fresh weight or oven dried equivalents.

(b) Only categories where the proportion of miscanthus was greater than 90% are included.

(c) Figures for 2009-10 have been revised to include 29 thousand tonnes of miscanthus and wood mix not previously accounted for.

(d) Blended with either cereal residues or wood.

See Annex B for details of the Ofgem Renewables Obligations dataset.

A detailed breakdown of all figures for 2009/10 to 2015/16 can be found in Table J of the crops for bioenergy dataset.

[8] Section 4, Renewables Obligation Annual Report 2013/14 https://www.ofgem.gov.uk/publications-and-updates/renewables-obligation-ro-annual-report-2013-14 Further information on energy crops can be found in chapter 2 and appendices 3 and of the fuel measurement and sampling guidance: https://www.ofgem.gov.uk/publications-and-updates/renewables-obligation-fuel-measurement-and-sampling-guidance-0

2.4 Short Rotation Coppice (SRC) - willow or poplar areas

Table 8: Total area of Short Rotation Coppice grown in England

Hectares

	2008	2009	2010	2011	2012	2013	2014	2015	2016
England total	6 216	3 721	2 591	2 720	2 551	2 650	2 849	2 885	2 962
95% confidence interval	*+/- 2 839*	+/- 1 349	*+/- 416*	*+/- 768*	*+/- 702*	*+/- 218*	*+/- 503*	*+/- 656*	*+/- 665*
Number of growers	373	381	251	228	186	230	182	361	437

Source: Defra June Survey of Agriculture and Horticulture Defra analysis to produce regional figures and numbers of growers.

A regional breakdown of SRC areas for 2010, 2013 and 2016 is available in Table K of the crops for bioenergy dataset.

- SRC (since 2009) represents less than 0.1% of the total arable area in England.
- Since 2009, the picture has been relatively stable. It is suspected that the apparent large fall in area between 2008 and 2009 is due to reduced data robustness in 2008, the first year of this data collection.
- Subsidy schemes can provide a secondary source of area statistics. The Energy Crops Scheme closed in 2013 although planting for the scheme could be undertaken in 2013, 2014 and 2015. More background can be found at Annex B
- Comparing the total area of new plantings claimed under subsidies since 2000 (around 2,500 hectares) to the 2016 Defra June Survey area (2,962 hectares) suggests that the vast majority of SRC has been grown within the subsidy payment scheme.
- Full details of the areas of SRC plantings under the Energy Crops Scheme in England can be found in Table L of the crops for bioenergy dataset.

2.5 Short Rotation Coppice yields/production

Much research has been done on SRC yields but as yet, no official estimates of achieved yields are available. SRC is harvested every 3-4 years (or more recently, every 2-3 years) and yields vary greatly according to the number of years since planting, site conditions, type of planting method, crop type (willow or poplar) as well as the standard variations of region, annual weather conditions etc.

Table 9: Short Rotation Coppice production based on upper and lower yield estimates[(a)]

Thousand oven dried tonnes

	2008	2009	2010	2011	2012	2013	2014	2015	2016
Lower estimate	37	22	16	16	15	16	17	17	18
Upper estimate	75	45	31	33	31	32	34	35	35

Source: National Non-Food Crops Centre SRC fact sheet http://www.nnfcc.co.uk/publications/nnfcc-crop-factsheet-short-rotation-coppice-src-willow, Natural England guidance to applicants of ECS http://www.naturalengland.org.uk/Images/short-rotation-coppice_tcm6-4262.pdf, Forestry Commission guidance http://www.biomassenergycentre.org.uk/portal/page?_pageid=75,18113&_dad=portal&_schema=PORTAL

(a) Estimates based on areas from the June Survey of Agriculture and Horticulture and yields of 6 to 12 oven dried tonnes per hectare.

- Industry experts at the National Non Food Crops Centre (NNFCC) estimate an average annual SRC yield of 9.4 oven dried tonnes (odt)/ha/yr (taking the average 3 yearly harvest period into account). The Forestry Commission suggest a likely average yield for SRC is in the region of 8 odt/ha/yr. Other industry experts suggest that yields are much lower than these and may be in the region of 6 odt/ha/yr.

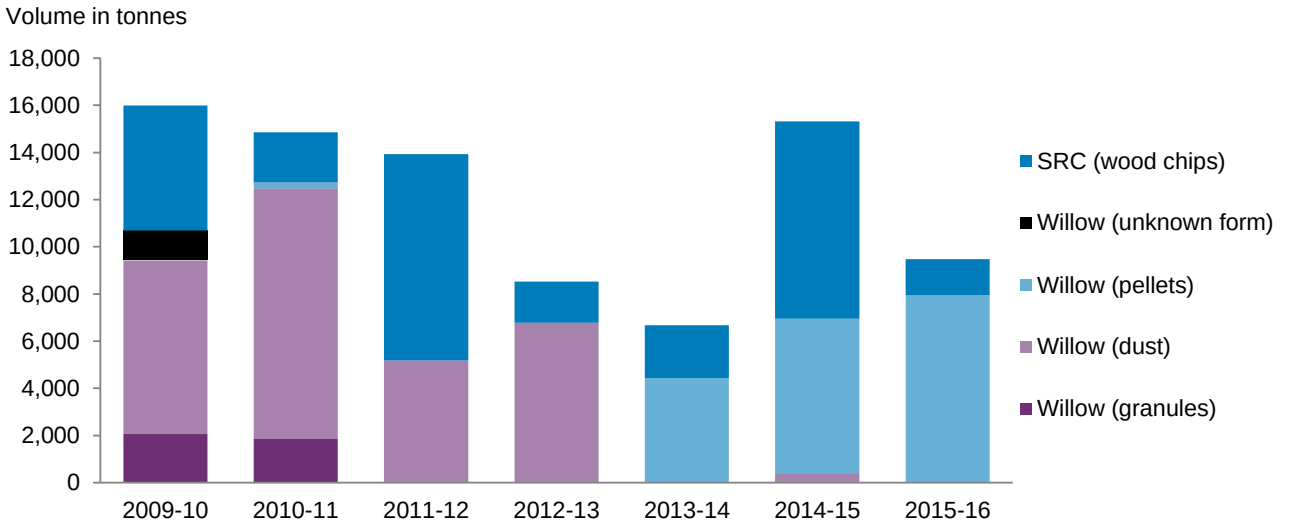
- Table 9 shows the estimated volume of SRC produced in England each year based on both the upper and lower yield estimates of 12 odt/ha and 6 odt/ha. These figures should be treated as broad estimates rather than definitive figures as there is much uncertainty behind the estimates

- Total SRC production in England was around 18 thousand tonnes in 2016, based on low end assumptions of yields.

2.6 Short Rotation Coppice usage

The volume of UK produced SRC Willow which was used in power stations is collated by Ofgem, as part of sustainability requirements under the Renewables Obligation. SRC is suited to a range of heat and power generation systems down to domestic level (not captured here). There are few other end uses.

Figure 9: Short Rotation Coppice usage in UK power stations[(a)]



Source: Ofgem Renewables Obligations dataset

(a) Tonnages are reported directly by the generating stations so it is not known whether these are fresh weight or oven dried equivalents.

Source: Ofgem Renewables Obligations dataset. See Annex B for details.

A detailed breakdown of all figures for 2009/10 to 2015/16 can be found in Table M of the crops for bioenergy dataset.

- Approximately 9 thousand tonnes of SRC were used in UK power stations for electricity in 2015/16, 38% less than the volume used in the previous year (Figure 9). 2014/15 was the first year when solid biomass and biogas stations with a total installed capacity (TIC) of 1MW or greater had to submit a sustainability audit which may have influenced the increase seen then[9].

[9] Section 4, Renewables Obligation Annual Report 2014/15 https://www.ofgem.gov.uk/publications-and-updates/biomass-sustainability-dataset-2014-15

- The decrease between 2012/13 and 2013/14 reflects the Renewables Obligation Amendment Order which came into force in April 2013 and introduced a number of changes that reduced the incentive for stations to use energy crops[10].

- The volume of SRC used in UK power stations was around half of all the SRC produced in England in 2016, based on low end assumptions of yields.

2.7 Volumes of biomass used in the UK for energy

Data from the Department for Business, Energy and Industrial Strategy (BEIS) in the Digest of UK Energy Statistics, "DUKES", publication show the volumes of plant biomass used in the UK for energy (the figures represent the energy content of the fuel used). These figures cover all plant biomass, which includes, but is not restricted to, miscanthus and SRC.

As plant biomass comprises a variety of materials, it is not possible to convert these DUKES values from tonnes of oil equivalent to volumes or raw materials in tonnes. Nevertheless, these data are useful for showing trends in plant biomass usage over time.

Table 10: Trends in plant biomass derived fuel used in the UK to generate heat and electricity: 2011-2016

Thousand tonnes of oil equivalent

	2012	2013	2014	2015	2016	% change 2015/16
Total plant biomass used for heat /electricity	1 748	2 481	3 499	4 723	4 998	6
Of which:						
Used to generate electricity	1 463	2 062	2 938	3 885	3 896	0
Co-firing with fossil fuels	401	54	25	38	25	-35
Plant Biomass [(a)]	1 062	2 008	2 913	3 848	3 871	1
Used to generate heat (plant biomass only)[(b)]	285	419	561	838	1 102	32
Percentage used for electricity	84%	83%	84%	82%	78%	

Source: Table 6.6 from Chapter 6 of the DECC Digest of UK Energy Statistics (DUKES) 2017
https://www.gov.uk/government/statistics/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes

(a) Includes straw combustion and energy crops.

(b) Includes heat from straw, energy crops, paper and packaging.

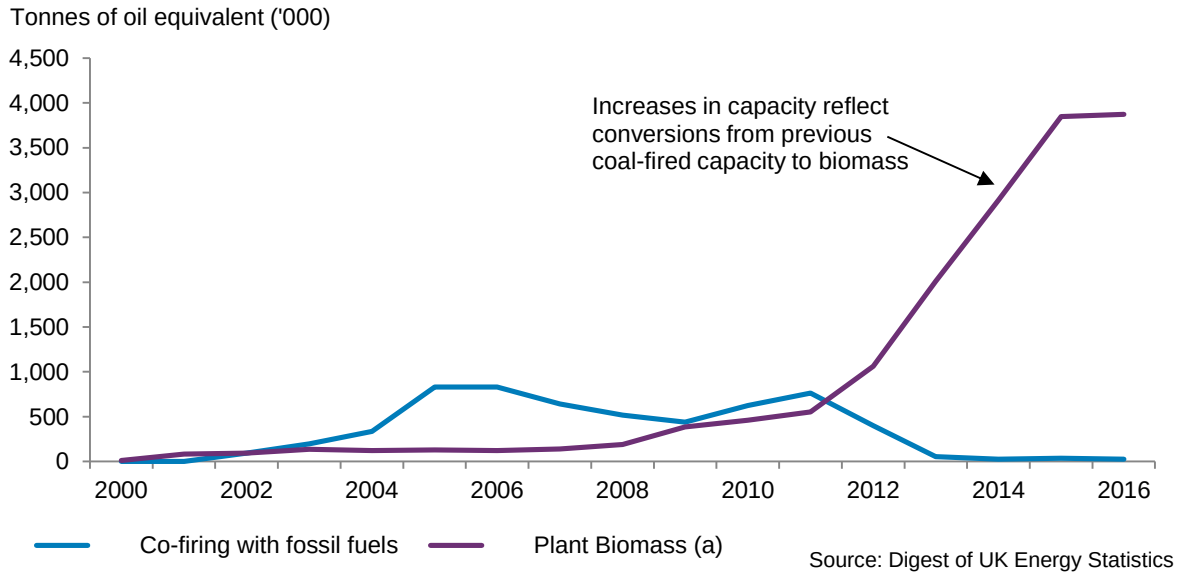
For a time series from 2009 see Table N in the crops for bioenergy dataset.

- Around 80% of plant biomass is used for generating electricity. This has remained stable despite the increase in overall use.

- There was little change in the volume of plant biomass used to generate electricity in 2016 compared to 2015, Figure 10. Increases in the preceding years reflect continued conversions from previously coal-fired capacity to biomass.

[10] Section 4, Renewables Obligation Annual Report 2013/14 https://www.ofgem.gov.uk/publications-and-updates/renewables-obligation-ro-annual-report-2013-14 Further information on energy crops can be found in chapter 2 and appendices 3 and 4 of the fuel measurement and sampling guidance: https://www.ofgem.gov.uk/publications-and-updates/renewables-obligation-fuel-measurement-and-sampling-guidance-0

Figure 10: Volume of plant biomass used for electricity: 2000 to 2016



(a) Includes straw combustion and energy crops

3. Plant biomass: straw

Straw is a by-product of the cereals industry. It is used for animal bedding, as animal feed and, to a small extent, as an energy crop to be burnt for heating and electricity in power stations and combined heat and power units.

3.1 UK Straw availability and usage

Figure 11: Selected UK cereal areas at June each year

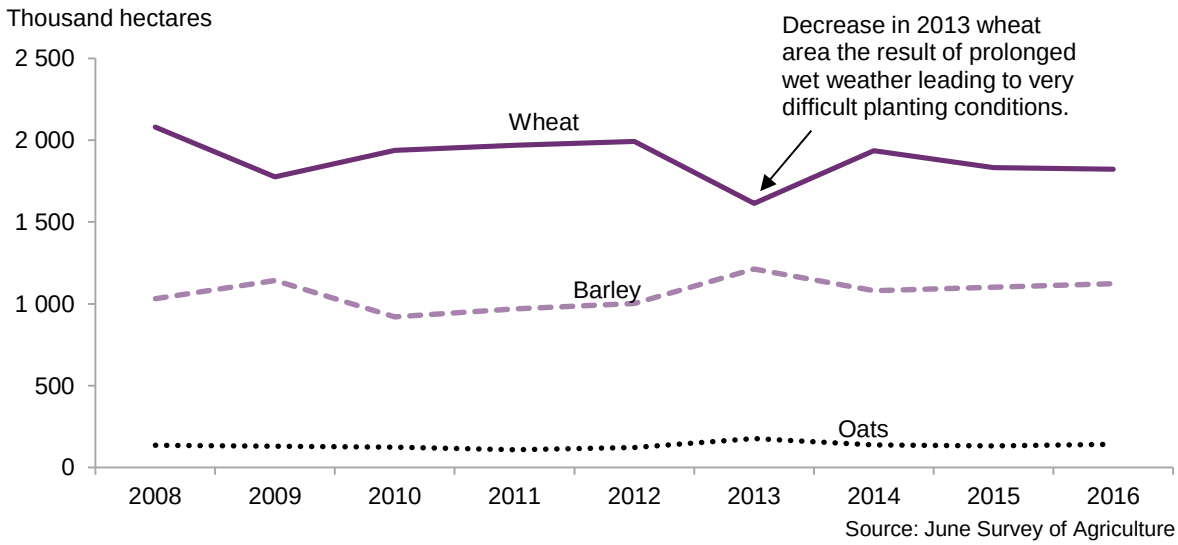
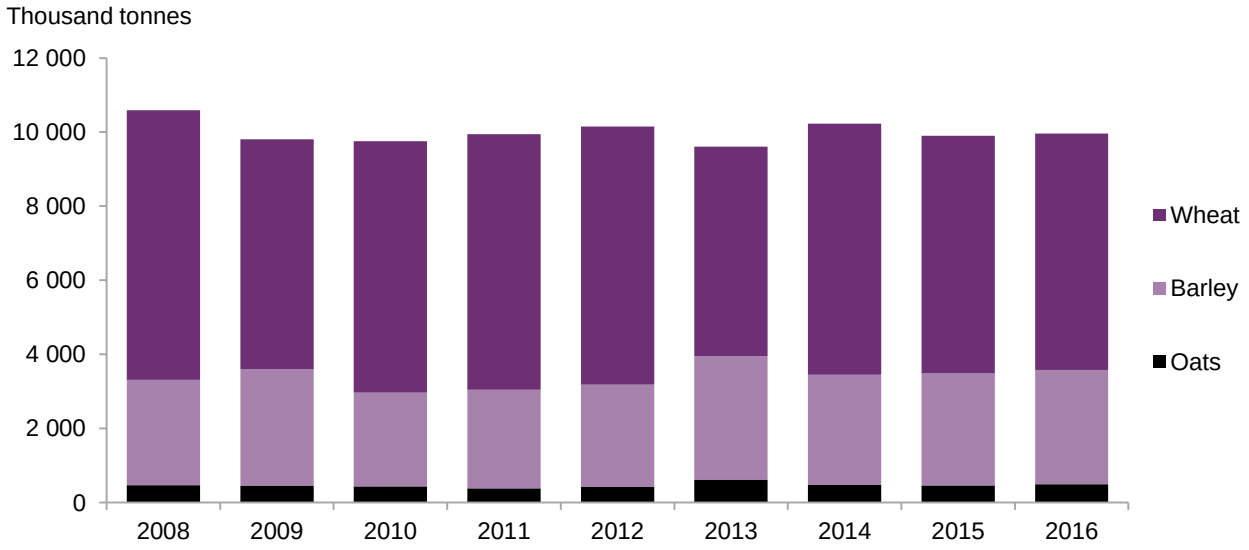


Figure 12: UK estimates of cereal straw production based on survey areas and typical straw yields



- Figure 12 gives some broad estimates of production (yields can vary by up to 30% depending on harvest conditions).

- UK cereal straw production is generally around 9 to 10 million tonnes per year with typical yields of 3.5 tonnes/ha for wheat and oats and 2.75 tonnes/ha for barley. These yields are based on industry information and qualitative expert opinion.

A longer time series for cereal areas and estimated yields can be found in the crops for bioenergy dataset, Tables O and P.

Since 2014, Defra's Cereal and Oilseed Production Survey, which covers England, has included questions on straw yield. The results are shown in Table 11 and provide a useful comparison to the UK level industry information in Table 12.

Table 11: Estimates of cereal and oilseed rape straw production, England

		2014	2015	2016
Wheat	Area (thousand hectares)	866	724	751
	Production (thousand tonnes)	3,527	3,021	3118
	Yield (tonnes per hectare)	4.1	4.2	4.2
Barley	Area (thousand hectares)	532	585	566
	Production (thousand tonnes)	2,037	2,347	2115
	Yield (tonnes per hectare)	3.8	4.0	3.7
Oats	Area (thousand hectares)	71	50	55
	Production (thousand tonnes)	270	196	240
	Yield (tonnes per hectare)	3.8	3.9	4.4
Oilseed rape	Area (thousand hectares)	48	37	39
	Production (thousand tonnes)	119	115	106
	Yield (tonnes per hectare)	2.5	3.1	2.7

Source: Defra Cereal & Oilseed Production Survey

Table 12: Estimates of cereal straw supply and demand in the UK, 2016

UK Supply/Demand	Thousand tonnes	% of cereal straw production	Implied cereal area ('000 ha)[a]
Cereal straw availability[b]	10 400		3 087
Cereal straw usage:			
Animal bedding[b]	5 800	56%	1 721
Animal feed[b]	2 000	19%	594
Mushroom industry[c]	40	0%	12
Carrots[d]	405	4%	120
Power stations[e]	560	5%	166
Surplus cereal straw resource available in the UK for other markets	1 595	15%	473

(a) Area of wheat, barley and oats. Implied areas are calculated as the % of cereal straw production multiplied by the 2016 cereal area.

(b) Tonnages sourced from AEA, 2010: AEA 2010 UK and Global Bioenergy Resource. Annex 1 report: details of analysis http://www.decc.gov.uk/assets/decc/What%20we%20do/UK%20energy%20supply/Energy%20mix/Renewable%20energy/policy/1465-aea-2010-uk-and-global-bioenergy-annex.pdf

(c) Tonnages sourced from CSL, 2008: National and regional supply/demand balance for agricultural straw in Great Britain http://www.nnfcc.co.uk/tools/national-and-regional-supply-demand-balance-for-agricultural-straw-in-great-britain via http://www.northwoods.org.uk/files/northwoods/StrawAvailabilityinGreatBritain.pdf

(d) Agriculture and Horticulture Development Board http://www.ahdb.org.uk/projects/straw.aspx

(e) Tonnages sourced from Ofgem: https://www.ofgem.gov.uk/publications-and-updates/biomass-sustainability-dataset-2014-15

- It is estimated that around 10 million tonnes of cereal straw is produced in the UK each year. Normally around 60% of the straw produced can be baled and used; the remaining stubble is incorporated back into the soil. The two main uses of straw are livestock bedding and feed.

- Around 560 thousand tonnes of straw (5% of total straw production) was used as fuel in biomass power stations in England in 2015/16. The figures suggest a net surplus of straw availability in the UK. However, as straw is bulky and costly to transport, much straw usage occurs close to the source so there can be much greater regional variation in the supply/demand balance[11].

- From 2014 Defra's Cereal and Oilseed Production Survey has included questions on the end use of straw. Table 13 shows the proportion of straw by end use. Whilst these figures cover England only, they broadly in line with the UK estimates in Table 12.

Table 13: End use of cereal and oilseed rape straw England, 2014 - 2016

	% of straw production		
End usage[a]	2014	2015	2016
Home use bedding / feed	40%	51%	37%
Home use biomass	0.3%	0.3%	1%
Home use for other purposes	1%	0.5%	1%
Sold / exchanged for feed / bedding	42%	36%	41%
Sold for biomass	5%	3%	5%
Sold for other purposes	11%	9%	15%

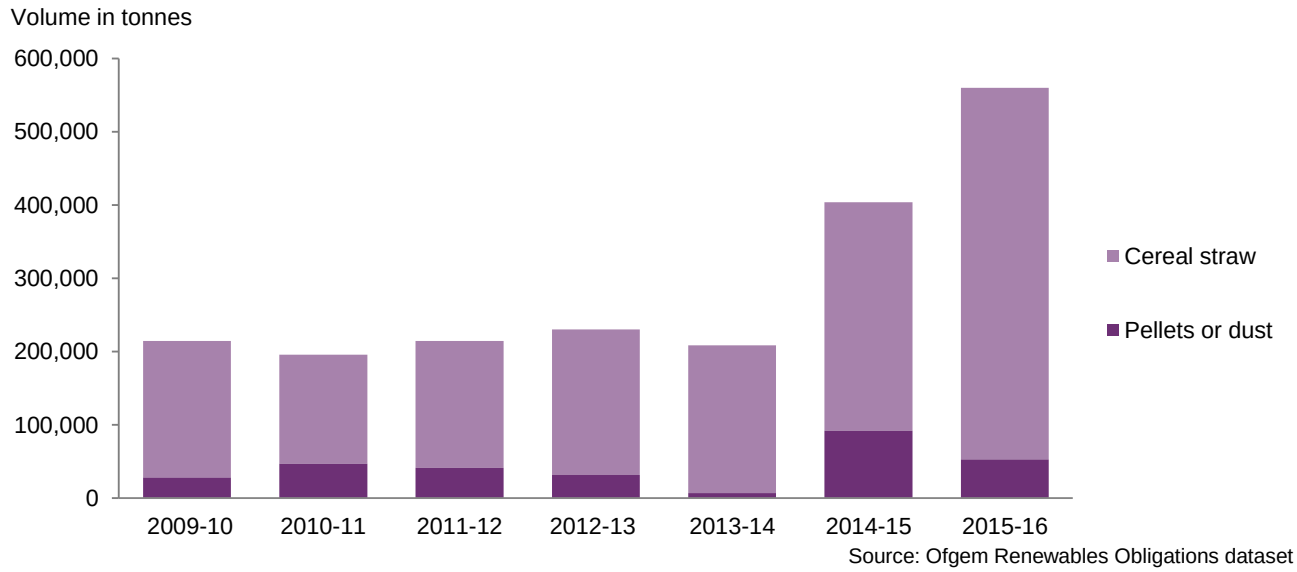
Source: Defra Cereal and Oilseed Production Survey

(a) End usage includes a small number of holdings with Rye straw tonnage

[11] Regional surpluses of straw occur in the largely arable Eastern regions of the UK. The Western, and typically livestock regions need to bring in straw to meet local demand. More details of regional variation can be found in Section 3.2 at : https://www.gov.uk/government/statistics/area-of-crops-grown-for-bioenergy-in-england-and-the-uk-2008-2012

3.7 Power station usage of straw

Figure 13: Straw usage in UK power stations[(a)]



Source: Ofgem Renewables Obligations dataset

(a) Tonnages are reported directly by the generating stations so it is not known whether these are fresh weight or oven dried equivalents.

For more details of the Ofgem Annual Sustainability dataset and report see Annex B.

- Data collated by Ofgem as part of sustainability requirements in the Renewables Obligation indicate that in 2015/16, 560 thousand tonnes were used by power stations (these were all in England). This was a 39% increase on 2014/15 reflecting new straw-fired plant capacity. The increase between 2013/14 and 14/15 was influenced by a number of factors including: new power plants, conversion of previously coal-fired capacity to biomass and the new requirement that solid biomass and biogas stations with a total installed capacity (TIC) of 1MW or greater had to submit a sustainability audit[12]

- A detailed breakdown of all figures for 2009/10 to 2015/16 can be found in Table Q of the crops for bioenergy dataset.

- With another large scale straw fired plant becoming operational in 2017, potential straw consumption could increase by around 250 thousand tonnes in the coming year[13].

[12] Section 4, Renewables Obligation Annual Report 2014/15 https://www.ofgem.gov.uk/publications-and-updates/biomass-sustainability-dataset-2014-15

[13] https://www.snettertonbiomass.com/

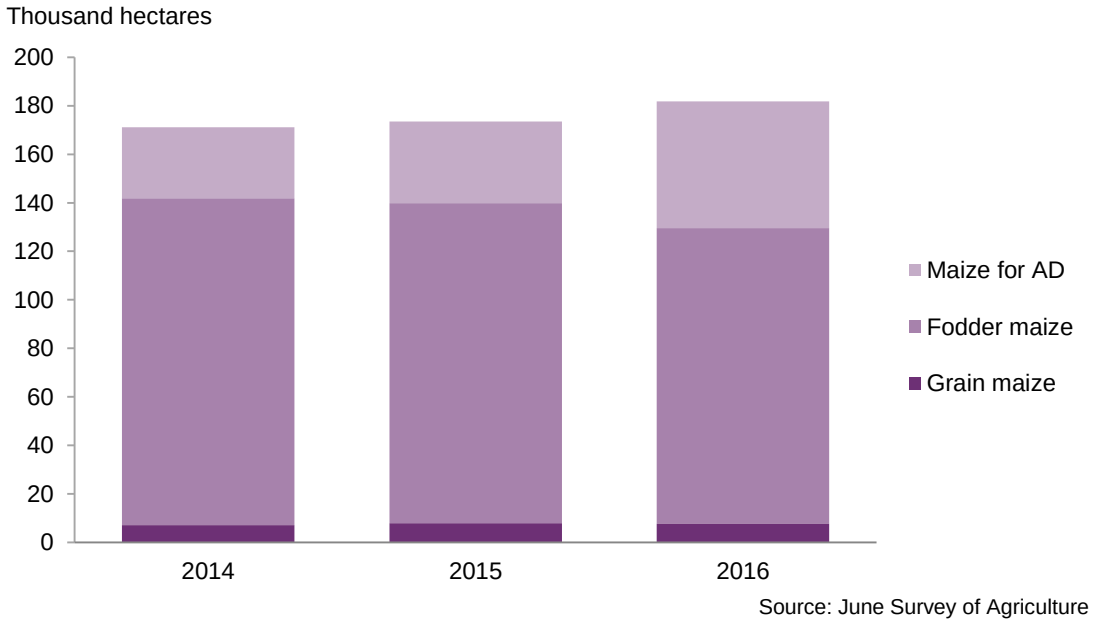
4. Anaerobic digestion

Waste and purpose-grown crops can be used to produce bioenergy through the process of anaerobic digestion. Anaerobic digestion (AD) is a natural process in which plant and animal materials are converted into useful products by micro-organisms in the absence of air. The process releases a methane rich gas which can be used to provide heat, power or transport fuel while the remaining material is rich in nutrients and can be used as a fertiliser. The types of materials suitable for AD include food waste, slurry and manure, crops and crop residues.

4.1 Types of crops used as feedstocks

Types of crops suitable for use as feedstocks include maize, grass and oilseeds. Official statistics on the amount and type of crops grown used for AD are currently limited to maize. We will be exploring possible ways to gather crop feedstock data in the future.

Figure 14: Maize by intended usage, England



Source: June Survey of Agriculture

- The June Survey of Agricultural and Horticulture asked farmers in England to specify the end purpose of their maize for the first time in 2014.

- At June 2016 the area of maize being grown for AD was 52,280 hectares. This was an increase of 55% on 2015 and equates to 29% of the total maize area in 2016 and 1% of the total arable area.

4.2 Use of purpose grown crops as feedstocks for AD

The latest data available on crops grown crops for AD feedstocks are for 2013. Details of these can be found in Section 4 of the 2016 release of these statistics at:
https://www.gov.uk/government/collections/non-food-crops

Use of the statistics

Annual estimates of crop areas of oilseed rape, sugar beet, wheat, maize, miscanthus, short rotation coppice and straw crops grown in the UK for use as bioenergy are used by government policy advisors, non-food crop promoters and processors.

Blended in small quantities with fossil fuels, bioethanol (used in petrol) and biodiesel (used in diesel) can be used in today's road vehicles. These biofuels play an important role in the UK plan to meet the target set in the European Renewable Energy Directive 2009 (EU Directive 2009/28/EC http://ec.europa.eu/energy/renewables/biofuels/biofuels_en.htm) for 10% of final energy consumption in the transport sector to be supplied from renewable sources by 2020.

The Renewable Transport Fuels Obligation (RTFO) is one of the Government's main policies for reducing greenhouse gas emissions from road transport in the UK by encouraging the supply of renewable fuels. Obligated suppliers must supply a certain percentage[14] of their road transport fuel as biofuel, or purchase Renewable Transport Fuel Certificates or pay in to the buy-out fund for the shortfall. Further details can be found at: https://www.gov.uk/renewable-transport-fuels-obligation

The use of biofuels also supports other Government objectives to improve security of energy supply and rural development[15].

Data sources

These statistics, which are from a range of sources, are a secondary analysis of data that have already been published. Although much of the source data are published as National Statistics, there are limitations to these statistics and these are described within each section.

This section gives details of the three main data sources, more detailed information on these and the other sources used can be found in Annex B

- *The June Survey of Agriculture and Horticulture* collects information from farmers on the area of crops grown in the UK at the 1st June each year. In general farmers are not asked about their intended end use for the crops. For crops such as oilseed rape, wheat and sugar beet, where there are multiple end uses, reference has been made to other existing data sources on usage in order to try and establish the crop production and area associated with crops grown for bioenergy by applying appropriate conversion factors to the data collected on biofuel production. From 2014 the June Survey asked farmers to indicate the intended end use of their maize to help determine the proportion intended for used as an anaerobic digestion feedstock.

[14] Rising from 2.5% in 2008/09 to 4.75% from 2013/14 onwards. From 15 April 2013, the end uses covered by the Renewable Transport Fuels Obligation were amended to include non-road mobile machinery (including inland waterways vessels), agriculture and forestry tractors and recreational craft when not at sea (known collectively as NRMM). To keep the supply of biofuel broadly consistent the biofuel target level was changed from 5% to 4.75% based on data supplied by industry on the volume of low sulphur gas oil used for NRMM end uses.

[15] https://www.gov.uk/government/policies/maintaining-uk-energy-security--2 https://www.gov.uk/government/news/15m-fund-for-rural-energy-projects-opens-to-applications

The latest June Survey UK results can be found at:
https://www.gov.uk/government/statistics/farming-statistics-provisional-crop-areas-yields-and-livestock-populations-at-1-june-2017-united-kingdom

- *Renewable Transport Fuels Obligation data* (collected by the Department for Transport). This data source provides information on the volume of biofuel supplied to the UK road transport market. It includes a breakdown of information by fuel type (e.g. biodiesel, bioethanol) and by feedstock used (e.g. oilseed rape, used cooking oil, sugar beet) and the country of origin of the feedstock. By applying relevant conversion factors, it is possible to derive the equivalent UK crop tonnages used (for oilseed rape, sugar beet and wheat) and UK crop areas.

  Data are supplied by obligated companies supplying more than 450,000 litres of road transport fuel in a given year (the reporting year runs mid-April to mid-April) and by biofuel companies wishing to trade in the renewable transport fuel certificate (RTDC) market. The obligated companies supply more than 95% of the biofuels in the UK market. The main limitation of the data is that it does not include UK crops or biofuel produced from UK crops which may be exported and used outside the UK or that goes to end uses other than road transport. Questions included in the Renewable Energy STATistics (RESTATS) Questionnaire (see below) help give an indication of the fuller picture.

- *Renewable Energy STATistics (RESTATS) Questionnaire* (collected by the Department for Business, Energy and Industrial Strategy). The purpose of this survey is to determine UK production of biofuels. Since 2012, the survey has also asked questions on the type and origin of feedstocks for the first time. This provides an indication of the volume of UK grown crops which are processed into biofuels for use other than road transport and any that may be produced for export. With the data reported under the RTFO (described above) it helps build a more complete overall picture.

Annex A: Glossary of terms and conversion factors

Definition of biodiesel and bioethanol (*Source: Chapter 6, paragraph 6.115 and 6.116 of DUKES* 2017)

In the UK biodiesel is defined for taxation purposes as diesel quality liquid fuel produced from biomass or waste vegetable and animal oils and fats, the ester content of which is not less than 96.5 per cent by weight and the sulphur content of which does not exceed 0.005 per cent by weight[16]. Biodiesel can be blended in low proportions with fossil diesel for use in diesel engines. Diesel fuel currently sold at retail outlets in the UK can contain up to 7 per cent biodiesel.

Bioethanol a liquid fuel consisting of ethanol produced from biomass. Bioethanol can becblended with petrol at low proportions for use in petrol engines. Petrol currently sold in at retail outlets in the UK can contain up to 5% bioethanol. Since March 2013 a revised petrol standard (EN228) allows retailers to sell petrol containing up to 10% ethanol by volume (E10), if appropriately labelled[17].

Conversions

- Tonnes of oil equivalent to gigajoules
  1 tonne of oil equivalent=41.868 gigajoules.

  Source DUKES Chapter 1 (Energy) paragraph 1.28.
  https://www.gov.uk/government/statistics/energy-chapter-1-digest-of-united-kingdom-energy-statistics-dukes

- Calorific values of fuels to convert gigajoules to tonnes are available at Annex A of DUKES, A.1 and A.2:
  https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/642725/Annex_A.pdf

  Megajoules to litres
  Bioethanol= 23.6 megajoules per litre,
  Biodiesel= 34.4 megajoules per litre.

  Source: Direct from DECC Energy Statistics team

- Litres to tonnes
  429 litres biodiesel = 1 tonne oilseed rape
  101 litres bioethanol = 1 tonne sugar beet
  367 litres bioethanol = 1 tonne wheat grain (at 15% moisture)
  317 litres of bioethanol = 1 tonne of barley
  418 litres of bioethanol = I tonne of corn

  Source: Department for Transport https://www.gov.uk/government/publications/rtfo-guidance and The National Non-Food Crops Centre

[16] https://www.gov.uk/government/publications/excise-notice-179e-biofuels-and-other-fuel-substitutes/excise-notice-179e-biofuels-and-other-fuel-substitutes

[17] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/232126/petrol-protection-extention-ia.pdf

Annex B: Background information on key data sources

B.1 Renewable Transport Fuels Obligation (RTFO)

The Department for Transport (and the Renewable Fuels Agency pre-2011) produce statistics on the volumes of biofuels supplied to the UK road market under the Renewable Transport Fuels Obligation (RTFO). Published reports include information on the volumes of fuel supplied to the UK road market:

- by fuel type (e.g. biodiesel, bioethanol);
- by feedstock (e.g. oilseed rape, used cooking oil, sugar beet);
- by country of origin (e.g. UK); and
- whether it meets sustainability standards and the lifecycle greenhouse gas savings of fuels.

Therefore it is possible to derive information on the volumes of UK grown crops and equivalent crop areas which have been used to supply biofuel to the UK road transport market.

Prior to December 2011 these data were supplied monthly to the RTFO Administrator by fuel suppliers and were verified annually. Reports are released quarterly. Verified year 1 (April 2008 to March 2009), verified year 2 (April 2009 to March 2010) are available and verified year 3 (April 2010 to March 2011) data are all available on the Department for Transport website at: https://www.gov.uk/renewable-transport-fuels-obligation.

Since the implementation of the Renewable Energy Directive[18] in December 2011 data must be verified prior to submission to the RTFO Administrator. The verified data are available as follows:
2011/12 (Year 4) https://www.gov.uk/government/statistics/biofuel-statistics-year-5-2012-to-2013-report-6
2013/12 (Year 5) https://www.gov.uk/government/statistics/biofuel-statistics-year-5-2012-to-2013-report-6
2013/14 (Year 6) https://www.gov.uk/government/statistics/biofuel-statistics-year-6-2013-to-2014-report-6 and for 2013/15
2014/15 (Year 7) https://www.gov.uk/government/statistics/biofuel-statistics-year-7-2014-to-2015-report-6
2015/16 (Year 8) https://www.gov.uk/government/statistics/biofuel-statistics-year-8-2015-to-2016-report-6

The RTFO data include:

- Biofuels from UK grown and imported crops (these are presented separately in the tables)
- Biofuels supplied to the UK road transport sector
- Data from organisations that supply more than 450,000 litres of road transport fuel in a given year. These obligated companies supply more than 95% of the biofuels in the UK market.
- Data from suppliers of less than 450,000 litres a year where they have chosen to apply for Renewable Transport Fuel Certificates.

[18] This is a European Directive which sets out sustainability criteria which biofuels must meet in order to count towards Member State's targets. These criteria cover protection of land (carbon stocks and biodiversity) and set minimum greenhouse gas savings that increase over time https://ec.europa.eu/energy/en/topics/renewable-energy/renewable-energy-directive

The RTFO data exclude:

- UK biofuel or biofuel feedstock production which may subsequently be exported.
- Producers of less than 450,000 litres of road transport fuel per year who do not claim Renewable Transport Fuel Certificates (RTFCs). However it is not expected that there are many small producers excluded from the RTFO statistics.
- Prior to the implementation of the Renewable Energy Directive[19] (RED) in December 2011, biofuel producers who did not use any fossil fuels (i.e. only supplied biofuels) and did not claim Renewable Transport Fuel Certificates were excluded. For the same reason as above, it is not expected that there were many of these excluded from the RTFO statistics. Following the implementation of the RED only biofuel producers who supply less than 450,000 litres are excluded.

B.2 Renewable Energy STATistics (RESTATS) Questionnaire

From 2010, to estimate the volume of biofuels produced in the UK, an annual renewable energy survey has been carried out by The Department for Business, Energy and Industrial Strategy (formally The Department for Energy and Climate Change). Neither HMRC or RTFO figures can be used for this purpose since they include both UK produced fuels and imports. The survey is carried out by Ricardo Energy & Environment on behalf of BEIS. The production companies are contacted directly in combination with a survey of UK biofuels production capacity that is required by the EU (Reg. 833/2010). The data include estimates for very small scale production (for personal use), though this makes a very small contribution to the totals.

The reports include UK production of biodiesel and bioethanol, the proportion supplied to the UK road market and the percent of biofuel from UK sources together with information on production capacity.

Results or 2010 can be found in DECC/Ricardo-AEA Ltd "RESTATS: UK Production of Biofuels for transport in 2010 - Abstract" at: https://restats.decc.gov.uk/cms/assets/Uploads/Results_2010/ABSTRACT-UKBiofuelsProduction2010v2.pdf

For 2011 in DECC/Ricardo-AEA Ltd "RESTATS: UK Production of Biofuels for transport in 2011 - Abstract" at: https://restats.decc.gov.uk/cms/assets/Uploads/Results_2011/ABSTRACT-UK-Biofuels-Production-2011v1FINAL.pdf

For 2012 in DECC/Ricardo-AEA Ltd "RESTATS: UK Production of Biofuels for transport in 2012 - Abstract" at: https://restats.decc.gov.uk/cms/assets/Uploads/Results_2012/ABSTRACTS-UK-Biofuels-Production-2012-v1.pdf

Further details on the Liquid Biofuels survey are available on page 7 at: http://www.decc.gov.uk/assets/decc/statistics/source/renewables/60-renewable-statistics-methodology.pdf

[19] This is a European Directive which sets out sustainability criteria which biofuels must meet in order to count towards Member State's targets. These criteria cover protection of land (carbon stocks and biodiversity) and set minimum greenhouse gas savings that increase over time. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=Oj:L:2009:140:0016:0062:en:PDF

Data from the renewable energy survey also feeds into the Digest of UK Energy Statistics (DUKES) which is again produced by The Department for Business, Energy and Industrial Strategy. The digest is a comprehensive source of energy information and can be found at: https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes

B3. Cereal and Oilseed Rape Production Survey

The Cereal and Oilseed Rape Production Survey gathers data on production tonnages and moisture content for various cereal and oilseed crops. It also verifies data gathered from the June Survey of Agriculture on planted areas for these crops. These data are then used to calculate average yield estimates for each crop type. These were used in calculations of the areas of crops used for biofuel production. In 2014 questions were on straw production and usage where introduced. The latest results from the cereal and oilseed rape production survey can be found at: https://www.gov.uk/government/statistics/farming-statistics-provisional-crop-areas-yields-and-livestock-populations-at-1-june-2017-united-kingdom

B4. Energy crops scheme

Farmers were able to claim subsidies under the Energy Crops Scheme (ECS) to assist with the establishment of miscanthus and short rotation coppice as part of the Rural Development Programme for England (RDPE). This scheme was administered by Natural England and comprised two rounds:

- ECS1 (2000-2006/7) which paid a flat rate to help farmers establish new plantings of the crop.
- ECS2 (2007-2013) which pays 50% of all costs incurred in establishing the crop.

The second Energy Crops scheme closed in 2013 although planting for the scheme could be undertaken in 2013, 2014 and 2015.

B5. Ofgem Renewable Obligation Annual Report - Biomass Sustainability Dataset

The concept of sustainability was introduced into the Renewables Obligation (RO) in April 2009 and required operators to submit information on the sustainability of their fuels to Ofgem. The report contains profiling information submitted by the operator regarding the sustainability characteristics of their fuel such as: type of biomass, form of biomass, country of origin and whether it conforms to any environmental quality assurance standards. Datasets for each year are available as follows:

http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=318&refer=Sustainability/Environment/RenewablObl/FuelledStations/ro-sustainability (2010/11 data)
http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=248&refer=Sustainability/Environment/RenewablObl/FuelledStations/ro-sustainability (2009/10 data)
https://www.ofgem.gov.uk/publications-and-updates/annual-sustainability-report-2011-2012 (2011/12 data)
https://www.ofgem.gov.uk/publications-and-updates/biomass-sustainability-dataset-2012-13 (2012/13 data)
https://www.ofgem.gov.uk/publications-and-updates/biomass-sustainability-dataset-2013-14 (2013/14 data)
https://www.ofgem.gov.uk/publications-and-updates/biomass-sustainability-dataset-2014-15 (2014/15 data)
https://www.ofgem.gov.uk/publications-and-updates/biomass-sustainability-dataset-2015-16 (2015/16 data)

Annex C: Background information on crops used for bioenergy

C1. Sugar beet

Production of sugar from beet in the UK has been governed by EU regulations, collectively known as the EU sugar regime. In 2006 there was substantial reform of the EU sugar regime, aimed at reducing EU sugar production to more sustainable levels. Key changes included reductions in beet sugar production quotas and changes in the rules applying to any sugar made in excess of the quotas. British Sugar are the sole quota holder in the UK and the reforms led to significant restructuring of their business, with closure of the Allscott and York factories after the 2006/07 campaign and contract tonnage re-allocated to growers closer to the remaining four factories. Furthermore, the UK's first bioethanol plant was constructed at the Wissington factory. Opening in November 2007, it provided an outlet for sugar beet produced above the quota. From 2008/9 onwards the quota was 1,056,474 tonnes of sugar (equivalent to around 6 million tonnes of sugar beet). This quota applied until 30 September 2017, after which sugar production quotas were abolished.

Data reported under the RTFO have been used to estimate the equivalent tonnage and crop area of sugar beet used to produce bioethanol (Figure 3).