



26 March 2019

## Total factor productivity of the UK agriculture industry

### Revised Estimates for the period 1973 to 2017

This release revises and replaces the second estimate of Total Factor Productivity (TFP) of the UK agriculture industry for 2017 published in November 2018. This corrects an error identified in the results for the overall volume of inputs and Total Factor Productivity. Full details and associated revisions are given on page 2 of this publication.

Total factor productivity is a measure of how well inputs are converted into outputs giving an indication of the efficiency and competitiveness of the agriculture industry. While external factors such as weather conditions or disease outbreaks may have short term impact on productivity, it is developments in productivity over a longer period that constitute one of the main drivers of agricultural income. This release also presents volume indices for inputs and outputs.

### Key points for 2017

- Total factor productivity is estimated to have increased by +2.8% between 2016 and 2017. This is driven by an increase in overall levels of production partly offset by a smaller rise in volumes of inputs.
- The volume of all outputs increased by +3.4% from the low levels seen in 2016.
- The volume of all inputs increased by only +0.6%, considerably lower than the increase in output volumes.

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## Details of the error and revisions to estimates

An error has been identified in the calculation of TFP. The overall volume index for all inputs was found to be double counting the volume of labour. The error affects only the indices for the total volume of inputs and TFP. All other measures including those for partial productivity are unaffected. This error has been traced back and found to exist for all estimates published between April 2016 and November 2018.

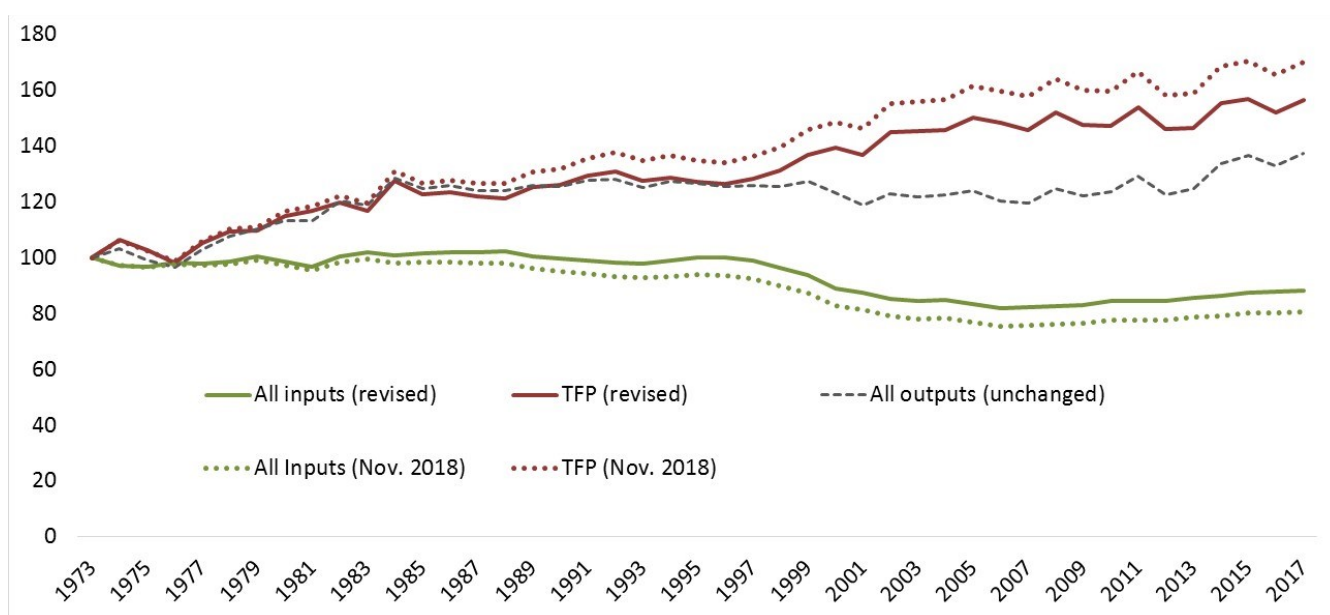
The impact of this error is small when using the series based on 2010=100 and when comparing year on year change. The change in the volume of inputs between 2016 and 2017 has been revised from +0.7% to +0.8% and the change for TFP has been revised from +2.7% to 2.8% (Table A). However, the cumulative impact of this error means that the impact is greater for the longer term time series presented using 1973 as the base year (Figure 1). Revised data for the long term time series can be found in the accompanying spreadsheet.

**Table A - Revisions to Summary volume indices and Total Factor Productivity (2010=100)**

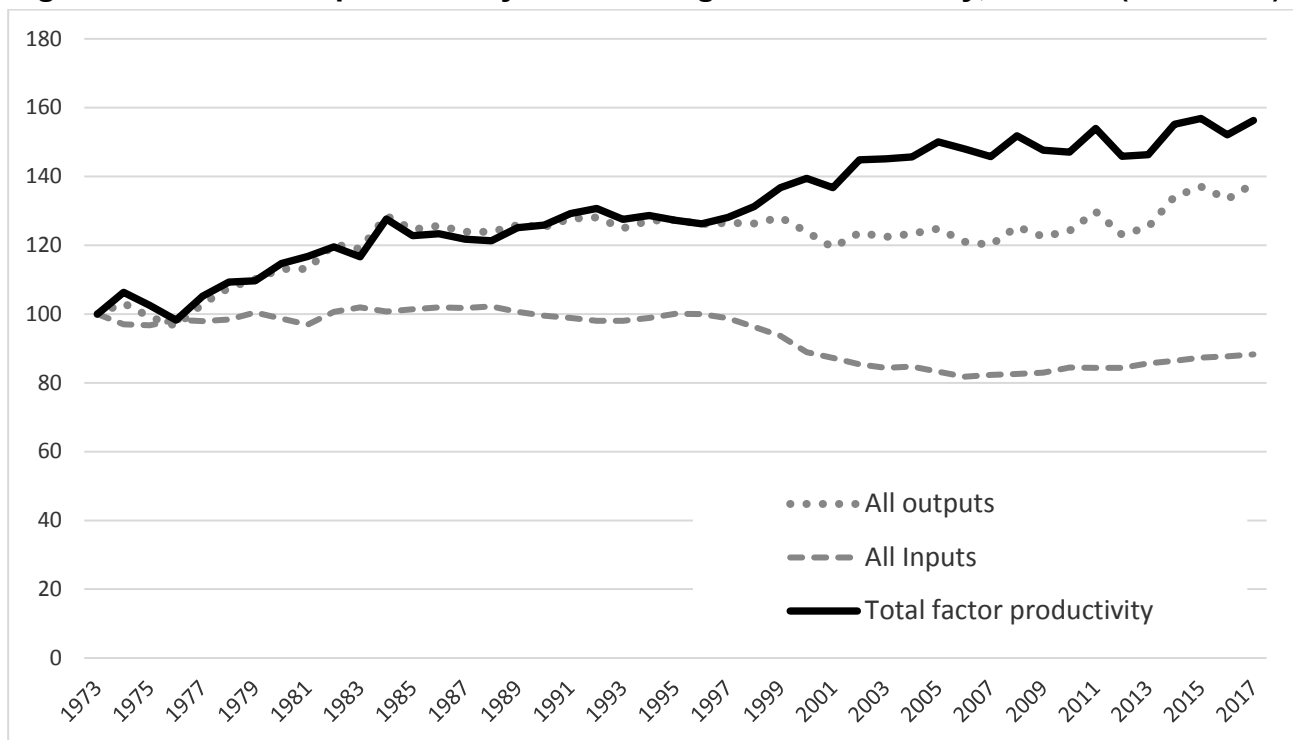
		2015	2016	2017	% change from 2016
<b>All inputs</b>	(published November 2018)	103.4	103.5	104.2	+0.7%
	(revised March 2019)	103.5	103.8	104.5	+0.6%
<b>Total Factor Productivity</b>	(published November 2018)	106.8	103.8	106.5	+2.7%
	(revised March 2019)	106.7	103.4	106.3	+2.8%

Note: All other figures presented in the Statistics Notice are unchanged.

**Figure 1: Details of revisions to Total factor productivity (1973=100)**



**Figure 2: Total factor productivity of the UK agriculture industry, revised (1973=100)**



Total factor productivity of the agriculture industry in the United Kingdom is estimated to have increased by +2.8% between 2016 and 2017. This represents a recovery, after a dip in 2016, to a level close to the highest ever seen in 2015. Although there are annual fluctuations the long-term trend is still one of slow but steady overall improvement.

The annual increase is driven by an increase in almost all outputs, partially offset by a smaller increase in the volume of inputs. Compared to 2016 the volume of all outputs rose by +3.4%, whilst the volume of all inputs rose by +0.6%.

**Table 1a Volume indices for outputs (2010=100)**

2010=100

	2015	2016	2017	% Change from 2016
<b>1 Output of cereals</b>	<b>120.4</b>	<b>107.0</b>	<b>108.5</b>	<b>1.4%</b>
wheat	109.1	97.3	96.8	-0.4%
rye	90.9	90.9	77.3	-15.0%
barley	164.5	142.3	152.8	7.4%
oats and summer cereal mixtures	119.4	122.3	120.3	-1.7%
other cereals	89.3	77.8	95.0	22.1%
<b>2 Output of industrial crops</b>	<b>109.5</b>	<b>84.7</b>	<b>106.5</b>	<b>25.7%</b>
oil seeds	111.3	78.9	96.5	22.3%
oilseed rape	114.0	79.6	97.9	23.0%
other oil seeds	39.7	66.4	64.2	-3.3%
protein crops	124.5	113.2	125.5	10.9%
sugar beet	95.3	87.1	136.6	56.8%
other industrial crops	101.1	101.1	104.9	3.8%
<b>3 Output of forage plants</b>	<b>121.3</b>	<b>121.3</b>	<b>121.3</b>	<b>0.0%</b>
<b>4 Output of vegetables &amp; horticultural products</b>	<b>100.3</b>	<b>100.2</b>	<b>102.1</b>	<b>1.9%</b>
fresh vegetables	103.0	101.4	103.8	2.3%
plants and flowers	97.4	98.9	100.3	1.5%
<b>5 Output of potatoes</b>	<b>137.3</b>	<b>131.0</b>	<b>151.4</b>	<b>15.6%</b>
<b>6 Output of fruit</b>	<b>110.4</b>	<b>101.7</b>	<b>106.7</b>	<b>4.9%</b>
<b>7 Output of other crop products</b>	<b>125.5</b>	<b>116.4</b>	<b>106.9</b>	<b>-8.1%</b>
<b>Total crop output (sum 1 - 7)</b>	<b>113.5</b>	<b>104.3</b>	<b>110.7</b>	<b>6.2%</b>
<b>8 Output of livestock (meat)</b>	<b>105.7</b>	<b>108.2</b>	<b>109.0</b>	<b>0.8%</b>
cattle	100.2	103.8	102.9	-0.9%
pigs	119.9	124.6	122.4	-1.8%
sheep	110.1	106.3	108.9	2.4%
poultry	105.1	108.4	112.0	3.3%
other animals	99.4	99.4	99.4	0.0%
<b>9 Output of livestock products</b>	<b>110.8</b>	<b>107.6</b>	<b>112.4</b>	<b>4.5%</b>
milk	112.5	107.6	112.0	4.1%
eggs	103.4	107.9	112.4	4.2%
raw wool	101.2	102.3	100.5	-1.8%
other animal products	82.8	89.4	117.2	31.1%
<b>Total livestock output (8 + 9)</b>	<b>107.8</b>	<b>108.2</b>	<b>110.5</b>	<b>2.1%</b>
<b>10 Inseparable non-agricultural activities</b>	<b>120.4</b>	<b>122.6</b>	<b>122.0</b>	<b>-0.5%</b>
<b>11 All outputs</b>	<b>110.4</b>	<b>107.4</b>	<b>111.0</b>	<b>3.4%</b>

**Table 1b Volume indices for inputs (2010=100)***Revised figures are highlighted*

2010=100

	2015	2016	2017	% Change from 2016
<b>12 Seeds</b>	<b>105.8</b>	<b>107.3</b>	<b>109.5</b>	<b>2.1%</b>
<b>13 Energy</b>	<b>98.1</b>	<b>97.9</b>	<b>95.8</b>	<b>-2.2%</b>
electricity and fuels for heating	82.7	79.6	84.4	6.1%
motor and machinery fuels	104.5	106.0	99.8	-5.8%
<b>14 Fertilisers</b>	<b>100.7</b>	<b>114.4</b>	<b>103.3</b>	<b>-9.7%</b>
<b>15 Plant protection products</b>	<b>134.0</b>	<b>132.7</b>	<b>132.6</b>	<b>-0.1%</b>
<b>16 Veterinary expenses</b>	<b>106.0</b>	<b>103.5</b>	<b>104.9</b>	<b>1.3%</b>
<b>17 Animal feed</b>	<b>105.4</b>	<b>104.9</b>	<b>108.2</b>	<b>3.1%</b>
compounds	114.5	116.3	122.6	5.4%
straights	90.8	86.2	84.4	-2.2%
<b>18 Total maintenance</b>	<b>102.3</b>	<b>102.6</b>	<b>101.2</b>	<b>-1.4%</b>
materials	101.7	101.3	103.4	2.1%
buildings	103.5	105.0	97.7	-7.0%
<b>19 FISIM</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>0.0%</b>
<b>20 Other goods and services</b>	<b>99.5</b>	<b>97.9</b>	<b>100.5</b>	<b>2.6%</b>
<b>21 Intermediate consumption (excluding Agricultural services)</b>	<b>104.3</b>	<b>105.0</b>	<b>105.4</b>	<b>0.4%</b>
<b>22 Consumption fixed capital (excluding livestock)</b>	<b>108.8</b>	<b>109.5</b>	<b>111.3</b>	<b>1.6%</b>
equipment	116.7	118.5	121.9	2.9%
buildings	96.9	96.1	95.3	-0.8%
<b>23 All Labour</b>	<b>101.2</b>	<b>100.5</b>	<b>101.1</b>	<b>0.7%</b>
Compensation of employees	102.0	100.1	101.5	1.4%
Entrepreneurial workers (farm and specialist contractor)	100.8	100.7	101.0	0.3%
<b>24 Land</b>	<b>99.5</b>	<b>100.7</b>	<b>101.4</b>	<b>0.7%</b>
<b>25 All Inputs and Entrepreneurial Labour</b>	<b>103.5</b>	<b>103.8</b>	<b>104.5</b>	<b>0.6%</b>

**Table 1c Summary volumes indices and Total Factor Productivity (2010=100)***Revised figures are highlighted*

2010=100

	2015	2016	2017	% change from 2016
<b>All outputs</b>	110.4	107.4	111.0	+3.4%
<b>All inputs</b>	<b>103.5</b>	<b>103.8</b>	<b>104.5</b>	<b>+0.6%</b>
<b>Total factor productivity</b>	<b>106.7</b>	<b>103.4</b>	<b>106.3</b>	<b>+2.8%</b>

## Annual change in volumes of outputs and inputs between 2016 and 2017

*Note: these estimates have been unaffected by the revisions.*

### OUTPUTS

**Total outputs** increased by +3.4%, driven by an increase of +6.2% in the volume of all crops and a smaller increase of +2.1% in the volume of livestock outputs.

**Cereal** volumes rose by +1.4% with oats being the only cereal crop to see a fall (-1.7%).

**Oilseed rape** saw a large increase in the volume of outputs, up +23%.

**Sugar beet** saw a large increase in volume, up by +57%.

**Livestock** outputs showed an overall increase of +2.1%.

**Milk** volume increased by +4.1% following the drop in 2016.

Total volume of **meat** production increased slightly, by +0.8%. This was driven by increases for sheep (+2.4%) and poultry (+3.3%) and partly offset by falls for cattle (-0.9%) and pigs (-1.8%).

### INPUTS

**Animal feed** is the largest input and showed an increase of +3.1% overall. This was driven by an increase of +5.4% for compounds, partly offset by a -2.2% fall for straights.

## Partial productivity

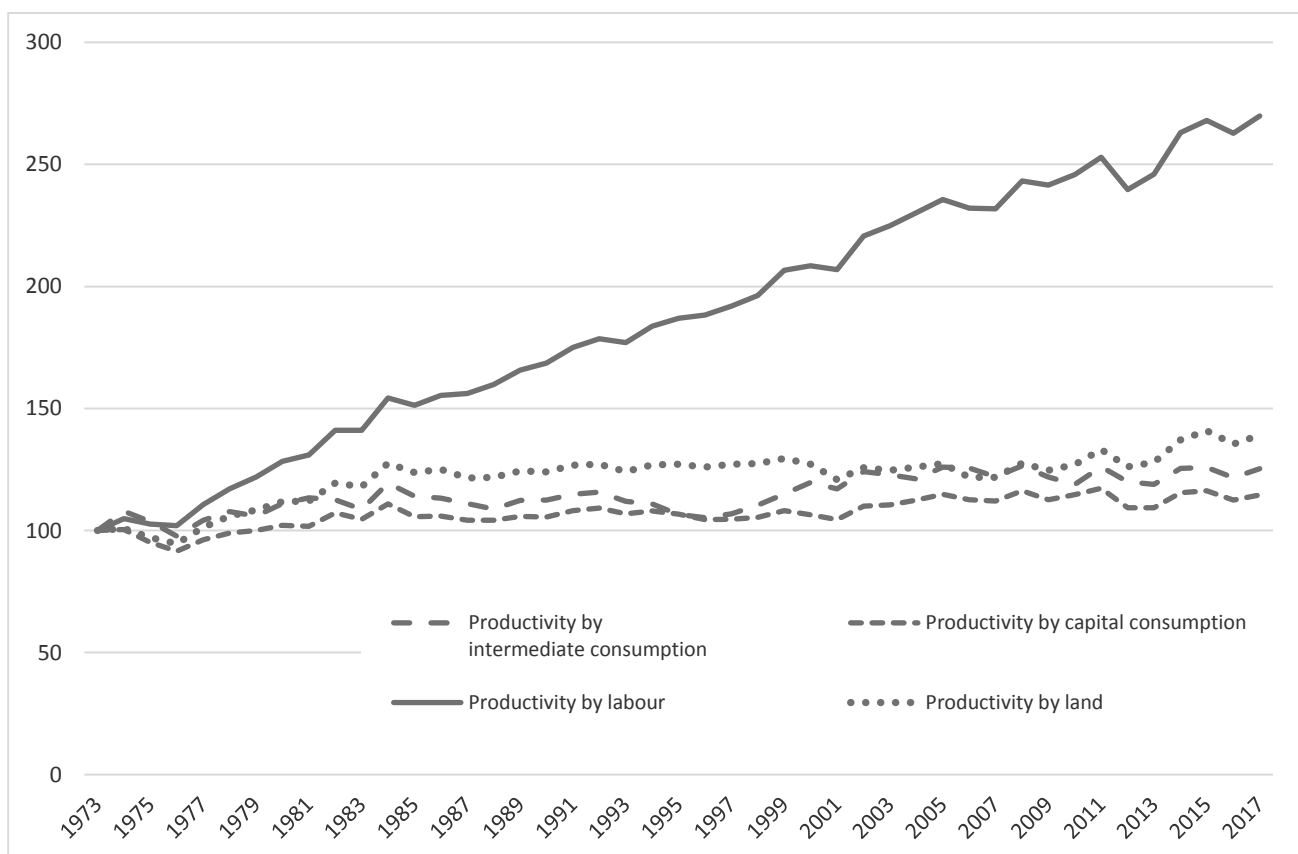
*Note: these estimates have been unaffected by the revisions.*

Partial productivity shows the impact key inputs have on productivity. It measures total outputs against a part of the inputs. The figures below clearly show that labour is the key input in driving productivity gains. Productivity by labour shows a steady increase over the whole period. Labour volumes are now approximately half of what they were in 1973. However over the last few years growth in labour productivity is due to increased output rather than a reduction in labour number.

**Table 2 Partial factor productivity (2010=100)**

	2015	2016	2017	% Change from 2016
<b>Total factor productivity</b>	<b>106.7</b>	<b>103.4</b>	<b>106.3</b>	<b>2.8%</b>
<b>Partial factor productivity indicators</b>				
Productivity by intermediate consumption	105.9	102.2	105.4	3.0%
Productivity by capital consumption	101.4	98.1	99.8	1.8%
Productivity by labour	109.0	106.9	109.8	2.7%
Productivity by land	110.9	106.6	109.5	2.7%

**Figure 3 Partial productivity indicators (1973=100)**



## Background

### Background to total factor productivity

Total factor productivity is a key measure of the economic performance of agriculture and an important driver of farm incomes. It represents how efficiently the agriculture industry uses the resources that are available to turn inputs into outputs. It is expressed here as a relative measure rather than an absolute measure, enabling us to see if improvements are made by comparing one year to another.

External factors such as weather and animal disease can have short term effects on total factor productivity. When we look at the results we should consider the overall, long-term trend. In the long-term, developments in productivity constitute one of the major factors that impact on income.

These results are produced as part of the preparation of aggregate agricultural accounts required by EU legislation and by UK policy making. The accounts are also used to produce other measures of the performance of the agriculture industry, including Total Income from Farming.

### Definitions and explanations

<b>All outputs</b>	The volume of all outputs sold off the farm. This excludes transactions within the industry.
<b>All inputs</b>	The volume of goods and services purchased and consumed. This excludes transactions within the industry.
<b>Total factor productivity</b>	How efficiently all inputs are turned into outputs. Derived by dividing all outputs by all inputs.
<b>Partial productivity</b>	How efficiently intermediate consumption, capital, labour or land is transformed into outputs. Derived by dividing all outputs by each factor.

### Quality Assurance

Defra has in place quality assurance processes to check the accuracy and reliability of the aggregate agricultural accounts that includes:

- Ongoing review of methods employed in the calculation of the accounts.
- Assessment of the quality of the estimates of components of the accounts with internal and external experts.
- Quality assessments made by Eurostat, the statistical office of the European Union.

A summary quality report for this statistical release can be found on the GOV.UK website at <https://www.gov.uk/government/collections/productivity-of-the-agricultural-industry>

This is an overview note which is not release-specific but will be reviewed and updated at regular intervals. It pulls together key qualitative information on the various dimensions of quality as well as providing a summary of methods used to compile the output. It provides users with information on usability and fitness for purpose of these estimates.



## **Main users and uses of total factor productivity**

Total factor productivity is used in conjunction with other economic information to:

- Inform policy decisions and to help monitor and evaluate current policies relating to agriculture in the UK by Government and in the European Union by the European Commission.
- Inform stakeholders of the performance of the agriculture industry.
- Inform research into the economic performance of the agriculture industry.
- As an impact indicator of Government policy.

## **User engagement**

As part of our ongoing commitment to compliance with the Code of Practice for Official Statistics <http://www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html>, we wish to strengthen our engagement with users of these statistics and better understand the use made of them and the types of decisions that they inform. Consequently, we invite users to make themselves known, to advise us of the use they do, or might, make of these statistics, and what their wishes are in terms of engagement. Feedback on this notice and enquiries about these statistics are also welcome.