Department
for Environment
Food & Rural Affairs

11 September 2018

Soil Nutrient Balances
England Provisional Estimates for 2017

This release corrects minor errors in the edition published on 11 September 2018. These errors were introduced in the processing of the data and relate to the intake and overall balance figures for years 2015, 2016 and 2017. The overall trends remain unaffected. A summary of the revisions is at the end of this document.

Summary of key results

Nitrogen

Provisional estimates for 2017 show the nitrogen balance:

- to be a surplus of 81 kg/ha of managed agricultural land
- decreased 4.2 kg/ha (-5%) compared to 2016
- decreased 27 kg/ha (-25%) compared to 2000

Phosphorus

Provisional estimates for 2017 show the phosphorus balance:

- to be a surplus of 3.9 kg/ha of managed agricultural land
- decreased 0.7 kg/ha (-15%) compared to 2016
- decreased 5.1 kg/ha (-57%) compared to 2000

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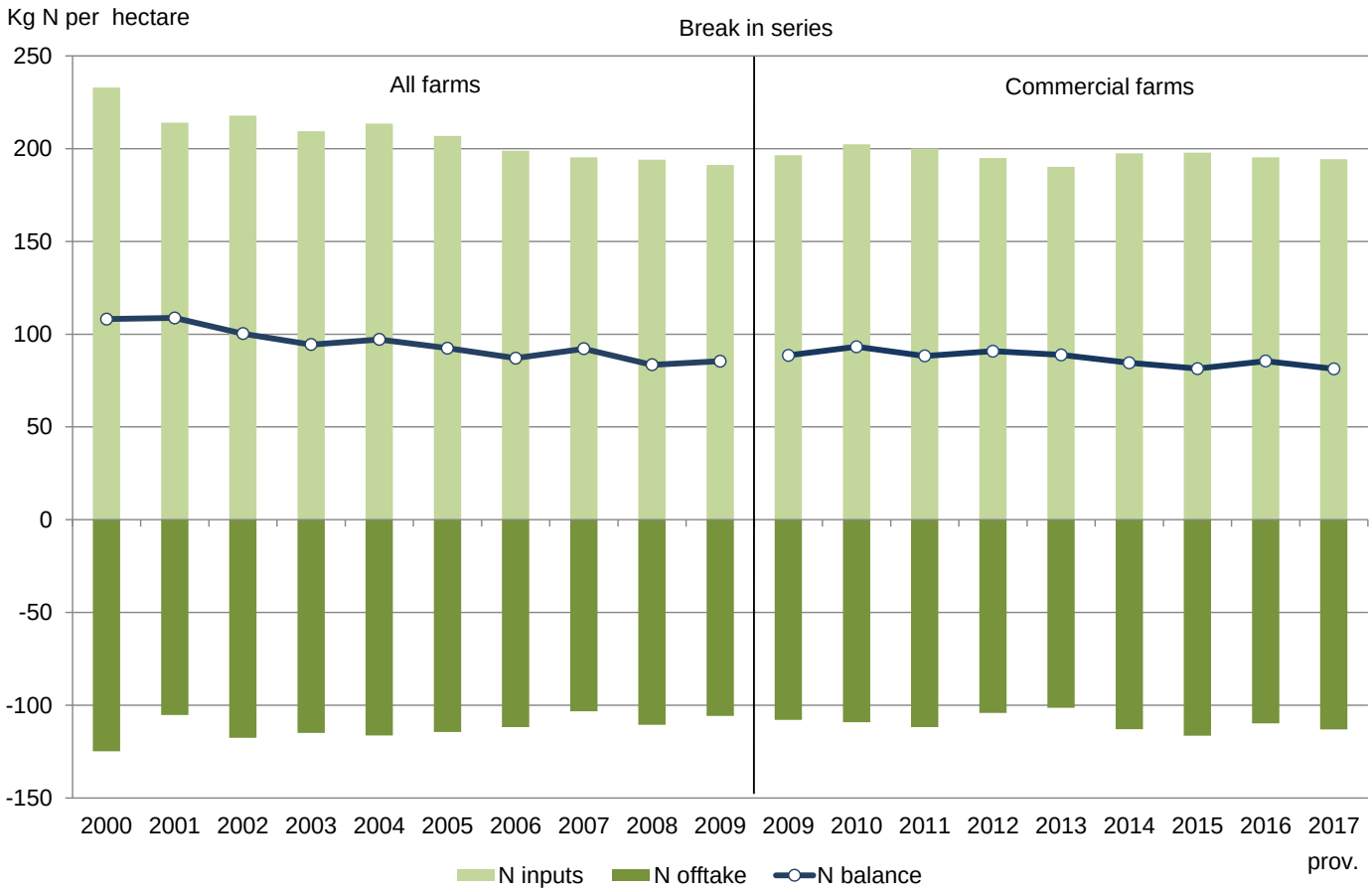
Detail

England Nitrogen Balance

Chart 1: Summary of Nitrogen balance for England, 2000 to 2017 (kg N per hectare)



For the period 2016 to 2017 the key points are:

- The 4.2 kg/ha (-5%) decrease in the total surplus per hectare has been driven by a 3% increase in offtake (mainly via harvested crops) while inputs remained little changed compared to the previous year.
- The increase in uptake by harvested crops was driven by higher yields and an increase in production for both cereals and oil crops.
- The changes seen from 2015 onwards to inputs via biological fixation and offtake via harvested pulses and beans are likely to have been influenced by Common Agricultural Policy greening measures.

For the period 2000 to 2017 the key points are:

- A 25% fall in the total surplus per hectare of managed agricultural land in England from 108 kg/ha in 2000 to 81 kg/ha in 2017.
- The main driver for the lower surplus has been a 39 kg/ha reduction in inputs (from 233 kg/ha to 194 kg/ha) largely due to reductions in inorganic fertiliser applications and manure production (reflecting lower numbers of livestock). This has been partially offset by a 12 kg/ha reduction (from 125 kg/ha to 113 kg/ha) in the nitrogen offtake (particularly forage).
- The series break is due to changes[1] in farm survey data collection.

[1] See https://www.gov.uk/structure-of-the-agricultural-industry-survey-notes-and-guidance for further information.

Table 1: Nitrogen balance for England, 2000, 2016 and 2017 (kg N per hectare)

			prov.	Change	
	2000	2016	**2017**	2016-17	2000-17
Total Inputs	233.0	195.3	**194.3**	-1.0	-38.7
Total Outputs	124.9	109.8	**113.0**	+3.2	-11.8
BALANCE (Inputs minus outputs)	108.1	85.5	**81.3**	-4.2	-26.8

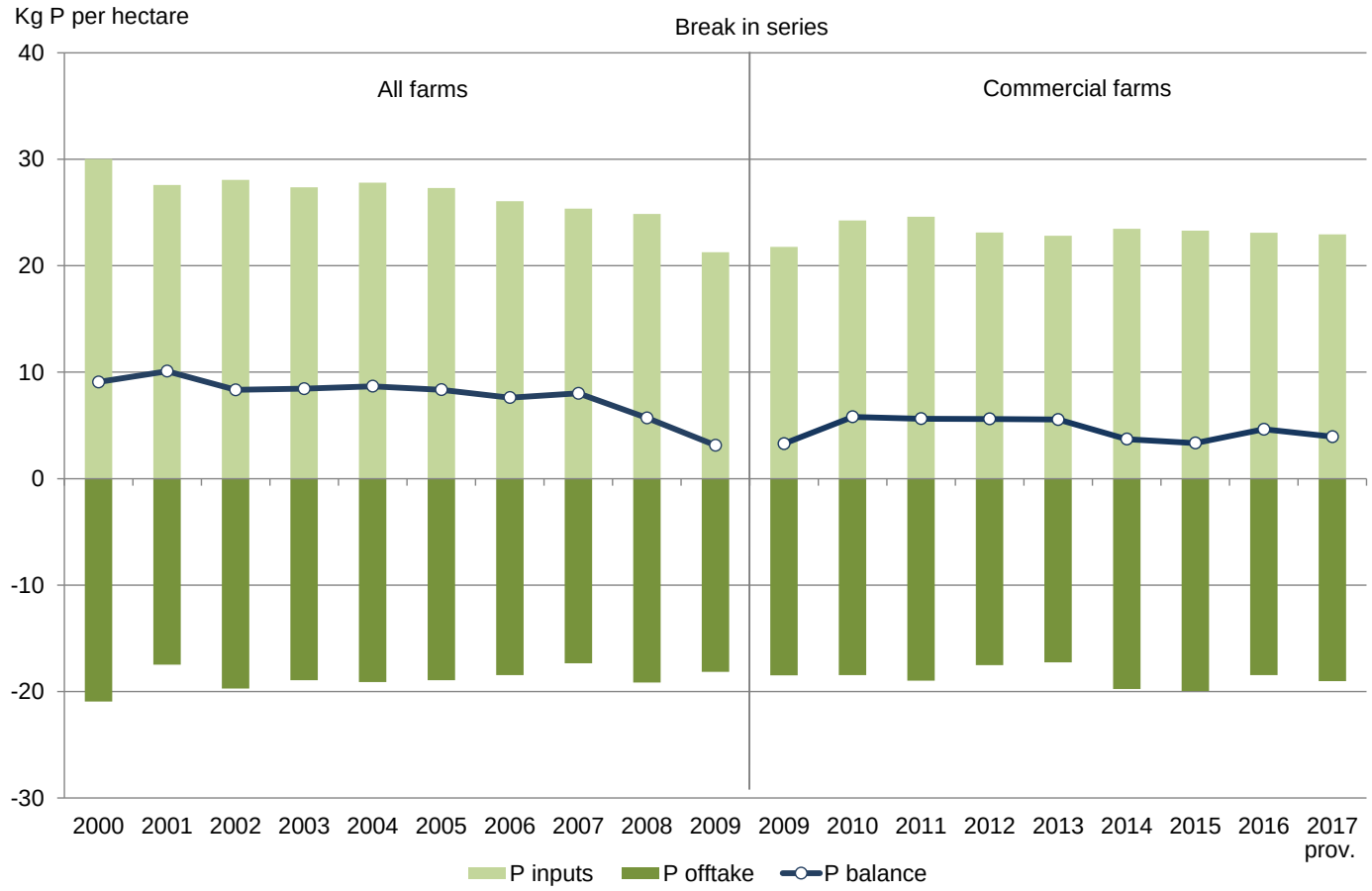
Table 2: Detailed nitrogen balance sheet results, 2000, 2016 and 2017 (thousand tonnes of N)

			prov.	Change	
	2000	2016	**2017**	2016-17	2000-17
TOTAL INPUTS	1,862	1,588	**1,590**	+2	-272
Fertilisers	938	786	**788**	+2	-150
Inorganic fertilisers	910	739	**741**	+2	-169
Total organic fertilisers	28	47	**47**	0	+18
Manures	680	571	**576**	+6	-104
Livestock Manure Production	697	584	**590**	+6	-107
Cattle	439	368	**368**	-1	-71
Pigs	62	44	**44**	0	-17
Sheep and goats	101	81	**84**	+3	-17
Poultry	91	86	**90**	+4	-1
Other livestock	6	4	**4**	0	-1
Withdrawals	-17	-14	**-14**	0	+3
Other inputs	244	231	**226**	-5	-18
Atmospheric Deposition	126	106	**107**	+1	-19
Biological fixation	109	117	**119**	+2	+10
Seeds and Planting Material	9	9	**8**	0	-1
TOTAL OFFTAKE	998	893	**925**	+32	-73
Total Harvested Crops	496	475	**513**	+37	+17
Cereals	398	363	**379**	+16	-19
Oil crops	32	51	**62**	+10	+30
Pulses and Beans	29	33	**37**	+4	+8
Industrial Crops	15	10	**15**	+5	0
Other Crops	22	18	**20**	+1	-2
Total Forage	491	406	**401**	-5	-90
Harvested Fodder Crops	17	31	**29**	-2	+12
Pasture	474	375	**372**	-3	-102
Crop residues	11	12	**11**	0	0
BALANCE (Inputs minus Offtake)	864	695	**665**	-30	-199
Managed area (thousand ha) (a)	7,993	8,128	**8,183**	+55	+189

(a) excludes rough grazing

England Phosphorus Balance

Chart 2: Summary of Phosphorus balance for England, 2000 to 2017 (kg P per hectare)



For the period 2016 to 2017 the key points are:

- There has been a decrease of 0.7 kg/ha (-15%) in the surplus per hectare compared to 2016. This has been driven by a 3% increase in offtake while inputs remained almost unchanged. As with nitrogen, the increase in offtake reflects a rise in harvested crops.

For the period 2000 to 2017 the key points are:

- A fall in the total surplus per hectare from 9.1 kg/ha in 2000 to 3.9 kg/ha in 2017, a 57% reduction.
- The main driver has been a reduction in inputs (from 30 to 23 kg/ha), due mainly to reduced fertiliser applications and manure production (as a result of declining livestock populations). Total offtake has also reduced although to a lesser extent (from 21 to 19 kg/ha).
- After remaining level from 2002 to 2007 there was a sharp fall in the surplus between 2007 and 2009. This was a result of increased offtake from harvested crops in 2008 and a sharp reduction in fertiliser applications in 2009. The surplus has since returned to levels more consistent with the longer term trend.
- The series break is due to changes[2] in farm survey data collection.

[2] See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/182206/defra-stats-foodfarm-landuselivestock-june-junemethodology-20120126.pdf for further information.

Table 3: Phosphorus balance for England, 2000, 2016 and 2017 (kg P per hectare)

	2000	2016	prov. 2017	Change 2016-17	Change 2000-17
Total Inputs	30.0	23.1	23.0	-0.1	-7.0
Total Offtake	20.9	18.5	19.0	+0.6	-1.9
BALANCE (Inputs minus Offtake)	9.1	4.6	3.9	-0.7	-5.1

Table 4: Detailed phosphorus balance sheet results, 2000, 2016 and 2017 (thousand tonnes P)

	2000	2016	**prov. 2017**	Change 2016-17	Change 2000-17
TOTAL INPUTS	240	188	**188**	0	-52
Fertilisers	115	82	**81**	-1	-33
Inorganic fertilisers	97	56	**55**	-1	-41
Total organic fertilisers	18	26	**26**	0	+8
Manures	121	101	**102**	+1	-19
Livestock Manure Production	121	101	**102**	+1	-19
Cattle	69	58	**58**	0	-12
Pigs	12	9	**9**	0	-4
Sheep and goats	16	13	**13**	0	-3
Poultry	22	21	**21**	+1	0
Other livestock	2	2	**2**	0	0
Withdrawals	0	0	**0**	0	0
Other inputs	5	5	**5**	0	0
Atmospheric Deposition	3	3	**3**	0	0
Seeds and Planting Material	2	2	**2**	0	0
TOTAL OFFTAKE	167	150	**156**	+6	-12
Total Harvested Crops	87	83	**90**	+7	+3
Cereals	70	64	**67**	+3	-3
Oil crops	7	10	**13**	+2	+6
Pulses and Beans	3	4	**4**	0	1
Industrial Crops	3	2	**3**	+1	0
Other Crops	3	3	**3**	0	0
Total Forage	79	65	**64**	-1	-15
Harvested Fodder Crops	3	6	**5**	0	+2
Pasture	76	59	**58**	-1	-17
Crop residues	2	2	**2**	0	0
BALANCE (Inputs minus Offtake)	73	38	**32**	-5	-40
Managed area (thousand ha) (a)	7,993	8,128	**8,183**	+55	+189

(a) excludes rough grazing

Background and methodology

A methodology for calculating soil nutrient balances has been developed by OECD[3] and adopted by Eurostat[4]. Soil nutrient balances provide a method for estimating the nutrient loadings of nitrogen and phosphorus to managed agricultural soils. Whilst a shortage of nutrients can limit the productivity of agricultural soils, a surplus of these nutrients poses a serious environmental risk. Losses of nutrients to the environment can impact on air quality (ammonia emissions), water quality (nitrate and phosphate levels in rivers) and climate change (nitrous oxide emissions). A soil nutrient balance estimate, expressed as a loading of nitrogen or phosphorus per hectare of managed agricultural land can be used as an indicator of the environmental risks. It provides a high level measure which can be used to monitor long term trends and to make meaningful comparisons between countries.

The approach estimates the full range of nutrient inputs and removals to soils from all sources. The input sources are: manures, mineral fertilisers, atmospheric deposition and biological fixation. The removals sources are: crop production and fodder production for livestock, including grazing. The nutrient input or removal from each source is either estimated directly (atmospheric deposition) or calculated by applying a coefficient (e.g. for the amount of nitrogen that a dairy cow produces each year) to the corresponding physical data characteristic (e.g. number of dairy cows). The relevant coefficients are derived from research and the physical data is taken from a wide range of data sources many of which are already published as official statistics.

Although based on an internationally recognised methodology, the nutrient balance estimates are subject to a level of uncertainty or error margins.

The estimates presented here utilise the June Survey data for England for commercial holdings[5] for 2009 onwards. A consistent time series can be found in the accompanying excel worksheets.

Managed agricultural land has been defined as the utilised agricultural area (UAA) excluding common land and sole right rough grazing. The balance per hectare is based on the area of managed agricultural land. This is based on the approximation that this is the only land to which significant levels of fertilisers and manures are applied.

The estimates within this release are based on a programme of work to develop and improve the methodology and data sources. This work includes two funded projects[6,7] and follow-up work carried out within Defra. Details of the two projects are available at https://www.gov.uk/government/organisations/department-for-environment-food-rural-affairs/series/agri-environment-analysis. The follow-up work is presented in a separate paper[8] that gives an overview of the methods utilised to compile the data series within this release. The paper also gives details of where they differ to the proposals within the ADAS project and provides a commentary on the resultant balances and components.

[3] Organisation for Economic Cooperation and Development
[4] Eurostat is the Statistical body of the European Commission
[5] See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/182206/defra-stats-foodfarm-landuselivestock-june-junemethodology-20120126.pdf for further information.
[6] TAPAS Funded Project – UK Soil Nutrient Balances, May 2009
[7] UK Nutrient Balances Methodology Review, ADAS, April 2011

[8] Observatory Report: Soil Nutrient Balances 2010 Update, April 2011
http://webarchive.nationalarchives.gov.uk/20130222210445/http://www.defra.gov.uk/statistics/files/defra-stats-foodfarm-environ-obs-research-soilnutrientbalance-1108-update.pdf

Summary of main revisions to the figures published on 11 September

Nitrogen balance for England, 2000, 2016 and 2017 (kg N per hectare)

Revised estimates (14 September)			**prov.**	Change	
	2000	2016	**2017**	2016-17	2000-17
Total Inputs	233.0	195.3	**194.3**	-1.0	-38.7
Total Outputs	124.9	109.8	**113.0**	+3.2	-11.8
BALANCE (Inputs minus outputs)	108.1	85.5	**81.3**	-4.2	-26.8

Original estimates (11 September)			**prov.**	Change	
	2000	2016	**2017**	2016-17	2000-17
Total Inputs	233.0	195.4	**194.4**	-1.0	-38.6
Total Outputs	124.9	109.8	**113.0**	+3.2	-11.8
BALANCE (Inputs minus outputs)	108.1	85.6	**81.4**	-4.2	-26.7

Phosphorus balance for England, 2000, 2016 and 2017 (kg P per hectare)

Revised estimates (14 September)			prov.	Change	
	2000	2016	2017	2016-17	2000-17
Total Inputs	30.0	23.1	23.0	-0.1	-7.0
Total Offtake	20.9	18.5	19.0	+0.6	-1.9
BALANCE (Inputs minus Offtake)	9.1	4.6	3.9	-0.7	-5.1

Original estimates (11 September)			prov.	Change	
	2000	2016	2017	2016-17	2000-17
Total Inputs	30.0	23.1	23.0	-0.1	-7.0
Total Offtake	20.9	18.5	19.0	+0.6	-1.9
BALANCE (Inputs minus Offtake)	9.1	4.6	4.0	-0.7	-5.1