



Soil Nutrient Balances UK 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 90 kg/ha of managed agricultural land
- decreased 0.6 kg/ha (-1%) compared to 2016
- decreased 21 kg/ha (-19%) compared to 2000

Phosphorus

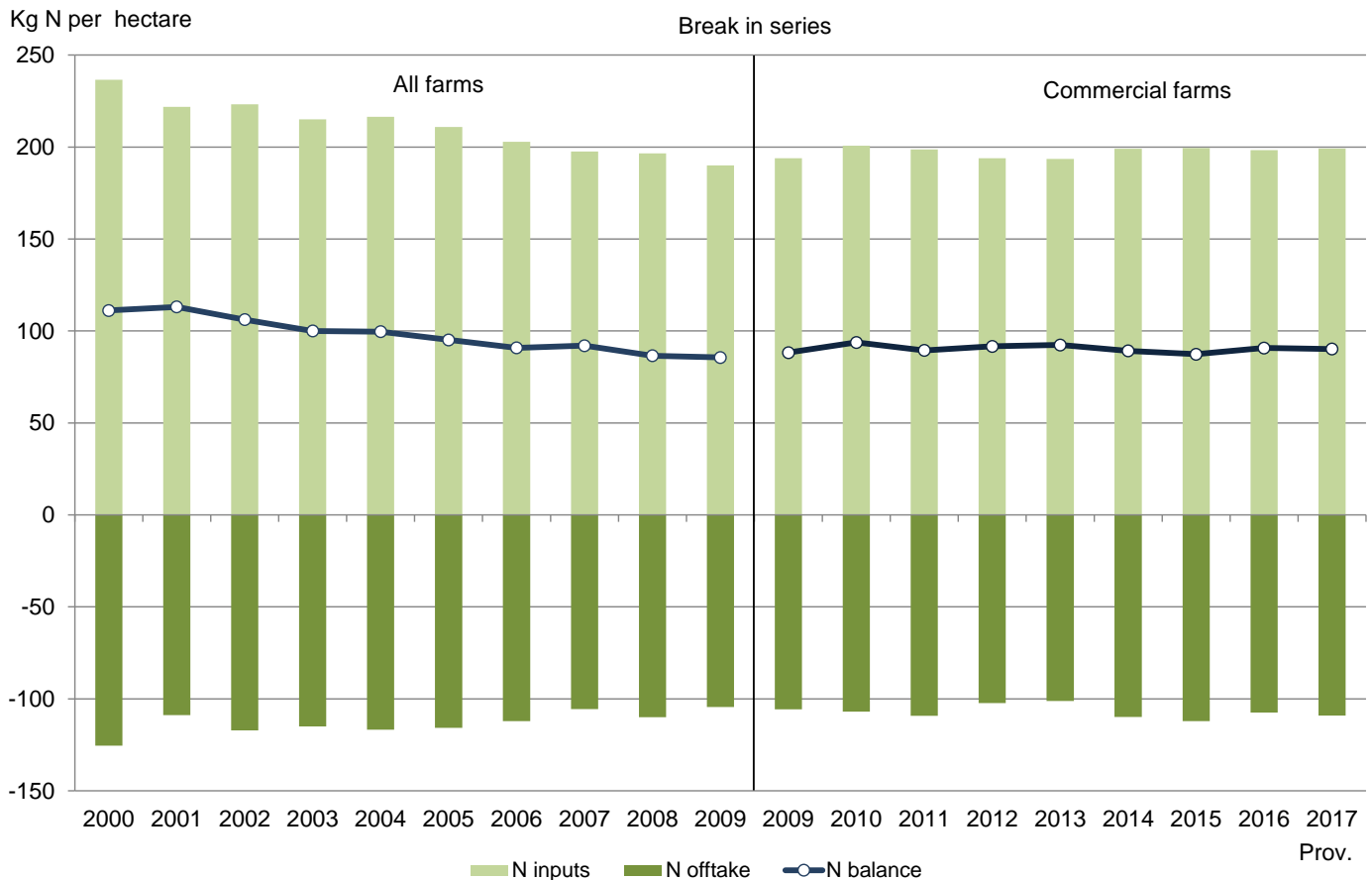
Provisional estimates for 2017 show the phosphorus balance:

- to be a surplus of 6.2 kg/ha of managed agricultural land
- decreased 0.2 kg/ha (-4%) compared to 2016
- decreased 3.8 kg/ha (-38%) compared to 2000

Detail

UK Nitrogen Balance

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



For the period 2016 to 2017 the key points are:

- The 0.6 kg/ha decrease (-1%) in the total surplus per hectare has been driven by an increase in offtake of 1% (mainly via harvested crops) while inputs (mainly from inorganic manufactured fertilisers and livestock manures) remained almost unchanged over the same period.
- 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 19% fall in the total surplus per hectare from 111 kg/ha to 90 kg/ha.
- The main driver has been a 37kg/ha decrease in inputs (from 237 kg/ha to 199 kg/ha) due to decreases in the application of inorganic (manufactured) fertilisers and manure production (the result of lower livestock numbers). This has been partially offset by a 16 kg/ha reduction in offtake (particularly forage) from 125 kg/ha to 109 kg/ha.
- The series break is due to changes¹ in farm survey data collection in England.

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

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

	2000	2016	prov. 2017	Change 2016-17	Change 2000-17
Total Inputs	236.6	198.2	199.2	+1.0	-37.4
Total Offtake	125.4	107.5	109.0	+1.5	-16.4
BALANCE (Inputs minus Offtake)	111.1	90.7	90.2	-0.6	-21.0

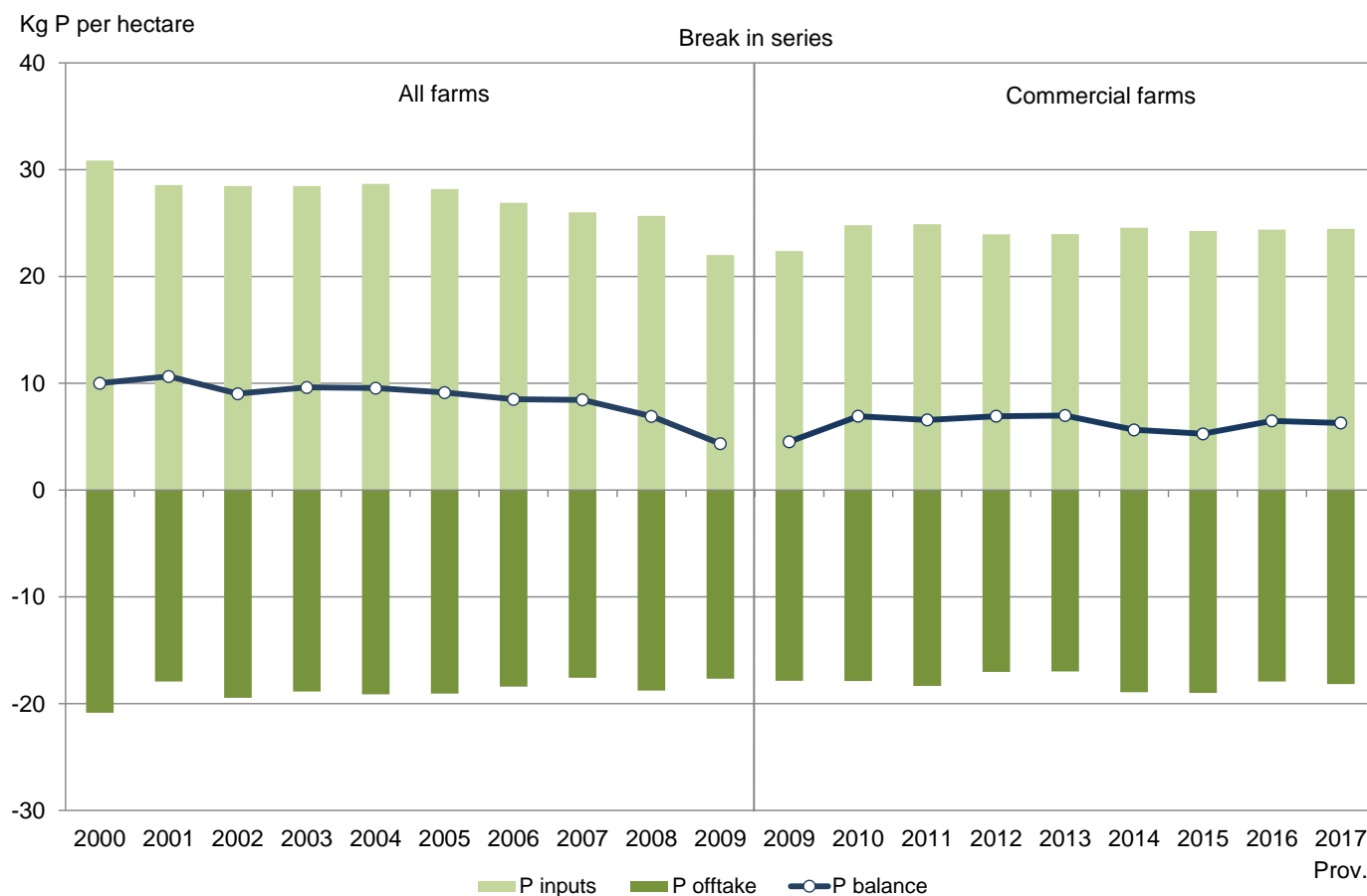
Table 2: Detailed nitrogen balance sheet results, 2000, 2016 and 2017 (thousand tonnes N)

	2000	2016	prov. 2017	Change 2016-17	Change 2000-17
TOTAL INPUTS	2,805	2,419	2,445	+27	-360
Fertilisers	1,301	1,085	1,099	+14	-202
Inorganic fertilisers	1,268	1,026	1,040	+14	-228
Total organic fertilisers	33	59	59	0	+26
Manures	1,180	1,015	1,024	+9	-155
Livestock Manure Production	1,196	1,033	1,041	+9	-155
Cattle	773	674	673	-1	-100
Pigs	73	54	55	+1	-18
Sheep and goats	227	183	187	+4	-40
Poultry	116	114	120	+5	4
Other livestock	7	7	6	0	-1
Withdrawals	-17	-17	-17	0	0
Other inputs	325	318	322	+4	-3
Atmospheric Deposition	172	155	156	+1	-16
Biological fixation	142	153	155	+2	+13
Seeds and Planting Material	10	11	11	0	0
TOTAL OFFTAKE	1,487	1,312	1,338	+27	-149
Total Harvested Crops	561	539	579	+40	+18
Cereals	453	417	434	+17	-19
Oil crops	36	55	67	+12	+30
Pulses and Beans	29	34	38	+4	+9
Industrial Crops	15	10	15	+5	0
Other Crops	27	23	25	+2	-1
Total Forage	915	760	747	-13	-168
Harvested Fodder Crops	23	38	36	-2	+13
Pasture	892	722	711	-11	-181
Crop residues	12	13	12	0	0
BALANCE (Inputs minus Offtake)	1,318	1,107	1,107	0	-211
Managed area (thousand ha) (a)	11,858	12,201	12,276	+75	+418

(a) excludes rough grazing

UK Phosphorus Balance

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



For the period 2016 to 2017 the key points are:

- There has been a decrease of 0.2 kg/ha (-4%) in the surplus per hectare compared to 2016. This has been driven by a 1% increase in offtake while inputs remained almost unchanged. As with nitrogen, the increase in offtake reflects increased production in harvested crops.

For the period 2000 to 2017 the key points are:

- A fall in the total surplus per hectare from 10 kg/ha in 2000 to 6.2 kg/ha in 2017 (-38%).
- The main driver has been a reduction in inputs (from 31 to 24 kg/ha) reflecting reduced fertiliser application rates and manure production (due to declining livestock populations). Total offtake has fallen from 21 to 18 kg/ha, largely due to reduced forage production.
- 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 changes² in farm survey data collection in England.

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 UK, 2000, 2016 and 2017 (kg P per hectare)

	2000	2016	prov. 2017	Change 2016-17	Change 2000-17
Total Inputs	30.9	24.4	24.4	0.0	-6.4
Total Offtake	20.8	17.9	18.2	+0.2	-2.7
BALANCE (Inputs minus Offtake)	10.0	6.5	6.2	-0.2	-3.8

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

	2000	2016	prov. 2017	Change 2016-17	Change 2000-17
TOTAL INPUTS	366	297	300	+2	-66
Fertilisers	158	116	117	0	-41
Inorganic fertilisers	138	86	86	0	-52
Total organic fertilisers	20	31	31	0	+11
Manures	201	174	176	+2	-25
Livestock Manure Production	201	174	176	+2	-25
Cattle	121	105	105	0	-16
Pigs	15	11	11	0	-4
Sheep and goats	35	28	29	+1	-6
Poultry	28	27	28	+1	+1
Other livestock	3	2	2	0	0
Withdrawals				-	-
Other inputs	7	7	7	0	0
Atmospheric Deposition	5	5	5	0	0
Seeds and Planting Material	2	2	2	0	0
TOTAL OFFTAKE	247	218	223	+5	-24
Total Harvested Crops	100	96	103	+8	+4
Cereals	82	75	78	+3	-3
Oil crops	7	11	14	+2	+6
Pulses and Beans	3	4	4	0	+1
Industrial Crops	3	2	3	+1	0
Other Crops	4	4	4	0	0
Total Forage	145	121	117	-3	-28
Harvested Fodder Crops	4	7	7	0	+2
Pasture	141	114	111	-3	-30
Crop residues	2	2	2	0	0
BALANCE (Inputs minus Offtake)	119	79	77	-2	-42
Managed area (thousand ha) (a)	11,858	12,201	12,276	+75	+418

(a) excludes rough grazing

Background and methodology

A methodology for calculating soil nutrient balances has been developed by OECD³ and adopted by Eurostat⁴. 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 use the June Survey data for England for commercial holdings⁵ for 2009 onwards and for all farms for preceding years. 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 paper⁸ 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-envirob-obs-research-soilnutrientbalance-1108-update.pdf>

Summary of main revisions to the figures published on 11 September

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

Revised estimates (14 September)			prov. 2017	Change	
	2000	2016		2016-17	2000-17
Total Inputs	236.6	198.2	199.2	+1.0	-37.4
Total Offtake	125.4	107.5	109.0	+1.5	-16.4
BALANCE (Inputs minus Offtake)	111.1	90.7	90.2	-0.6	-21.0

Original estimates (11 September)			prov. 2017	Change	
	2000	2016		2016-17	2000-17
Total Inputs	236.6	198.3	199.3	+1.0	-37.3
Total Offtake	125.4	107.5	109.0	+1.5	-16.4
BALANCE (Inputs minus Offtake)	111.1	90.8	90.2	-0.6	-20.9

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

Revised estimates (14 September)			prov. 2017	Change	
	2000	2016		2016-17	2000-17
Total Inputs	30.9	24.4	24.4	0.0	-6.4
Total Offtake	20.8	17.9	18.2	+0.2	-2.7
BALANCE (Inputs minus Offtake)	10.0	6.5	6.2	-0.2	-3.8

Original estimates (11 September)			prov. 2017	Change	
	2000	2016		2016-17	2000-17
Total Inputs	30.9	24.4	24.5	+0.1	-6.4
Total Offtake	20.8	17.9	18.2	+0.2	-2.7
BALANCE (Inputs minus Offtake)	10.0	6.5	6.3	-0.2	-3.7