



Soil Nutrient Balances England Provisional Estimates for 2019

Soil nutrient balances provide a method for estimating the annual nutrient loadings of nitrogen and phosphorus to agricultural soils. They give an indication of the potential risk associated with losses of nutrients to the environment; losses which can impact on air and water quality and on climate change. The nutrient balances are used as a high level indicator of farming's pressure on the environment and of how that pressure is changing over time. The balances do not estimate the actual losses of nutrients to the environment, but significant nutrient surpluses are directly linked with losses to the environment.

Nutrient balances are of direct relevance to a number of European directives including the Air Quality Directive, Water Framework Directive and Habitats Directive. The nitrogen balance for England is also used by Defra to monitor farming's environmental performance.

Key Messages

Nitrogen

Provisional estimates for 2019 show the nitrogen balance:

- to be a surplus of 76 kg/ha of managed agricultural land
- decreased 11 kg/ha (-12%) compared to 2018
- decreased 32 kg/ha (-30%) compared to 2000

Phosphorus

Provisional estimates for 2019 show the phosphorus balance:

- to be a surplus of 3.2 kg/ha of managed agricultural land
- decreased 1.8 kg/ha (-36%) compared to 2018
- decreased 5.9 kg/ha (-65%) compared to 2000

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What you need to know about this release

This section ensures any important information is clearly explained so users do not misunderstand the data.

Contact details

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National and Official Statistics

Publications with National Statistics status meet the highest standards of trustworthiness, quality and public value, and it is our responsibility to maintain compliance with these standards.

These estimates are based on a methodology developed by the OECD and adopted by Eurostat (see the Methodology section at the end for more detail). Whilst this methodology is sound and allows meaningful comparisons between countries and over time, the specific data sources used within different countries will vary depending on the data available. The majority of the data sources used to calculate these nutrient balance estimates are designated as National Statistics. However, some of the data are from sources that do not have this designation and may have greater levels of uncertainty. As a result these estimates have been designated as Official Statistics.

For general enquiries about National and Official Statistics, contact the National Statistics Public Enquiry Service:

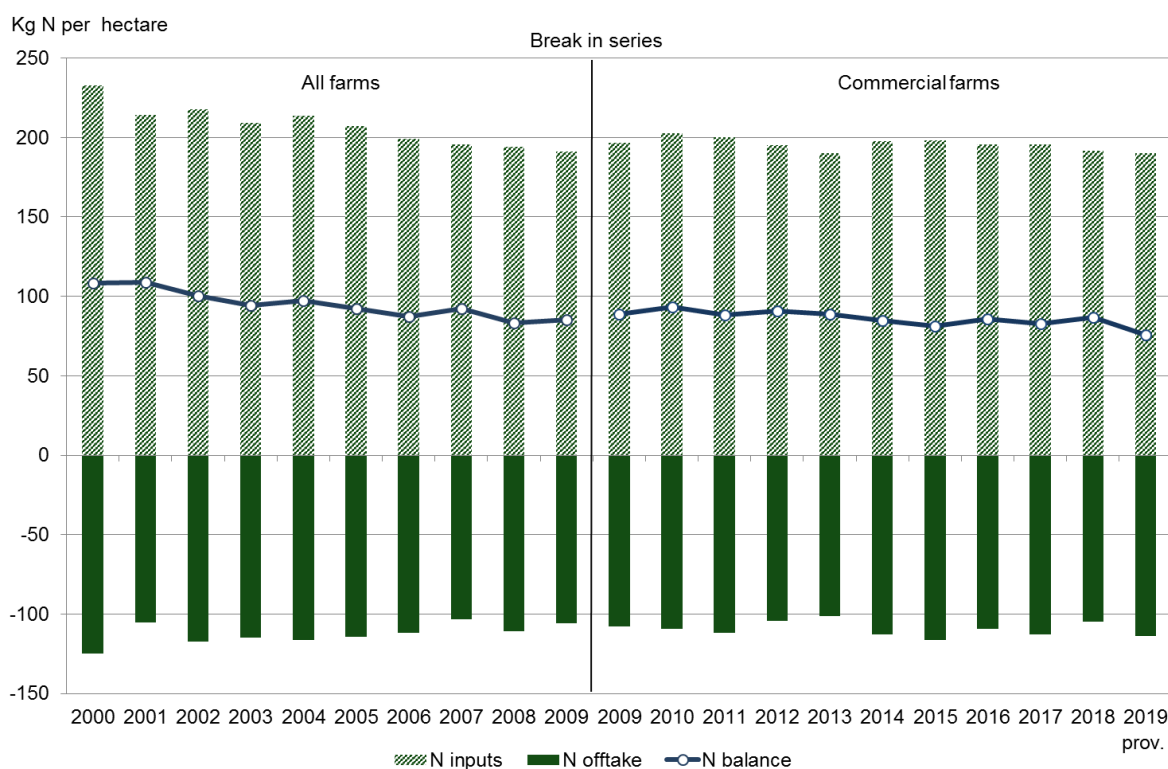
Tel: 0845 601 3034

Email: info@statistics.gov.uk.

You can find National Statistics on the internet [on the Gov.uk website](#).

Section 1 – England Nitrogen Balance

Figure 1 – Summary of nitrogen balance for England, 2000 to 2019



For the period 2018 to 2019 the key points are:

- The surplus of 76 kg/ha in 2019 is a decrease of 11 kg/ha (12%) compared to 2018. This has been driven by an increase in offtake of 9.1 kg/ha (8.7%) (mainly via harvested crops) while inputs (mainly from inorganic manufactured fertilisers and livestock manures) decreased by 1.6 kg/ha (0.8%) over the same period.
- The increase in uptake by harvested crops was driven by significantly higher yields and production for cereals in 2019 with the largest cereal harvest for decades.

For the period 2000 to 2019 the key points are:

- A 32 kg/ha (30%) fall in the total surplus per hectare from 108 kg/ha to 76 kg/ha.
- The main driver has been a 43 kg/ha decrease in inputs (from 233 kg/ha to 190 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 smaller reduction of 11 kg/ha in offtake (particularly forage) from 125 kg/ha to 114 kg/ha.

The series break in 2009 is due to changes in farm survey data collection in England. [See further information here.](#)

Table 1.1 - Nitrogen balance for UK, 2000, 2018 and 2019 (kg N per hectare)

	2000	2018	prov. 2019	Change 2018-19	Change 2000-19
Total Inputs	233.0	191.4	189.9	-1.6	-43.1
Total Offtake	124.9	104.9	114.0	9.1	-10.9
BALANCE (Inputs minus Offtake)	108.1	86.5	75.9	-10.6	-32.2

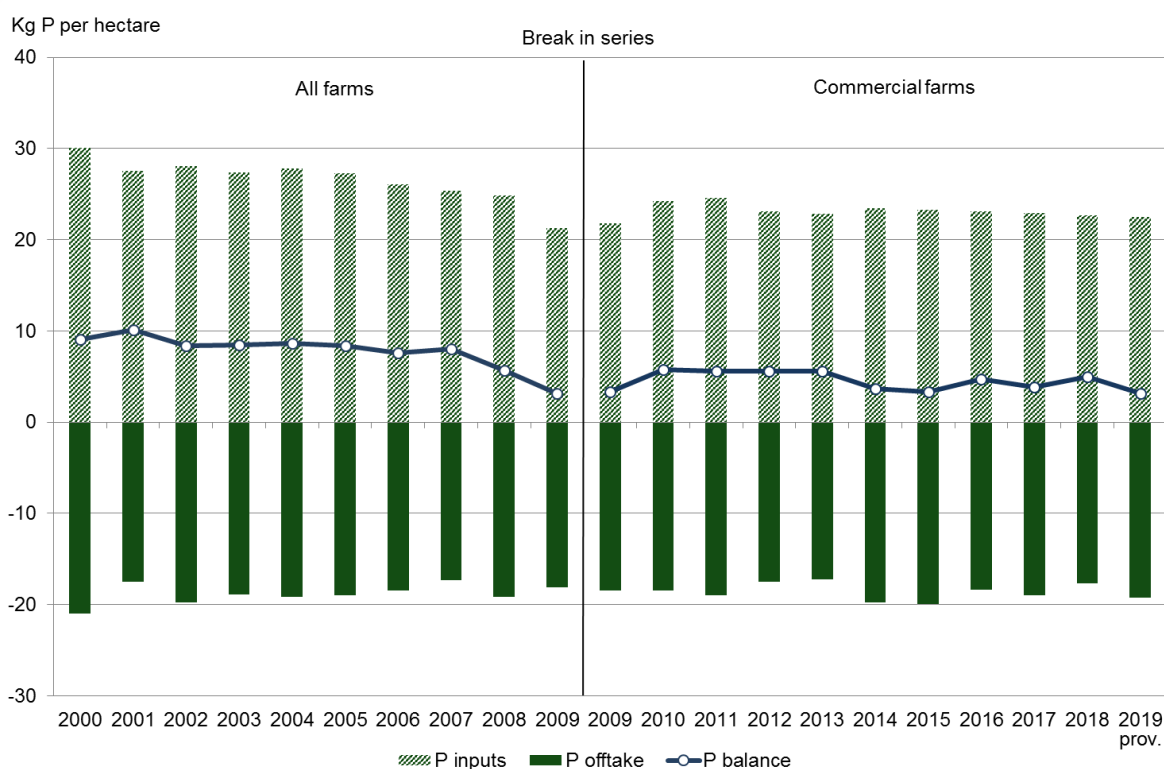
Table 1.2 – Detailed nitrogen balance sheet results, 2000, 2018 and 2019 (thousand tonnes N)

	2000	2018	prov. 2019	Change 2018-19	Change 2000-19
TOTAL INPUTS	1,862	1,566	1,560	-5	-302
Fertilisers	938	787	792	5	-146
Inorganic fertilisers	910	741	746	5	-164
Total organic fertilisers	28	47	47	0	18
Manures	680	574	567	-7	-113
Livestock Manure Production	697	588	581	-7	-116
Cattle	439	364	358	-6	-80
Pigs	62	44	45	1	-17
Sheep and goats	101	84	83	-1	-18
Poultry	91	92	91	-1	1
Other livestock	6	4	4	0	-1
Withdrawals	-17	-14	-14	0	3
Other inputs	244	204	201	-3	-43
Atmospheric Deposition	126	88	88	0	-38
Biological fixation	109	108	104	-4	-4
Seeds and Planting Material	9	8	9	0	-1
TOTAL OFFTAKE	998	858	937	79	-61
Total Harvested Crops	496	458	532	74	36
Cereals	398	349	421	72	23
Oil crops	32	58	50	-8	18
Pulses and Beans	29	21	33	13	5
Industrial Crops	15	13	10	-3	-6
Other Crops	22	17	17	0	-4
Total Forage	491	388	393	5	-98
Harvested Fodder Crops	17	35	37	2	20
Pasture	474	354	356	2	-118
Crop residues	11	11	12	0	0
BALANCE (Inputs minus Offtake)	864	708	624	-84	-240
Managed area (thousand ha) (a)	7,993	8,179	8,219	77	491

(a) Excludes rough grazing

Section 2 – UK Phosphorus Balance

Figure 2 – Summary of Phosphorus balance for England, 2000 to 2019



For the period 2018 to 2019 the key points are:

- The surplus of 3.2 kg/ha represents a decrease of 1.8 kg/ha (65%) compared to 2018. This has been driven by an 8.8% increase in offtake while inputs decrease by 1.0% when compared to 2018. As with nitrogen, the offtake increase reflects increased production in harvested cereal crops.

For the period 2000 to 2019 the key points are:

- A 5.9 kg/ha fall in the total surplus per hectare from 9.1 kg/ha in 2000 to 3.2 kg/ha in 2019 (-65%).
- The main driver has been a reduction in inputs (from 30 to 22 kg/ha) reflecting reduced fertiliser application rates and manure production (due to declining livestock populations). Total offtake has decreased from 21 kg/ha to 19 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 in 2009 is due to changes in farm survey data collection in England. [See further information](#).

Table 2.1 - Phosphorus balance for UK, 2000, 2018 and 2019 (kg P per hectare)

	2000	2018	Prov. 2019	Change 2018-19	Change 2000-19
Total Inputs	30.0	22.7	22.4	-0.2	-7.6
Total Offtake	20.9	17.7	19.3	1.6	-1.7
BALANCE (Inputs minus Offtake)	9.1	5.0	3.2	-1.8	-5.9

Table 2.2 - Detailed phosphorus balance sheet results for 2000, 2018 and 2019 (thousand tonnes P)

	2000	2018	Prov. 2019	Change 2018-19	Change 2000-19
TOTAL INPUTS	240	186	184	-1	-56
Fertilisers	115	79	79	0	-36
Inorganic fertilisers	97	53	53	0	-43
Total organic fertilisers	18	26	26	0	8
Manures	121	102	101	-1	-20
Livestock Manure Production	121	102	101	-1	-20
Cattle	69	57	56	-1	-13
Pigs	12	9	9	0	-3
Sheep and goats	16	13	13	0	-3
Poultry	22	22	22	0	0
Other livestock	2	1	1	0	-1
Withdrawals	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	145	158	14	-9
Total Harvested Crops	87	81	93	12	7
Cereals	70	62	75	13	4
Oil crops	7	12	10	-2	4
Pulses and Beans	3	2	4	1	1
Industrial Crops	3	3	2	-1	-1
Other Crops	3	3	3	0	-1
Total Forage	79	62	63	1	-16
Harvested Fodder Crops	3	6	7	0	4
Pasture	76	55	56	1	-20
Crop residues	2	2	2	0	0
BALANCE (Inputs minus Offtake)	73	41	26	-15	-46
Managed area (thousand ha) (a)	7,993	8,179	8,219	77	491

Section 3 – About these statistics

Background

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.

Methodology

A methodology for calculating soil nutrient balances has been developed by OECD (Organisation for Economic Cooperation and Development) and adopted by Eurostat (Statistical body of the European Commission). Although based on an internationally recognised methodology, the nutrient balance estimates are subject to a level of uncertainty or error margins.

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.

UK approach

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 and follow-up work carried out within Defra. [Details of the two projects can be found here.](#)

Follow-up work is presented in a separate paper 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. [The project report can be found here.](#)

The estimates presented in this Statistics Notice use the June Survey data for England for commercial holdings 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.

Future publications

The next publication is due in July 2021

Section 4 - Glossary

Term	Definition
Nutrients	The key macro-nutrients required for crop growth which are nitrogen and phosphorus
Inputs	The total amount of inputs of each nutrient to the soil. This can be through application of mineral fertilisers or organic manures, atmospheric deposition or biological fixation
Offtake	The total amount of nutrients removed from the soil by the growth of crops, which are either harvested or grazed by livestock.
Nutrient balance	The difference between the inputs and the offtake for each nutrient
Loading	Another term for the balance, conveying that this is the total net amount being loaded onto the soil over a year
Surplus	If the annual inputs exceed the offtake the net balance represents a surplus of the nutrient. This surplus represents an environmental risk as it can be lost from the soil to the air or water courses.
Deficit	If the annual inputs are less than the offtake the net balance represents a deficit of the nutrient and hence the crop growth requirements will not have been met.
Atmospheric deposition	The process by which nitrogen in the atmosphere is transferred into soils.
Biological fixation	The process by which nitrogen in the atmosphere is incorporated into the tissues of plants and crops