PAAG

Professional Agricultural Analysis Group

Collation of data from routine soil analysis in the UK

2015/2016

Contents

Summary

Results are reported for statistical collation of soil analytical data provided by participants in the Professional Agricultural Analysis Group. For the current year (June 1st 2015 to May 31st 2016) results for around 160,000 samples were available (different numbers for pH, P, K and Mg).

Some participants provided data that could be broken down by arable and grass as the current crop and datasets were constructed to allow collation within this breakdown.

Conclusions should be drawn cautiously as the data were not necessarily representative of all UK fields and data collations were not statistically rigorous.

Soil pH was <6.0 in 17% of arable samples (19% in 2014/15) and <5.5 in 19% of grass samples (21% in 2014/15). This supports the need for regular soil analysis to maintain pH.

As in previous years, only around 29% of all samples were at target Index of 2 for P and 30% were at target Index of 2- for K. Just 9% of samples were at target Indices for both P and K. Some 91% of samples indicated the need for adjustment of P or K Index giving clear support for the need to base fertilizer use on regular soil analysis.

In the current year 19% of arable samples and 5% of grass samples were in Mg Indices 0 or 1 where application of magnesium might be recommended for some crops. These percentages were slightly greater than those in 2013/14.

1. Background

The Professional Agricultural Analysis Group (PAAG) was established in 2009 to help ensure a common quality standard amongst participating laboratories and to promote the benefits of soil analysis for efficient nutrient management. One of the early actions agreed by the PAAG was the collation of their UK soil analytical data to show breakdown by pH class and by P, K and Mg Indices.

This report covers the collation of analytical data provided by participants for the period 1st June 2015 to 31st May 2016.

2. Data provided

Data comprised results of soil analyses - Olsen for P, ammonium nitrate extraction for K and Mg and 2.5:1 water:soil for pH. The amount and breakdown of data varied among participants. Data provided by some participants derived from several tens of thousands of samples, those from others derived from a few hundred samples. Some provided data that could be broken down by arable and grass. Datasets were constructed for current year UK data and for data broken down into grass and arable where this was possible. Where they could be identified, data from amenity trees, top fruit, coppice, gardens, top-soil, protected crops and non-UK sites were excluded. Data for amenity grass of all kinds (including horse paddocks) were excluded from the grassland dataset. Data for current arable crops following a ley were included in the arable dataset. Data for current arable crops and forage maize following permanent grassland or grazed grass were included in the grassland dataset. Data from every participant were allocated to the various datasets to the greatest extent possible. Consequently, sample record numbers vary among datasets and the sums of identifiable grass and arable sample records do not equal the total number for all samples.

3. Dataset classes

For every dataset, numbers of sample records in different pH classes and soil Indices (Table 1) were counted and expressed as percentages of the total number of samples in that dataset.

Table 1 Classes used for the collation

pH	P Index	K Index	Mg Index
<5.00	0	0	0
5.00-5.49	1	1	1
5.50-5.99	2	2-	2
6.00-6.49	3	2+	3
6.50-6.99	4	3	4
7.00-7.49	5	4	5
7.50-7.99	>5	5	6
>7.99		>5	>6

Only data that could be allocated to these classes, either directly or from concentrations in mg/l, were used in the analyses.

4. Interpretation of the data

Particular care is needed when drawing conclusions from the data. Firstly, soil samples submitted to laboratories are not randomly selected from the total population of fields. Technically aware farmers probably are more likely to use soil analysis in decision-making and their soils may be maintained at higher levels of available nutrients than are present in the population mean. Secondly, amounts and sources of data differed between the various datasets used. Several laboratories contributed to the collation of total samples for the UK. Fewer provided data for grass and arable soils separately. The collation of the data therefore was not statistically rigorous. Nevertheless, broad trends can be identified and some conclusions drawn.

5. Collation of data

5.1 Datasets

The current year was June 1st 2015 to May 31st 2016. Data sets were established for:

- UK data across all crops and grass
- UK data for arable samples
- UK data for grass samples

5.2 UK data across all crops and grass

Results for 160332 (pH), 170050 (P), 162542 (K) and 170050 (Mg) samples were available for the current year.

Mean soil pH was 6.47, 30% of samples were below 6.00 and 43% were between 6.00 and 7.00.

Only 29-30% of samples were at target soil P or K Index (2 and 2- respectively). Soil P was lower than target Index in 28% of samples and soil K was lower than target in 34% of samples. Soil Mg Index was lower than 2 in 13% of samples (Table 2, Fig 1).

Table 2 Soil pH and Indices - all samples

				Percentage of samples in class:				
Soil pH	**<5.0**	**5.00-5.49**	**5.50-5.99**	**6.00-6.49**	**6.50-6.99**	**7.00-7.49**	**7.50-7.99**	**>8**
	1	9	20	24	19	12	10	5
				Percentage of samples in class:				
P Index	**0**	**1**	**2**	**3**	**4**	**5**	**>5**	
	8	20	28	29	11	3	1	
				Percentage of samples in class:				
K Index	**0**	**1**	**2-**	**2+**	**3**	**4**	**5**	**>5**
	5	29	30	17	15	3	1	0
				Percentage of samples in class:				
Mg Index	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**>6**
	1	12	36	30	11	6	4	1

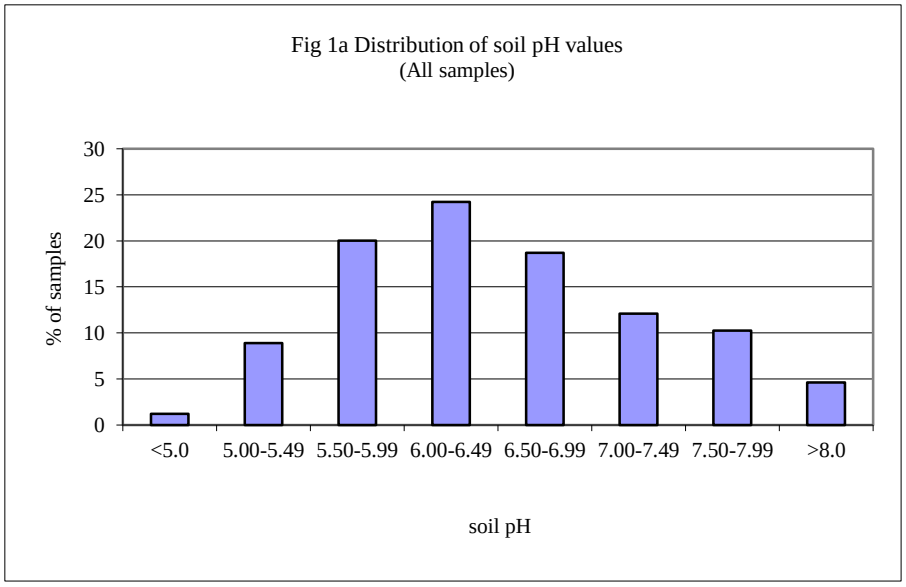


Fig 1b Distribution of soil P Index values
(All samples)

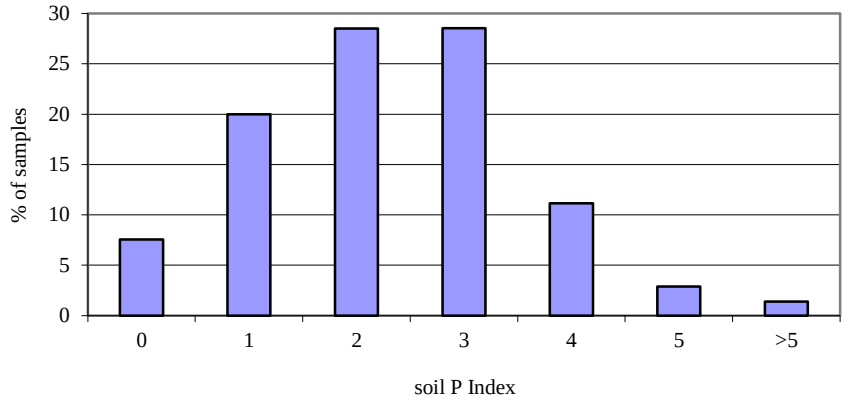


Fig 1c Distribution of soil K Index values
(All samples)

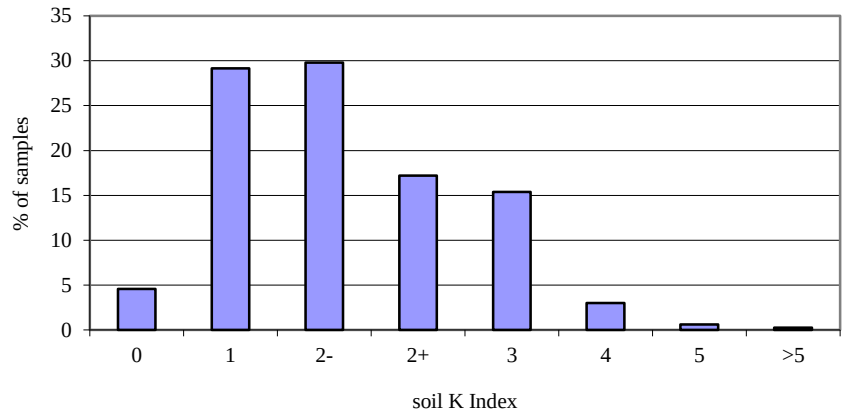
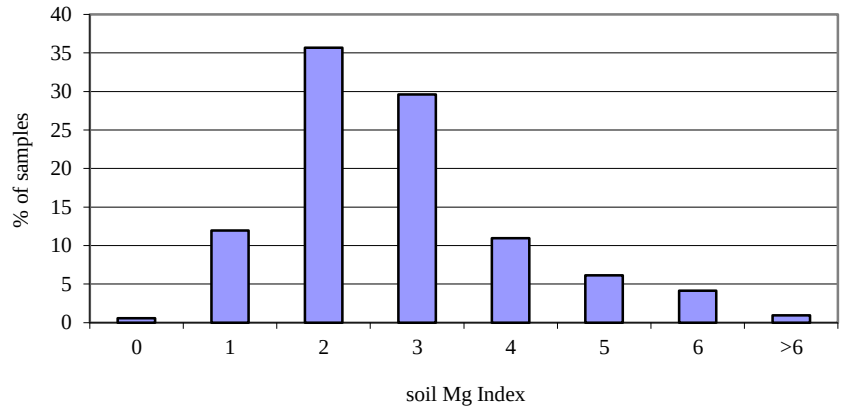


Fig 1d Distribution of soil Mg Index values
(All samples)



5.3 UK data by arable and grass

Some participants provided data where the past crop could be identified as arable or agricultural grass. These data (around 65000 samples for arable and 60000 for grass) are summarised in Table 3 and Fig 2.

Mean pH for arable was 6.77 and for grass 6.02.

The distribution of soil P values was similar for arable and grass with mean values of 32 mg/l (Index 3) for arable and 24 mg/l (Index 2) for grass. Only 27-30% of arable and grass samples were at target Index 2 with 21% (arable) and 36% (grass) in Indices 0 or 1.

The distributions of soil K values also were somewhat similar with means of 176 mg/l (Index 2-) for arable and 162 mg/l (Index 2-) for grass. Only 32% of arable and 27% of grass samples were at target Index 2- and 31% (arable) and 42% (grass) were in Indices 0 or 1.

There was a more noticeable difference between arable and grass in soil Mg. Mean value was lower for arable (120 mg/l, Index 3) than for grass (154 mg/l, Index 3). Only 5% of grass, but 19% of arable, samples were in Mg Indices 0 or 1.

Table 3 Soil pH and Indices – arable and grass

				Percentage of samples in class:				
Soil pH	**<5.0**	**5.00-5.49**	**5.50-5.99**	**6.00-6.49**	**6.50-6.99**	**7.00-7.49**	**7.50-7.99**	**>8**
Arable	1	4	12	22	24	16	14	8
Grass	2	17	33	27	12	5	3	1
				Percentage of samples in class:				
P Index	**0**	**1**	**2**	**3**	**4**	**5**	**>5**	
Arable	5	16	27	32	14	4	2	
Grass	12	24	30	25	7	2	0	
				Percentage of samples in class:				
K Index	**0**	**1**	**2-**	**2+**	**3**	**4**	**5**	**>5**
Arable	3	28	32	19	16	3	0	0
Grass	7	35	27	14	12	3	1	0
				Percentage of samples in class:				
Mg Index	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**>6**
Arable	1	18	39	24	9	5	4	1
Grass	0	5	32	37	13	7	5	1

Fig 2 Distributions by arable and grass

5.4 P x K Index matrix

A matrix was constructed showing percentages of all samples falling into different P and K Indices. A summary of results is shown in Table 4 and full results are in Appendix 1.

Only 9% of samples were at target Indices for both P and K. This percentage has been almost unchanged since the matrix was calculated first in 2010.

Table 4 Percentages of all samples in P and K Indices
(total 162542 samples)

	P Index		
K Index	<target	target	>target
<target	13	10	11
target	8	9	13
>target	7	10	19

Appendix 1 Percentages of samples in P x K Indices

All samples

	P Index				
K Index	**0**	**1**	**2**	**3**	**>3**
0	1	1	1	1	0
1	3	7	9	7	3
2-	2	6	9	9	4
2+	1	3	5	5	3
3	1	2	4	5	3
>3	0	0	1	1	1

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