THE BRITISH SURVEY OF

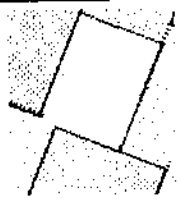
Fertiliser Practice

FERTILISER USE ON FARM CROPS FOR CROP YEAR 1999

Ministry of Agriculture Fisheries and Food

Fertiliser Manufacturers Association

SCOTTISH EXECUTIVE
Rural Affairs Department



First published 2000

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

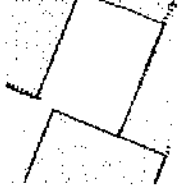
ISBN 0 85310 085 3

Further statistical analysis of the survey results are also available. For details and costs please contact:

David Heather

Fertiliser Manufacturers' Association
Greenhill House
Thorpe Wood
Peterborough
PE3 6GF

Tel: +44 (0) 1733 331303
Fax: +44 (0) 1733 332909



FOREWORD

The British Survey of Fertiliser Practice provides information on fertiliser use on the major crops and grass grown in mainland Britain.

The Survey is sponsored by the Fertiliser Manufacturers' Association (FMA), the Ministry of Agriculture, Fisheries and Food (MAFF) and the Scottish Executive Rural Affairs Department (SERAD). The Survey has the full support of the Farmers' Unions in England, Scotland and Wales.

The Survey is carried out annually and is based upon returns from a sample of farms, a new sample being used each year. In 1999, the Survey was co-ordinated by the Rural Business Unit at the University of Cambridge, which was also responsible for the survey design, statistical analysis and quality control monitoring. ADAS Consulting Ltd carried out the farm interviewing.

July 2000

ACKNOWLEDGEMENTS

The sponsors gratefully acknowledge the co-operation of all farmers taking part in the 1999 British Survey of Fertiliser Practice.

The authors of the report wish to thank all those involved for their assistance and support in the design, conduct and analysis of the Survey.

The agronomic interpretation of the Survey results benefited from advice from Chris Dawson (Chris Dawson and Associates), Agronomic Consultant to the Fertiliser Manufacturers' Association.

Andrew Chalmers[1]

Barry Hounsome[2]

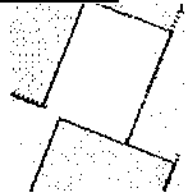
Ben Lang[2]

Alan Renwick[2]

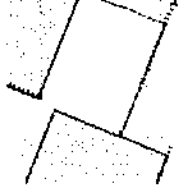
Carol Rush[2]

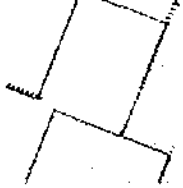
[1] ADAS Bridgets, Martyr Worthy, Winchester, Hampshire SO21 1AP.

[2] Department of Land Economy, Rural Business Unit, The University of Cambridge, 19 Silver Street, Cambridge CB3 9EP.

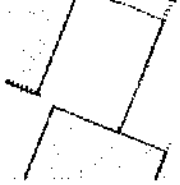


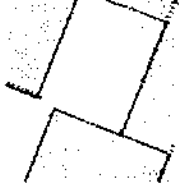
CONTENTS





LIST OF TABLES AND FIGURES





EXECUTIVE SUMMARY

The British Survey of Fertiliser Practice is an annual, nationally representative, survey based on the selection each year of a random stratified sample of farms from mainland Britain. In 1999, approximately 1,200 farms were surveyed. The main purpose of the survey is to estimate average application rates of nitrogen, phosphate and potash used for agricultural crops and grassland. Information is also collected on applications of sulphur fertilisers, organic manures and lime. Aggregated data have been obtained for Great Britain since 1983, the first year that the existing survey in England and Wales was extended to Scotland.

The main findings from the 1999 Survey on the use of each fertiliser nutrient in Great Britain are summarised below. Weather and economic factors which may have contributed to recorded changes in fertiliser use during the 1998/99 cropping season are also discussed in the report.

Nitrogen

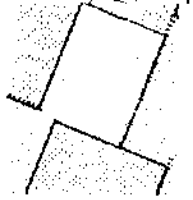
- The overall nitrogen rate on tillage crops was 141 kg/ha, which was 3 kg/ha less than in the previous year and the lowest recorded rate for five years. This drop in the total nitrogen rate, associated with a reduction in straight nitrogen use, was in part a result of a decreased proportion of barley being sown in the autumn in 1998/99. Overall nitrogen rates actually increased on the major cereal crops and oilseed rape, but decreased on potatoes and sugar beet. The change in nitrogen rate for oilseed rape was related to a further drop in the percentage crop area (7%) that was spring rather than autumn sown.

- Autumn nitrogen use on winter cereals was lower but similar to previous years, with 6% and 10% of the wheat and barley crop areas respectively receiving an application. About a third of the winter oilseed rape area was treated with autumn nitrogen, which was also lower than in recent seasons. Actual application rates, where autumn nitrogen is applied, have been about 20-25 kg/ha on winter cereals and 40 kg/ha on oilseed rape over the last few years.

- The overall rate of total nitrogen on grassland was 110 kg/ha and almost the same as in 1998, when recorded nitrogen use fell by 14 kg/ha to 109 kg/ha, the lowest level over the last five years. Estimated changes in straight and compound nitrogen use were very slight in 1999. Nitrogen use on grassland had previously shown a partial recovery in application rate, following the very large drop, from 129 kg/ha to 105 kg/ha, recorded in 1992.

Phosphate

- Overall phosphate use in 1999 decreased sharply, by 6 kg/ha, to 45 kg/ha on tillage crops, the lowest recorded rate since 1983. This drop was principally caused by reductions in the proportion of some arable crops which received a phosphate application, rather than any major change in the rates actually applied. On grassland, the overall phosphate rate in 1999 was 20 kg/ha, which was 1 kg/ha less than the estimated rate for the previous season and the lowest rate over the last five years.



Potash

- The overall potash rates on tillage crops also fell sharply, by 7 kg/ha, to 57 kg/ha in 1999, for the same reason as for phosphate. Overall potash use on grassland, as for phosphate, was 1 kg/ha lower in 1999, at 28 kg/ha. These potash rates were the lowest over the last five year period for both tillage crops and grassland.

Sulphur

- Sulphur use on arable crops susceptible to sulphur deficiency had increased between 1993, when the Survey first started to collect data on sulphur applications, and 1997. Since then, however, the proportion of both cereal crops and oilseed rape treated with sulphur fertiliser has hardly changed. In 1999, 12% of the spring barley, 14% of the winter cereals and 31% of the oilseed rape area received a sulphur application. The results indicate static use of sulphur fertiliser on these susceptible crops, despite the increasing risk of sulphur deficiency with declining sulphur deposition.

- Sulphur use on grassland has remained at a very low and static level over the last five years. In 1999, sulphur was only applied to 4% of the total grassland area. The risk of sulphur deficiency is, however, greatest under intensive cutting regimes and sulphur was actually applied to 7% of grassland cut for silage in 1999.

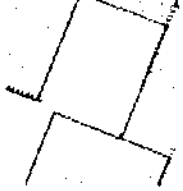
Longer term trends

The longer term trends in application rates since 1983 show that:

- Overall nitrogen use has declined on both tillage crops and grassland.

- Phosphate use has declined gradually on tillage crops but, apart from lower rates in 1998-99, has been relatively stable on grassland.

- Potash use has tended to decline on tillage crops, despite some apparent recovery in application rate in 1997 and 1998. Overall potash rates on grassland have shown larger annual fluctuations, but have also decreased slightly.



SECTION A

THE BRITISH SURVEY OF FERTILISER PRACTICE

A1 INTRODUCTION AND STRUCTURE OF THE REPORT

The British Survey of Fertiliser Practice (BSFP) is unique in its range and in its aspiration to produce an accurate assessment of fertiliser use for England and Wales, and Scotland. To achieve this aim, estimates from the survey data are used in conjunction with crop areas from the Annual Agricultural Census[3]. The report is the principal source of estimates for fertiliser applications in Great Britain, and is used by the British fertiliser industry, by Government and by the wider agricultural community. With such a high profile it is essential that the claims made from the survey are underpinned by an effective methodology. Section A2 describes this methodology, detailing measures undertaken to avoid bias and unreliability. National changes in relative cropping areas are discussed in Section A3.

Section B provides a commentary of recent changes in survey data and longer term trends. Section C presents the main tables of results from the Survey, grouped by geographic coverage. They include major crop groups, grassland, product types and farm types. Figures for 'total', 'straight' and 'compound' nutrient rates are presented in separate tables. Supplementary questions, which change each year, are also included in the Survey. Section D provides an analysis of information which was gathered in the 1999 Survey regarding soil sampling and testing by farmers in relation to fertiliser use.

A1.1 HISTORY

The survey has been in existence, in various forms, since 1942 for England and Wales. It was extended to Scotland in 1983. The current methods of survey design and implementation are the result of adaptation of the original design by Rothamsted Experimental Station, undertaken by Edinburgh Data Library at the University of Edinburgh between 1992 and 1998. In 1999 responsibility for design and analysis transferred to the Rural Business Unit at the University of Cambridge.

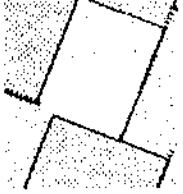
A2 SURVEY METHODOLOGY

A2.1 SAMPLE

The basis of the sample framework is the Agricultural Census[4]. Each year, two samples are extracted, one for England and Wales and one for Scotland. In England and Wales, farms are classified into one of three types, cropping, livestock and horticulture. Farms are then further classified into four size groups. In Scotland, a similar number of size groups are used but farms are classified into only two types, mainly cropping and mainly livestock. This produces 20 stratification cells, 12 for England and Wales and eight for

[3] MAFF, SOAEFD and the Welsh Office *The Digest of Agricultural Census Statistics UK 1998.*

[4] The June census is undertaken annually and records information on farm size, cropping and stocking and employment. It is the most accurate information available on farming in the UK.



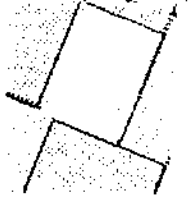
Scotland, shown in Tables A2.1 and A2.2. As the census does not record information on holdings less than 20 hectares in size, these holdings are also excluded from the BSFP.

The process of random stratification results in more precise estimates than those which would be obtained by simple random sampling.

Table A2.1 Derivation of the stratified random sample for the 1999 survey, England and Wales

	farm holdings in population in 1997	total crops & grass in 1997	notional sampling fraction	target sample size	achieved sample size	achieved sample fraction
England & Wales		(column %)	(%)			(%)
Livestock (MAFF robust types 4-7)						
crops & grass area						
20-50 ha	24365	9.7	0.45	109	134	0.55
51-100 ha	17142	13.5	0.95	162	169	0.99
101-200 ha	7992	11.9	1.79	143	128	1.60
200+ ha	2618	11.5	5.29	139	48	1.83
Crops & mixed (MAFF robust types 1,2,8)						
crops & grass area						
20-50 ha	10497	4.0	0.46	48	47	0.45
51-100 ha	10438	8.5	0.98	102	78	0.75
101-200 ha	9538	15.0	1.88	180	134	1.40
200+ ha	6411	25.7	4.81	309	217	3.38
Horticulture (MAFF robust type 3)						
crops & grass area						
20-50 ha	713	0.2	0.41	12	11	1.54
51-100 ha	207	0.2	0.95	8	8	3.86
101-200 ha	96	0.2	1.84	7	3	3.13
200+ ha	29	0.1	4.12	5	4	13.79
Total for England and Wales	89001	100.0		1224	981	1.10

The fraction of farm holdings sampled from each cell is proportional to the total area of crops and grass (see Column 3, Tables A2.1 and A2.2). An exception to this is that in England and Wales a deliberate policy of over sampling is undertaken for the horticultural group to ensure sufficient numbers for a robust estimate to be made. The notional sampling fraction presented in Tables A2.1 and A2.2 indicates the percentage of the total population of holdings that are sampled in each cell. As the larger farms cover a greater area, then a higher proportion of these holdings are sampled. The process of selecting the actual holdings to be surveyed involves two steps. First the holdings in each cell are ordered by geographic location (using the County, Parish, Holding (CPH) identifier). This



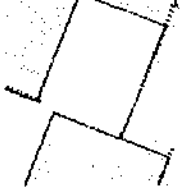
enables a high degree of geographic dispersion in the sample. The number of farms to be surveyed is then drawn at random from these stratified groups. This process leads to a *sought* sample (a total of 1474 farms) that is representative of the population as a whole. The actual sample *achieved* is influenced, like all surveys, by a number of factors.

Table A2.2 Derivation of the stratified random sample for the 1999 survey, Scotland

	farm holdings in population in 1997	total crops & grass in 1997	notional sampling fraction	target sample size	achieved sample size	achieved sample fraction
Scotland		(column%)	(%)			(%)
Cereal/general cropping/horticulture (SERAD robust types 1-3)						
crops & grass area						
20-50 ha	1067	3.0	0.71	8	9	0.84
51-100 ha	1249	7.6	1.52	19	15	1.20
101-200 ha	1133	13.2	2.91	33	33	2.91
200+ ha	472	12.5	6.62	31	26	5.51
Livestock & mixed (SERAD robust types 4-8)						
crops & grass area						
20-50 ha	2686	7.7	0.72	19	22	0.82
51-100 ha	3207	19.2	1.50	48	38	1.18
101-200 ha	2047	23.2	2.83	58	54	2.64
200+ ha	564	13.5	6.00	34	33	5.85
Total for Scotland	12425	100.0		250	230	1.85

Current census data for the year of the survey were not available. Therefore, information used from the census to draw the sample is to some extent historic, being either one or two years old. For this reason not all of the holdings selected were actually eligible for the survey, simply through the process of structural change. In addition, as the survey is voluntary, it is also inevitable that there will be some non-response from those that are eligible. Response rates are presented in the Appendix. Non-response is a problem as it may introduce bias into the survey. Clearly it would be wrong to assume that those farms that did not co-operate have the same level of fertiliser use as those that did. In order to reduce the problem of non-response, two samples are drawn (known as the main and reserve samples). The main sample is drawn through the process described above. The reserve sample is drawn by selecting the nearest holding, as represented by the CPH number, that falls in the same stratification cell as the main list holding. This means that farms are 'paired'. This ensures that the geographical dispersion is maintained.

Each farm in the main sample is contacted; if for whatever reason a farm is not able to take part in the survey, the farm on the reserve list that it is 'paired' with is then contacted. If this farm also refuses then no farm is recruited into the survey. Any over sampling (or under sampling) that occurs through this process is corrected for by the use of weighting factors, which are the inverse of the achieved sampling fraction.



A2.2 DATA COLLECTION

Data collection was undertaken by ADAS Consulting Ltd., who visited farms between May and September 1999. The timing of the survey was set so that the majority of holdings were visited after they had applied their last fertiliser dressing for the crop year. In addition to collecting information on the fertiliser use on each field, the recorder collected general information on the holding and some supplementary information. The supplementary questions in 1999 considered soil sampling and testing by farmers and are discussed in Section D.

A2.3 DATA PROCESSING

The data processing and analysis were undertaken by the Rural Business Unit at the University of Cambridge. Some idea of the complexity of the survey can be given through the amount of data that has to be inputted and processed. In 1999 the 1191 farms recorded represented one per cent of the total crops and grass area in Britain. This equated to over 10,000 fields and nearly 20,000 applications of fertiliser.

At present the database is designed in Microsoft Access, which provides a user-friendly interface as well as a powerful tool for checking data accuracy. Various checks were built in at the inputting stage, for example the total nutrient applied to the field was calculated and checked against a credible range.

The high degree of detail collected per farm enabled analysis of fertiliser use at a number of levels; by crop, by type of fertiliser (straight or compound), by timing of application, by geographic region, etc. This enables the survey to present a comprehensive picture of fertiliser use in Britain. The longevity of the survey also means that it is invaluable for demonstrating the changing trends in fertiliser use.

Each participating farmer receives customised feedback highlighting their fertiliser use by crop and/or grass categories and comparison with regional averages. In addition to the individual feedback, co-operators also have the option to receive a summary report highlighting the main findings from the survey.

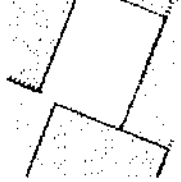
A2.4 DEFINITIONS OF TERMS

1. For the purpose of the Survey, the term **Britain** is defined to cover mainland Britain, Anglesey and the Isle of Wight.

2. The **survey year** ran from autumn 1998 to autumn 1999, corresponding to the 1999 season or harvest year. The recording period for fertiliser applications varied for different crop and grass groups.

3. For the purposes of this survey, a **field** is defined as any single area of land measuring more than 0.2 ha (half an acre) which had a uniform cropping and fertiliser history from autumn 1998. Areas within the same natural boundary receiving different treatments (crops of fertilisers) were recorded separately. Agricultural land which had been set-aside under the Arable Area Payment Scheme was recorded, but was not included in analyses unless it was used to grow an industrial crop. Fallow land other than set-aside has always been recorded in the survey.

4. In the report, **tillage** is defined as all crops except grass, forestry, glasshouse crops and land designated as 'set-aside' under the Arable Area Payments scheme. Grass refers to all forms of grassland which may be grazed, conserved or grown for seed production; rough grazing is excluded.



5. The abbreviation **N** is used for nitrogen; P_2O_5 for phosphate; K_2O for potash, SO_3 for sulphur and **FYM** for all types of organic manure e.g. slurries and solid manures. The phrase **total use** includes both straight (single nutrient) and compound (multi nutrient) products.

6. For each fertiliser nutrient, the **average field rate** (of application) is defined as the average rate at which a nutrient was used by farmers on those fields which received any dressing of the nutrient. Crop area without any application of the nutrient is excluded from the calculation of the average field rates of application. These field-specific application rates provide direct evidence on the level and variation in farming practice.

7. The term **dressing cover** is used to describe the proportion of crop area treated with any dressing of the fertiliser nutrient in question, and is stated as a percentage.

8. The **overall application rate** is defined as the proportion of the total quantity of nutrient used, in kilograms (kg), to the total extent of crop area, in hectares (ha). When combined with information from the national total crop area estimates in the Agricultural Census, these overall application rates provide a means of estimating the tonnage of fertiliser nutrient used during the survey year.

Any change in an overall application rate is due to a change in either the (actual) field rate of application used on farms, or to a change in the dressing cover, or to changes in both. Arithmetically, overall application rate is equivalent to the sum obtained by multiplying the average field rate of application by the proportion of crop area that receives any nutrient dressing. The overall application rate of a nutrient on a crop, by definition, cannot be greater than the average field rate of application.

A3 GENERAL TRENDS AND ISSUES

A3.1 CROP AREAS AND WEATHER CONDITIONS

Annual changes in relative cropping areas, as well as any changes in fertiliser practice for individual crops, may affect nutrient application rates when aggregated across the main crop groupings. Table A3.1 provides a summary of Census estimates for areas of individual major crops, crop groupings and total tillage and grassland categories in 1997/98 and 1998/99, and illustrates percentage changes in relative cropping areas over the past five years. There were about 10.5 million hectares of managed agricultural land in Britain in 1999, of which 4.7 million hectares (45%) were cultivated for tillage cropping and the remainder, 5.8 million hectares, were grassland (excluding rough grazing).

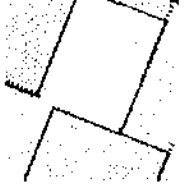


Table A3.1 Cropping and grassland areas ('000 ha) in Great Britain, 1997/98 - 1998/99

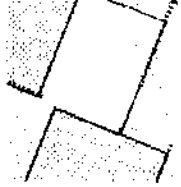
Crops	1997/98 '000s ha	1998/99 '000s ha	% change since 1998	% change since 1994	1998/99 crop areas as % of total tillage area
Wheat - winter	1997	1815	-9.1	2.7	39
- spring	41	37	-9.6	2.9	1
Barley - winter	764	543	-28.9	-12.6	12
- spring	456	600	31.6	32.7	13
Total Cereals[1]	*3375*	*3099*	*-8.2*	*3.3*	*66*
Oilseed rape - winter	443	387	-12.6	7.8	8
- spring	62	30	-51.5	-31.6	1
Sugar beet	189	183	-3.0	-6.1	4
Potatoes[2]	157	170	8.3	9.5	4
Linseed	100	209	110.1	261.0	4
Peas/beans[3]	213	202	-5.3	-11.4	4
Maize/other fodder	168	163	-3.0	1.6	3
Vegetables	122	124	1.6	-1.6	3
Total tillage[4]	*4946*	*4685*	*-5.3*	*5.2*	*100*
Set-aside[5]	313	570	82.1	-21.7	12
Grassland					**1998/99 grass areas as % of total grass area**
Less than 5 years old	1147	1085	-5.4	-13.0	19
5 years and older	4675	4752	1.6	0.3	81
Total grass[6]	*5822*	*5837*	*0.3*	*-2.5*	*100*
Total crops and grass[7]	*10768*	*10522*	*-2.3*	*0.8*	

[1]including minor cereals (oats, rye, triticale, mixed corn)
[2]early + second early + maincrop potatoes
[3]harvested dry for animal consumption
[4]including other crops and bare fallow, but not set-aside
[5]including industrial crops; the percentage area is expressed as the ratio of set-aside area to the total area designated for cultivation.
[6]managed grassland, excluding rough grazing
[7]total tillage + total grassland

Source: Annual MAFF/SERAD/NAWAD June Census data

The total tillage area fell by 261,000 hectares (5%) in 1999, because of the increased area (+257,000 hectares) of arable land that was set aside under the Arable Area Payment Scheme[5]. This increase in set-aside, together with a rise of 109,0000 hectares (+110%) in the linseed area, accounted for the drop in total cereal and oilseed rape areas of 276,000 and 88,000 hectares respectively. Two thirds of the tillage area was cropped

[5] MAFF (1998) Arable Area Payments Scheme. Explanatory Guide: 1999 Update. PB 3775. AR31.



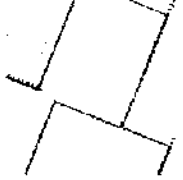
with cereals, of which 60, 18 and 19% was wheat, winter barley and spring barley respectively. The winter wheat and winter barley areas dropped by 9 and 29% respectively in 1999 because of the combined effects of set-aside requirements, difficult soil and weather conditions for sowing crops in autumn 1998 and, for winter barley, expectation of poorer financial returns. As a result spring barley sowings increased by 32%. Both the winter and spring oilseed rape areas decreased in 1999, by 13 and 52% to 387,000 and 30,000 hectares respectively, so that the spring-sown crop was down to only 7% of the total oilseed rape area. The other main categories of tillage crops showed little change in cropping area, apart from a 13,000 hectare (+8%) increase for potatoes (early and maincrop). The total managed grassland area was virtually unchanged in 1999, as the estimated decrease of 62,000 hectares (-5%) in the grassland area less than five years old was compensated for by an increase in the area of older grassland.

Compared to 1994, the total tillage area was 5% higher, mainly because of changes in set-aside practice. Net changes in both the total cereals and wheat areas have been small over the past five years, while the winter barley cropping area has declined. The winter oilseed rape area was 8% higher in 1999 than in 1994, while the spring crop has dropped by a third, due to changing economic factors linked to the Arable Area Payment scheme and rape seed commodity prices. The potato and linseed areas, which in the latter case had fallen markedly to only 58,000 hectares in 1994, increased by 15,000 and 151,000 hectares respectively over this period. The increased areas of winter oilseed rape, potatoes and linseed accounted for most of the rise in total tillage area. In contrast, total grassland has slightly decreased, by 3%, since 1994 with a significant decline in the area of grass less than five years old. A fifth of grassland was less than five years old in 1999, compared to almost a quarter five years earlier.

Unusual seasonal weather conditions can influence fertiliser usage in some years. For example:

- A very wet autumn can delay the establishment of winter sown crops, or alter the ratio of winter to spring sown crops, with their different fertiliser requirements.
- Prolonged wet weather can increase leaching losses of some nutrients, particularly nitrogen and sulphur. Weather conditions also affect other aspects of soil chemistry and nutrient availability.
- Adverse weather conditions can disrupt planned farming activities, such as fertiliser spreading.
- Growing conditions determine plant growth and hence affect nutrient requirements.

The autumn and winter of the 1998/99 cropping season were wetter than normal, apart from periods of relatively dry weather in November and February, in most parts of Britain. The wet autumn restricted opportunities for drilling winter crops, especially on heavier textured soils. Spring rainfall was much higher than average during April in some areas, leading to local flooding in river catchments. Temperatures were milder than normal during the winter and spring and sunshine was also above average for the majority of the main growing season. The summer weather was, however, cool and wet in June and most of August, which hampered cereal harvesting, while July was mainly hot and dry. The growing conditions during the season produced very good yields of cereals and oilseed rape, which were second to highest over the last five years.



SECTION B

COMMENTARY ON FERTILISER USE IN GREAT BRITAIN

This commentary refers to rates of application in mainland Britain of fertilisers containing nitrogen (N), phosphate (P_2O_5), potash (K_2O) and sulphur (SO_3) on tillage crops and grassland (excluding rough grazing). Section B1 of the report covers the five-year period 1995 to 1999. Comments on longer term trends are made in Section B2, using data available from what were, prior to 1992, two separate Surveys of Fertiliser Practice, for England and Wales and for Scotland.

The estimates of overall application rates from the survey relate to usage on farms during the 1998/99 growing season: they form a basis for estimating quantities of fertiliser used in Great Britain. The estimates of the average field rates provide a better indication than overall application rates of actual usage levels and also of any annual variation in fertiliser practice on farms.

The statistics on the pattern of fertiliser practice reported for Great Britain largely reflect practice in England and Wales due to its greater area of total crops and grassland: about 8.7 million hectares in England and Wales and about 1.8 million hectares in Scotland. In what is otherwise a commentary on Britain as a whole, remarks on the separate regions are only made to highlight particular trends of interest. Readers interested in more detailed recent trends for individual crops in England and Wales or in Scotland, can refer to tables presented in Section D of the 1996 to 1998 annual Reports (Section C for 1999), in conjunction with the summary tables of annual fertiliser use in the main text of the 1995 report[6].

The nutrient rates presented and discussed in the main text of this Report are based on crop areas estimated from the survey data. Data from the 1999 Agricultural Census on crop areas have been summarised in Table A3.1. Crop area estimates from the Agricultural Census have greater reliability as they are derived from a far larger sample of farms. Census crop areas are used in the Appendix of the report to re-estimate application rates, for total tillage and grassland crop groupings, taking into account the limitations of survey crop area estimates extrapolated from a comparatively small survey sample. This is the third year that these adjusted rates have been calculated and consideration is being given to their regular inclusion in the report and to the re-estimation of statistics for earlier years in order to assist comparison over time. In general, the adjusted estimates are very close to those reported in Section B, although they do appreciably moderate some estimates reported for grassland.

---

[6] Burnhill P M, Chalmers A G and Fairgrieve J (1996) *The British Survey of Fertiliser Practice: fertiliser use on farm crops 1995*. HMSO: Edinburgh.

B1 1999 RESULTS FOR GREAT BRITAIN AND CHANGES IN RECENT YEARS

B1.1 OVERVIEW OF FERTILISER USE ON ALL CROPS AND GRASS

Overall rates of total nitrogen, phosphate and potash in Great Britain over the last five years are illustrated in Figure B1.1, which is based on data presented in Tables B1.1 and B1.2. Application rates for straight and compound nitrogen applied on crops and grassland are also presented in Table B1.1. Definitions of the terms used are set out in Section A of this report.

Figure B1.1 Overall fertiliser use (kg/ha) on all crops and grass, Great Britain 1995 - 1999

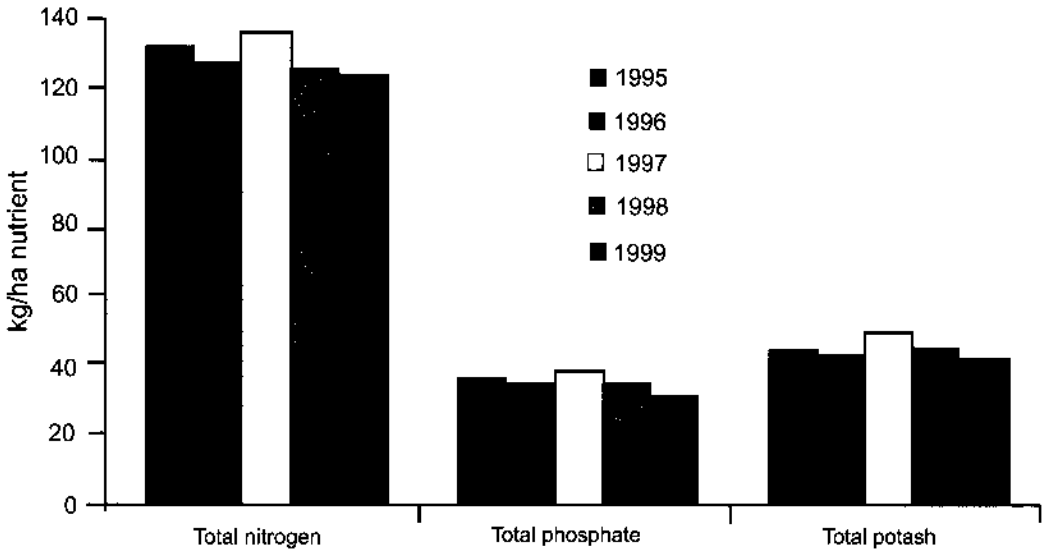


Table B1.1 Overall nitrogen use (kg/ha), Great Britain 1995 - 1999

Total nitrogen

	tillage crops	*grass*	*all crops and grass*
1995	149	118	132
1996	145	115	128
1997	149	123	136
1998	144	109	126
1999	141	110	125

Straight nitrogen

	tillage crops	*grass*	*all crops and grass*
1995	125	52	85
1996	121	53	84
1997	126	54	88
1998	123	53	87
1999	121	52	85

Compound nitrogen

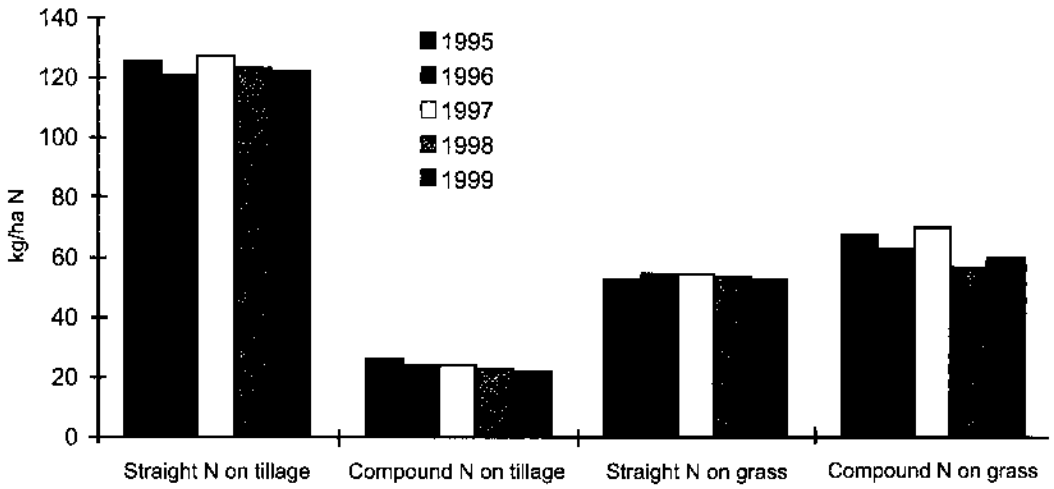
	tillage crops	*grass*	*all crops and grass*
1995	25	66	47
1996	24	62	45
1997	24	69	47
1998	21	56	39
1999	21	58	40

B1.1.1 NITROGEN

All Crops and Grassland

Total nitrogen use on all crops and grassland in 1999, at 125 kg/ha, was almost the same as in the previous year (Table B1.1, Figure B1.1). The recorded drop of 1 kg/ha was the net effect of a slight decrease in straight nitrogen use and a marginal increase in the overall rate of compound nitrogen use. Despite an increase in 1997, total nitrogen use on all crops and grassland has decreased over the last five years, mainly because of a drop in the overall application rate of compound nitrogen on both tillage crops and grassland.

Figure B1.2 Overall straight and compound nitrogen use (kg/ha), Great Britain 1995 - 1999

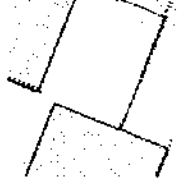


Tillage Crops

Estimated total nitrogen use on tillage crops dropped, but not significantly, by 3 kg/ha in 1999 to 141 kg/ha, because less straight nitrogen was used in both England and Wales and in Scotland compared to 1998. Total nitrogen use on tillage crops in Great Britain has dropped significantly by 8 kg/ha since 1995, despite the apparent increase in 1997 when there was a rise in straight nitrogen use, because of falls in the overall rates of both straight and compound nitrogen.

Grassland

Overall total nitrogen use on grassland showed no real change in 1999, with a non-significant increase of only 1 kg/ha to 110 kg/ha. This change reflected a 1 kg/ha increase (to 108 kg/ha) in England and Wales, while total nitrogen use in Scotland dropped by 2 kg/ha (to 117 kg/ha). The slight recorded drop in straight nitrogen use in Britain was counterbalanced by an increase in the overall rate of compound nitrogen. As for tillage crops, total nitrogen use on grassland has dropped significantly, by 8 kg/ha, over the last five years, despite the temporary increase observed in 1997, as a result of a drop in compound nitrogen use.



B1.1.2 PHOSPHATE AND POTASH

Phosphate

Overall phosphate use on all crops and grassland decreased by 3 kg/ha in 1999, to 32 kg/ha. This drop reflected a significant reduction of 6 kg/ha in the overall rate of phosphate applied to tillage crops, which was caused by a decrease in dressing cover rather than any change in average field rate. In contrast, phosphate use on grassland showed an apparent decrease of only 1 kg/ha in 1999, to 20 kg/ha. Although there have been net falls in phosphate use of 8 kg/ha on tillage crops and 4 kg/ha on grassland since 1995, the actual decreases have only really occurred over the last one or two years respectively.

Table B1.2 Overall phosphate and potash use (kg/ha), Great Britain 1995 - 1999

Total phosphate				Total potash			
	tillage crops	*grass*	*all crops and grass*		*tillage crops*	*grass*	*all crops and grass*
1995	53	24	37	*1995*	61	31	45
1996	52	23	36	*1996*	61	30	44
1997	55	25	39	*1997*	67	35	50
1998	51	21	35	*1998*	64	29	45
1999	45	20	32	*1999*	57	28	42

Potash

Changes in potash use in 1999 were similar to those observed for phosphate. Potash use on all crops and grass dropped by 3 kg/ha to 42 kg/ha, mainly because the application rate on tillage crops decreased by 7 kg/ha, to 57 kg/ha, as a result of a decreased dressing cover. The overall rate of potash on grassland showed an apparent marginal drop of 1 kg/ha in 1999, to 28 kg/ha. Over the last five years, estimated overall potash rates on tillage crops and grassland have fallen, but not significantly, by 4 and 3 kg/ha respectively.

B1.2 FERTILISER USE ON MAJOR TILLAGE CROPS

Overall and average field rates of fertiliser application for major tillage crops in Great Britain over the past five years are summarised in Tables B1.3 and B1.4. More detailed statistics for 1999 are presented in Section C. Longer term trends in overall application rates of nitrogen, phosphate and potash since 1983, are summarised in Section B2.

Small apparent changes in fertiliser use on individual crops should be treated with a degree of caution as these estimates are based on a smaller number of farms and fields than the aggregate estimates for all tillage crops. Information on 'sampling errors', which help in judging whether apparent changes may be real or attributable to sampling variation alone, is given in the Appendix.

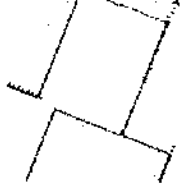


Table B1.3 Overall fertiliser use (kg/ha) on major tillage crops, Great Britain 1995 - 1999

Total nitrogen

	winter wheat	*spring barley*	*winter barley*	*maincrop potatoes* [a]	*oilseed rape* [b]	*sugar beet*
1995	193	99	144	176	188	118
1996	185	94	140	171	188	107
1997	192	95	143	169	203	110
1998	182	92	135	188	188	109
1999	185	99	141	158	197	97

Straight nitrogen

	winter wheat	*spring barley*	*winter barley*	*maincrop potatoes* [a]	*oilseed rape* [b]	*sugar beet*
1995	177	45	130	33	165	96
1996	174	41	125	25	168	84
1997	179	40	127	30	182	85
1998	171	40	120	49	170	88
1999	174	53	127	27	180	78

Compound nitrogen

	winter wheat	*spring barley*	*winter barley*	*maincrop potatoes* [a]	*oilseed rape* [b]	*sugar beet*
1995	16	54	14	143	22	22
1996	11	52	16	146	20	23
1997	13	54	15	139	21	25
1998	11	52	15	139	18	22
1999	11	46	14	131	17	19

Total phosphate

	winter wheat	*spring barley*	*winter barley*	*maincrop potatoes* [a]	*oilseed rape* [b]	*sugar beet*
1995	51	47	53	185	49	51
1996	51	47	52	178	52	40
1997	53	51	58	173	51	50
1998	48	42	51	184	50	49
1999	41	45	47	169	46	52

Total potash

	winter wheat	*spring barley*	*winter barley*	*maincrop potatoes* [a]	*oilseed rape* [b]	*sugar beet*
1995	52	55	63	255	50	111
1996	53	56	60	248	52	96
1997	56	59	70	249	55	133
1998	53	58	66	276	48	121
1999	46	54	61	251	48	128

[a] All 1997 to 1999 figures for maincrop potatoes include second earlies.

[b] Single crop grouping for the combined winter and spring oilseed rape areas.

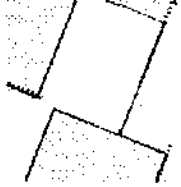


Table B1.4 Average field rates (kg/ha) on major tillage crops, Great Britain 1995 - 1999

Total nitrogen

	winter wheat	*spring barley*	*winter barley*	*maincrop potatoes*[a]	*oilseed rape*[b]	*sugar beet*
1995	194	99	145	182	190	122
1996	188	96	143	180	197	112
1997	193	96	144	184	204	112
1998	183	95	136	193	188	111
1999	189	101	142	178	202	104

Straight nitrogen

	winter wheat	*spring barley*	*winter barley*	*maincrop potatoes*[a]	*oilseed rape*[b]	*sugar beet*
1995	184	76	136	108	175	113
1996	179	77	137	111	183	100
1997	185	71	138	101	194	100
1998	176	74	127	123	177	102
1999	182	85	134	93	188	93

Compound nitrogen

	winter wheat	*spring barley*	*winter barley*	*maincrop potatoes*[a]	*oilseed rape*[b]	*sugar beet*
1995	52	65	44	163	50	77
1996	48	67	51	162	50	74
1997	49	69	49	160	50	82
1998	47	67	46	164	45	73
1999	57	68	54	164	47	85

Total phosphate

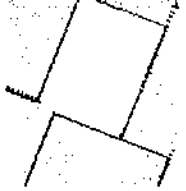
	winter wheat	*spring barley*	*winter barley*	*maincrop potatoes*[a]	*oilseed rape*[b]	*sugar beet*
1995	66	51	63	192	63	70
1996	68	53	64	190	65	67
1997	68	57	65	186	64	63
1998	68	51	66	195	66	68
1999	72	54	62	192	71	75

Total potash

	winter wheat	*spring barley*	*winter barley*	*maincrop potatoes*[a]	*oilseed rape*[b]	*sugar beet*
1995	72	59	75	265	69	133
1996	74	62	73	259	67	129
1997	75	64	78	267	71	143
1998	77	64	80	291	68	139
1999	78	62	77	287	76	153

[a] all 1997 to 1999 figures for maincrop potatoes include second earlies.

[b] Single crop grouping for the combined winter and spring oilseed rape areas.



B1.2.1 NITROGEN

Overall nitrogen rates increased on cereal crops and oilseed rape in 1999, suggesting a possible recovery in application rates compared to earlier years, but decreased on potatoes and sugar beet. These changes in total nitrogen use, compared to 1998 levels, were mostly related to shifts in overall application rates of straight nitrogen. However, changes in cropping areas (see Section A3) meant that total nitrogen use on tillage crops, as a combined crop grouping, fell by 3 kg/ha in 1999 to 141 kg/ha.

Winter wheat

Overall use of total nitrogen fertiliser on winter wheat rose, but not significantly, by 3 kg/ha in 1999 to 185 kg/ha, due to increased use of straight nitrogen (Table B1.3). Despite significant increases in application rates in 1995 and 1997, the mean overall rate of total nitrogen over the last five years was 187 kg/ha, which was very similar to the estimated application rates of 185-186 kg/ha that were reported for the 1992 to 1994 period.

The field cropping information collected in the Survey enables separate estimates to be made of nitrogen fertiliser use on milling and non-milling (feed/seed) categories of winter wheat (Table B1.5). Field average nitrogen rates on both milling and, less so, non-milling wheats showed some recovery in 1999, after the large recorded decreases in 1998, giving five year means of 202 and 186 kg/ha respectively.

Table B1.5 Average field application rates (kg/ha) of nitrogen on cereals by market use, Great Britain 1995 - 1999

Total nitrogen

	winter wheat		*spring barley*		*winter barley*	
	milling	*non-milling*	*malting*	*non-malting*	*malting*	*non-malting*
1995	205	191	102	96	132	152
1996	198	185	97	93	129	152
1997	209	190	98	91	126	151
1998	192	180	100	89	116	146
1999	204	183	103	99	125	149

The mean difference of 16 kg/ha in average nitrogen rate between milling and non-milling wheats reflects differences in crop husbandry and nitrogen management practices.

- Nitrogen fertiliser requirements for winter wheat depend on the intended market end use, as well as upon average yield potential, soil type and the residual soil nitrogen fertility from previous cropping and manure practice[7]. Milling varieties are often grown as a second wheat and often receive extra nitrogen, either as a solid dressing or as late foliar urea spray, which is applied to improve the chances of achieving an adequate grain protein content for a milling premium. High yielding feed crops, rather than lower yielding varieties of milling wheat, are often grown as a first winter wheat after a break crop. This is to exploit the potential yield and residual soil nitrogen benefits from the crop rotation, and also to avoid any risk of lower grain protein concentrations as a result of high yield diluting the grain nitrogen concentration for first wheat in the rotation.

[7] MAFF (1994). *Fertiliser Recommendations for Agricultural and Horticultural Crops*. MAFF Reference Book 209 (Sixth edition). London: HMSO.

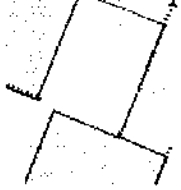


Table B1.6 Percentage distribution (% crop area) of cereal crop areas by market use, Great Britain 1995 - 1999, as estimated from the Survey

	winter wheat		*spring barley*		*winter barley*	
	milling	*non-milling*	*malting*	*non-malting*	*malting*	*non-malting*
1995	20	80	63	38	32	68
1996	20	80	65	35	30	70
1997	16	84	65	35	33	67
1998	26	74	52	48	33	67
1999	28	72	66	34	34	66

The survey estimates of crop areas showed a slight increase, from 26% to 28%, in the proportion of the winter wheat area that was grown for milling use in 1999 (Table B1.6). The results suggest a sustained recovery in milling wheat cropping, after decreasing from 26% in 1994 to 16 - 20% of the total winter wheat area between 1995 and 1997. The increased nitrogen use on the total winter wheat crop in 1999 was principally a result of higher nitrogen application rates to both milling and non-milling wheats, rather than any effect of the slight increase in the percentage area grown for milling.

Information on autumn and early winter applications of nitrogen on winter wheat, and also on winter barley, is presented in Section B2.2.2.

Spring barley

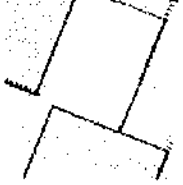
The overall total nitrogen rate on spring barley rose significantly, by 7 kg/ha, to 99 kg/ha in 1999 (Table B1.3). This application rate was the highest recorded level for this crop over the last five years and was the same as that estimated in 1995, giving a five-year mean of 96 kg/ha. The increase in overall total nitrogen use in 1999 was the net effect of a 13 kg/ha increase in straight nitrogen use which was partly offset by a 6 kg/ha decrease in compound nitrogen use.

More detailed analysis of the 1999 data shows that, as in previous years, the average field rate of nitrogen was slightly higher (+4 kg/ha) on malting than non-malting (feed/seed) spring barley, while mean rates over the last five years were 100 and 94 kg/ha respectively (Table B1.5). Nitrogen use appears to have recovered on both types of spring barley crop, back to 1995 levels, after decreases of 5-7 kg/ha.

- The slightly higher use of nitrogen on malting than non-malting crops may seem anomalous, since lower rates of nitrogen are recommended for malting barley, under the same conditions of soil type and nitrogen fertility level, than for the feed varieties of barley. This recommendation is made to avoid the risk of high grain nitrogen content which would adversely affect subsequent malt quality. However, malting crops are normally grown on soils with low nitrogen fertility and the average field rates of nitrogen reported for malting varieties in Table B1.5 are generally in the range recommended for mineral soil types with low nitrogen residues (90 - 100 kg/ha)[8]. Feed crops on the other hand are often grown within mixed rotations, which tend to have a higher soil nitrogen fertility, with consequently less need for nitrogen fertiliser.

The survey estimates suggest that the proportion of spring barley grown for the malting market recovered in 1999, back to two thirds of the total crop area, after dropping to 52% in 1998 (Table B1.6). This shift in relative areas of malting and non-malting spring

[8] MAFF (1994). *Fertiliser Recommendations for Agricultural and Horticultural Crops*. MAFF Reference Book 209 (Sixth edition). London: HMSO, 1994.



barley, combined with increases in average field rates on both crop types, resulted in the 7 kg/ha increase in overall nitrogen rate for the total spring barley crop.

Winter barley

Overall total nitrogen use on winter barley rose, but not significantly, by 6 kg/ha in 1999 to 141 kg/ha, due to an increase in the application rate of straight nitrogen, following a drop in the previous season (Table B1.3). The mean total nitrogen rate over the five-year period from 1995 to 1999 was also 141 kg/ha, while annual changes were associated with fluctuations in straight, rather than compound nitrogen use.

Nitrogen requirements for winter barley, as with the spring sown crop, depend on a range of agronomic factors, including the intended market for the grain. Average field rates of nitrogen had dropped appreciably on both malting and non-malting (feed/seed) winter barley in 1998, by 10 and 5 kg/ha respectively, but appeared to largely recover on both crop types in 1999. The rates reported for 1999 were almost the same as the five-year (1995 - 1999) means of 126 and 150 kg/ha for malting and non-malting crops respectively.

- Higher application rates of nitrogen (five-year mean of +24 kg/ha) on non-malting, compared to malting winter barley crops, reflects typical agronomic practice. The majority of winter barley feed crops are grown in England in arable rotations, usually after a previous cereal crop, when the soil nitrogen fertility status is low. Malting crops are also normally grown on soils with low available nitrogen status and, under similar cropping conditions, higher nitrogen rates are recommended for feed crops.

The Survey estimates of cropping areas indicated that, as in recent years, about a third of the winter barley area was grown for the malting market in 1999 (Table B1.6).

Maincrop potatoes

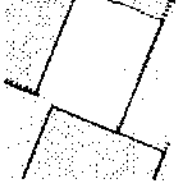
The overall rate of total nitrogen applied to maincrop potatoes dropped significantly, by 30 kg/ha, to 158 kg/ha in 1999 (Table B1.3). This drop was due to the combined effect of decreases in both straight and, to a lesser extent, compound nitrogen use. Total nitrogen use had been fairly steady between 1995 and 1997, ranging from 169 to 176 kg/ha, but had risen significantly in 1998 because of increased use of straight nitrogen, giving a five-year mean of 172 kg/ha.

About three quarters of the total fertiliser nitrogen input for maincrop potatoes was applied in compound form, as a seedbed dressing, while straight nitrogen tended to be applied as a top dressing on irrigated crops at tuber initiation stage.

Oilseed rape

Overall total nitrogen use on oilseed rape, as a combined category for both the autumn and spring sown crop, rose significantly by 9 kg/ha in 1999 to 197 kg/ha, after a recorded drop of 15 kg/ha in the previous season (Table B1.3). This change was caused by an increase in the application rate of straight nitrogen. However, the overall total rate has ranged from 188 to 203 kg/ha over the last five years (mean 193 kg/ha). Over this period, compound nitrogen use has decreased slightly, but the reported changes in total nitrogen rate have mostly been related to fluctuations in straight nitrogen use. On average, 90% of total fertiliser nitrogen was applied in straight form.

A more detailed breakdown of the data for oilseed rape shows that the average field rate of nitrogen application on winter oilseed rape was unchanged in 1999, at 204 kg/ha, but



has been as high as 215 kg/ha over the last five years (Table B1.7). On the spring sown crop, the average field rate had ranged from 115 to 127 kg/ha between 1995 and 1998 but, in 1999, the estimated rate was 161 kg/ha. This latter estimate was, however based on a very small sample size of only twenty five fields and is therefore unlikely to be sufficiently reliable or representative of normal fertiliser practice on this crop. Mean application rates over the last five years, (excluding the 1999 estimate for the spring sown crop), were 209 and 121 kg/ha for winter and spring oilseed rape respectively.

Table B1.7 Average field application rates of nitrogen on winter and spring oilseed rape and percentage distribution of crop areas, Great Britain 1995 - 1999

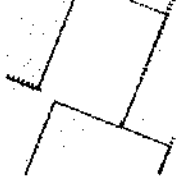
	Total nitrogen (kg/ha)		% crop area	
	winter	*spring*	*winter*	*spring*
1995	210	121	79	21
1996	212	127	81	19
1997	215	120	88	12
1998	204	115	83	17
1999	204	161	95	5

Most of the oilseed rape area is autumn, rather than spring sown and the latter area has decreased over the last five years, down to just 5% (as estimated in this survey) of the total crop area in 1999 (Table B1.7). The shift in these relative cropping areas has been the main factor determining nitrogen use on oilseed rape as a combined crop category, together with a smaller effect from the annual changes in nitrogen rates applied to the autumn and spring sown crops.

Information on autumn and early winter applied nitrogen for winter oilseed rape is given in Section B2.2.2.

Sugar beet

Total nitrogen use for sugar beet production in Britain, which is now confined to parts of England, fell by an estimated 12 kg/ha in 1999 to 97 kg/ha (Table B1.3). This apparent, but not statistically significant drop, was caused by recorded decreases in both straight and, to a lesser extent, compound nitrogen use. The Survey estimates had indicated a fairly steady level of nitrogen use, ranging from 107 to 110 kg/ha, between 1996 and 1998, following an estimated drop of 11 kg/ha in the 1996 season which was related to a decrease in straight nitrogen use. The mean overall rate of total nitrogen over the last five years was 108 kg/ha, compared with a mean of 118 kg/ha for the 1990 to 1994 period, suggesting a further small decline in nitrogen use on this crop following the decrease which had occurred during the 1980s.



B1.2.2 PHOSPHATE AND POTASH

Phosphate

The drop of 6 kg/ha in overall phosphate use on tillage crops in 1999 was mostly related to a decrease in dressing cover on winter cereals, maincrop potatoes and oilseed rape rather than a decrease in average field rates. However, overall phosphate use increased slightly on spring barley and sugar beet in 1999, compared with the previous year.

Estimated overall application rates of phosphate decreased by 7 kg/ha on winter wheat and by 4 kg/ha on both winter barley and oilseed rape in 1999, down to 41, 47 and 46 kg/ha respectively (Table B1.3). Phosphate use on these crops had been relatively steady over the previous four years, apart from a temporary increase on winter barley in 1997 to 58 kg/ha, with mean overall rates of 51 kg/ha for both winter wheat and oilseed rape, and 54 kg/ha for winter barley over this period. Average field rates actually increased in 1999 by 4 and 5 kg/ha on winter wheat and oilseed rape respectively, so that the reductions in overall phosphate use on these crops were due to a reduction in the percentage of the crop area receiving a dressing. For winter barley, however, the drop in overall rate reflected a decrease in average field rate. Phosphate use also decreased, but not significantly by 15 kg/ha on maincrop potatoes in 1999 to 169 kg/ha, well below the mean of 178 kg/ha over the last five-year period.

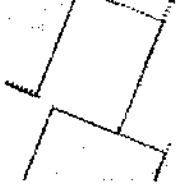
- No specific reason was identified from the Survey data for this marked drop in phosphate use. However, a number of the participating farmers commented that they had reduced their fertiliser inputs because of the current economic difficulties facing the agricultural industry. The lower phosphate (also potash on winter cereals) use on these crops may reflect short term changes in fertiliser policy on some farms to make cost savings. The wet 1998 autumn could also be a contributory factor, as it gave only limited opportunities for establishing winter crops, especially on heavier textured soils; in this situation some of the seedbed dressings of phosphate and potash which would normally be applied were possibly deferred because drilling operations took priority whenever soil conditions were suitable for fieldwork.

Overall phosphate use showed an apparent but not significant increase of 3 kg/ha on both spring barley and sugar beet in 1999, to 45 and 52 kg/ha respectively. These results suggested some recovery in phosphate use on spring barley, compared to rates of 47-51 kg/ha between 1995 and 1997, while the rate for sugar beet was at the highest recorded level over the past five years.

Potash

Overall potash use on tillage crops decreased by 7 kg/ha in 1999, mostly as a result of lower estimated application rates on cereals and maincrop potatoes. Potash use was unchanged on oilseed rape, but appeared to increase on sugar beet, compared with estimates for 1998.

The overall application rate of potash on winter barley decreased significantly, by 5 kg/ha, to 61 kg/ha in 1999 (Table B1.3). Potash use also dropped, but not significantly, by an estimated 7 and 4 kg/ha respectively on winter wheat and spring barley, to 46 and 54 kg/ha respectively. The reductions in overall rates for winter cereals were related to decreases in dressing cover and also, for winter barley, to a drop in average field rate. For spring barley, the reduction in overall rate was mainly caused by a lower average field rate, compared to 1998. On both winter wheat and spring barley, overall phosphate rates in 1999 were the lowest over the last five years, while mean rates over this period were 52 and 46 kg/ha respectively. Annual fluctuations in estimated phosphate use had,



however, been more variable on winter barley, ranging from 60-70 kg/ha with a five-year mean of 64 kg/ha.

- The apparent cutback in potash applications to winter cereals in 1999 may, as for phosphate, reflect short-term strategies on some farms for saving fertiliser costs, to improve gross margins for cereal production at low grain prices. The wet autumn weather may also have made it impractical to apply normal seedbed dressings of potash for some crops, and may not necessarily have been applied as top dressings instead, later in the growing season.

Overall potash use on oilseed rape remained the same as in 1998, when the estimated rate had dropped by 7 kg/ha to 48 kg/ha. The dressing cover actually showed a decrease in 1999, but this was compensated for by an increase in average field rate. The overall rate consequently remained below the five-year mean of 53 kg/ha.

Overall potash use dropped on maincrop potatoes, but not significantly, by 25 kg/ha in 1999 to 251 kg/ha, which was very similar to the application levels reported from 1995 to 1997. This drop in overall rate was mainly caused by a reduction in dressing cover, combined with a small (4 kg/ha) decrease in field average rate.

On sugar beet, the overall potash rate apparently increased by 7 kg/ha in 1999, to 128 kg/ha, due to a rise in average field rate. Estimated potash use has, however, tended to fluctuate quite widely over recent years, ranging from 96 to 133 kg/ha between 1995 and 1999.

- Part of the reason for recent apparent fluctuations in estimates of nutrient application rates for sugar beet and potatoes may lie in the reporting process; it is recognised that information on the nutrient content of bulk fertilisers, often applied by contractors, is less reliably reported by farmers than for self-applied, bagged products, where constituent details are given on the fertiliser bag.

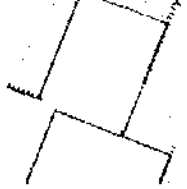
B1.2.3 SULPHUR

The risk of sulphur deficiency in crops such as oilseed rape, cereals and intensively cut grass, which have a high sulphur requirement, has increased appreciably over the last decade. Sulphur reserves have become depleted in some soil types, particularly sandy and shallow soils, because of the continuing reduction in sulphur dioxide emissions from industrial sources and consequent decline in atmospheric deposition of sulphur over the last thirty years[9]. Sulphur application is now an essential agronomic requirement for susceptible crops grown in some parts of Great Britain.

The Survey has collected detailed information on sulphur fertiliser use since 1993, when only 3-6% of the cereal crop areas and 8% of the oilseed rape area received an application of sulphur. By 1997, the proportions of these crop areas which were treated with sulphur had increased markedly to 13-14% for cereals and 30% for oilseed rape (Table B1.8). Since then, however, dressing covers for sulphur have remained static on these crops, despite the steadily increasing risk of deficiency which may now be affecting 30-50% of arable land in Great Britain, according to recent modelling estimates.[9]

Estimates for average field rates of sulphur application between 1995 and 1999 tended to fluctuate on both cereals and oilseed rape, giving five-year means of 37, 39, 30 and 55 kg/ha for winter wheat, winter barley, spring barley and oilseed rape respectively. The

[9] McGrath S P, Zhao F J and Withers P J A (1996). Development of sulphur deficiency in crops and its treatment. *Proceedings No. 379*. The Fertiliser Society, York. ISSN 0369-9277.



mean rates for the winter cereal crops were almost identical to the recommended application rate of 40 kg/ha SO_3 (applied in water-soluble form in early spring) for potentially deficient crops, while the mean rate for spring barley was 10 kg/ha lower. On oilseed rape, however, the mean average field rate over the last five years was 20 kg/ha lower than the recommended application rate of 75 kg/ha SO_3, this latter figure reflecting the higher sulphur requirement of this crop compared to cereals.

Table B1.8 Dressing cover (% area) and average application rate (kg/ha SO_3) of sulphur on cereals and oilseed rape, Great Britain 1995 - 1999

Dressing cover

	winter wheat	*winter barley*	*spring barley*	*oilseed rape*
1995	11	11	11	22
1996	8	10	7	30
1997	13	13	14	30
1998	15	13	13	30
1999	14	14	12	31

Average field rate

	winter wheat	*winter barley*	*spring barley*	*oilseed rape*
1995	29	29	30	45
1996	46	47	26	48
1997	38	40	39	63
1998	38	36	27	51
1999	34	45	28	66

Dressing covers in 1999 for both cereals and oilseed rape were higher in Scotland than in England and Wales (Table B1.9). These figures reflect the more widespread need for sulphur applications in Scotland, because of the very low levels of atmospheric sulphur deposition and greater deficiency risk, compared to most other areas of Britain.

The use of sulphur-containing fertilisers will need to increase in future years, in order to prevent more widespread risk of sulphur deficiency in arable crops. Higher average field rates than those currently applied, will also be needed on severely deficient soils to ensure that adequate amounts of sulphur are applied.

Table B1.9 Dressing cover (% area) of sulphur on cereals and oilseed rape by region, 1999

	winter wheat	*winter barley*	*spring barley*	*oilseed rape*
England and Wales	14	13	10	31
Scotland	32	29	14	47
Great Britain	14	14	12	31

B1.3 FERTILISER USE ON GRASSLAND

Overall fertiliser usage on grassland in Great Britain over the last five years, as previously reported in Section B1.1, is summarised again in Table B1.10. The corresponding estimates of dressing cover and average field rates for each nutrient are shown in Table B1.11.

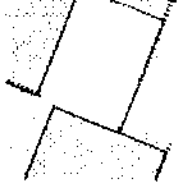


Table B1.10 Overall fertiliser use (kg/ha) on grassland, Great Britain 1995 - 1999

	straight nitrogen	*compound nitrogen*	*total nitrogen*	*total phosphate*	*total potash*
1995	52	66	118	24	31
1996	53	62	115	23	30
1997	54	69	123	25	35
1998	53	56	109	21	29
1999	52	58	110	20	28

Total nitrogen use on grassland in Great Britain did not change significantly in 1999, as the estimated overall rate increased by only 1 kg/ha to 110 kg/ha. Overall compound nitrogen use increased by 2 kg/ha, while straight nitrogen use dropped marginally by 1 kg/ha, but neither of these changes was significant. Since 1995, however, total nitrogen use has shown a significant net decrease of 8 kg/ha, because of a drop in the overall rate of compound nitrogen. During this time, overall use of straight nitrogen has remained very steady.

Overall phosphate and potash use both decreased marginally, but not significantly, by 1 kg/ha, to 20 and 28 kg/ha respectively in 1999. Application rates over the last five years appear to suggest a slight decline in overall use of both nutrients, compared to 1995 levels, with net decreases of 4 and 3 kg/ha respectively.

The apparent slight decreases in overall rates of straight nitrogen and of total phosphate and potash in 1999 were caused by slight reductions in dressing cover, while a small rise in average field rate was mainly responsible for the increase in overall compound nitrogen rate. Both dressing covers and, less so, average field rates for compound nitrogen and total phosphate and potash have been at lower levels over the last two years, compared to the 1995 to 1997 period.

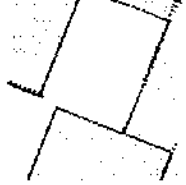
Table B1.11 Dressing cover (%) and average application rate (kg/ha) of fertiliser on grassland, Great Britain 1995 - 1999

Dressing cover

	straight nitrogen	*compound nitrogen*	*total nitrogen*	*total phosphate*	*total potash*
1995	43	66	84	68	44
1996	42	66	86	68	47
1997	42	68	86	70	69
1998	43	60	79	62	63
1999	39	61	79	61	61

Average field rate

	straight nitrogen	*compound nitrogen*	*total nitrogen*	*total phosphate*	*total potash*
1995	121	101	140	35	48
1996	124	94	133	34	45
1997	129	101	142	36	51
1998	125	93	138	33	46
1999	134	96	138	33	46



B1.3.1 NITROGEN

The survey information collected for grassland fields enables nitrogen and other fertiliser nutrient usage to be assessed in more detail according to sward management practice.

Cutting and Grazing Management

Fertiliser requirements for grassland vary according to the type of livestock enterprise, intensity of production and the associated cutting and grazing regimes used for sward management. Fertiliser use on dairy, other livestock and mixed farms in England and Wales and in Scotland in 1999 are presented in Section C tables. The Survey estimates for annual distributions of the total grassland area between grazing and cutting management regimes since 1995 are summarised in Table B1.12. These should not be taken as authoritative national estimates of grassland utilisation, as the Survey is designed to estimate fertiliser application rates, not to derive accurate crop areas. Fertiliser usage for the different cutting and grazing categories is presented in Table B1.13. The differences in average field rates for each nutrient illustrate the influence of grassland management practice on fertiliser inputs.

Table B1.12 Grassland utilisation (% of grass area), Great Britain 1995 - 1999

	grazed [a]	*silage* [b]	*hay* [b]
1995	91	29	14
1996	88	30	12
1997	91	35	13
1998	94	36	12
1999	96	34	13

Nearly all grassland is grazed at some stage during the season (Table B1.12). The grazing estimates of 94-96% of the total grassland area in 1998 and 1999 were higher than those for the 1995 to 1997 period, but at the same level as estimated by this Survey for a number of years prior to 1994. The proportion of grassland cut at least once for silage showed little change in 1999, at about one third, but the percentage has been consistently higher over the last three years compared with the 1995-96 period. The proportion of grassland cut for hay has been stable over the last five years, at 12-14%.

[a] May also be cut.

[b] May also be grazed.

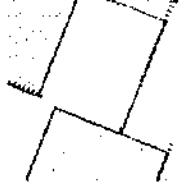


Table B1.13 Nitrogen application rates (kg/ha) by grassland utilisation, Great Britain 1995 - 1999

Total nitrogen

	Overall application rate				*Average field rate*		
	grazed [a]	*silage* [b]	*hay* [b]		*grazed* [a]	*silage* [b]	*hay* [b]
1995	114	185	88	*1995*	136	187	110
1996	110	172	94	*1996*	128	178	107
1997	119	179	85	*1997*	138	185	99
1998	107	168	82	*1998*	136	176	101
1999	108	168	72	*1999*	137	180	101

Straight nitrogen

	Overall application rate				*Average field rate*		
	grazed [a]	*silage* [b]	*hay* [b]		*grazed* [a]	*silage* [b]	*hay* [b]
1995	50	74	39	*1995*	120	124	101
1996	52	71	46	*1996*	125	127	106
1997	53	72	33	*1997*	129	134	94
1998	52	79	44	*1998*	125	130	100
1999	51	76	31	*1999*	133	139	98

Compound nitrogen

	Overall application rate				*Average field rate*		
	grazed [a]	*silage* [b]	*hay* [b]		*grazed* [a]	*silage* [b]	*hay* [b]
1995	63	111	49	*1995*	97	135	80
1996	58	101	48	*1996*	90	129	79
1997	66	107	52	*1997*	98	130	77
1998	55	89	39	*1998*	92	118	71
1999	57	92	41	*1999*	94	125	77

In 1999, overall total nitrogen use increased by just 1 kg/ha to 108 kg/ha on grazed grass, was unchanged at 186 kg/ha on grass cut for silage but dropped by 10 kg/ha to 72 kg/ha on grass cut for hay (Table B1.13). The decrease in nitrogen use for hay fields was caused by a drop in the overall rate of straight nitrogen, which was mainly associated with a lower dressing cover.

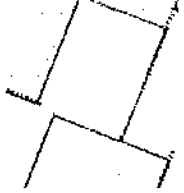
Changes in overall total nitrogen rates for each management category over the last five years have reflected annual fluctuations in both average field rates and dressing cover. During this period, overall use of straight nitrogen has remained fairly steady on grazed grass but more variable on cut grassland, with some suggestion of a rise on silage grass but decrease on grass cut for hay. Overall compound nitrogen use, however, has dropped on all three sward management categories since 1995, as a result of lower usage in 1998 and 1999.

Livestock numbers dictate forage production requirements, but there were only slight changes in 1999; the total number of cattle and calves (dairy plus beef) in Great Britain decreased by an estimated 0.8%, whilst the number of sheep and lambs increased by 0.4%.

---

[a] May also be cut.

[b] May also be grazed.



B1.3.2 PHOSPHATE AND POTASH

Phosphate and potash requirements for grassland depend, as for nitrogen, on the sward management system.

Table B1.14 Phosphate and potash use (kg/ha) by grassland utilisation, Great Britain 1995 - 1999

Total phosphate

	Overall application rate				*Average field rate*		
	grazed [a]	*silage* [b]	*hay* [b]		*grazed* [a]	*silage* [b]	*hay* [b]
1995	23	35	21	*1995*	34	43	33
1996	22	34	21	*1996*	33	43	31
1997	24	36	24	*1997*	35	44	34
1998	20	30	19	*1998*	33	40	32
1999	20	27	16	*1999*	33	39	29

Total potash

	Overall application rate				*Average field rate*		
	grazed [a]	*silage* [b]	*hay* [b]		*grazed* [a]	*silage* [b]	*hay* [b]
1995	28	61	26	*1995*	44	72	42
1996	27	58	26	*1996*	42	69	40
1997	32	64	28	*1997*	47	75	41
1998	28	54	23	*1998*	44	67	39
1999	27	51	20	*1999*	44	67	37

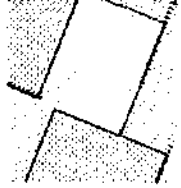
Overall use of phosphate in 1999 was unchanged at 20 kg/ha on grazed grass but there was an estimated decrease of 3 kg/ha on both categories of cut grassland, to 27 and 16 kg/ha on silage and hay fields respectively (Table B1.14). These reductions were mainly caused by decreases in dressing cover for silage grass and in average field rate for hay fields. Phosphate use for each type of sward management was lower in 1998 and 1999 than over the previous three years. On grazed grass, this apparent trend was the result of a reduction in dressing cover, while on cut grassland it was caused by a drop in both dressing cover and average field rate.

For potash, overall use in 1999 decreased, by just 1 kg/ha, to 27 kg/ha on grazed grass and by 3 kg/ha on both categories of cut grassland, to 51 and 20 kg/ha on silage and hay fields respectively. As for phosphate, the drop in potash use on cut grass was mainly caused by a decrease in dressing cover for silage grass whereas, on fields for hay production, there was a decrease in average field rate. Over the last five years, overall potash use has hardly changed on grazed grass, except for a temporary increase in 1997, but usage appears to have decreased on cut grass over the last two years, compared to application rates from 1995 to 1997. This drop on both silage and hay grass was mainly the result of decreases in dressing cover.

As most phosphate and potash fertiliser inputs on grassland are applied in some form of NPK compound, these two nutrients would be expected to show similar trends in application rates.

[a] May also be cut.

[b] May also be grazed.



B1.3.3 SULPHUR

Sulphur deficiency, causing loss of herbage yield and/or quality, is a potential risk on some soil types where grassland is cut intensively for silage, but deficiency is very unlikely where swards are used mainly for grazing or single hay cuts. Potential yield losses of silage due to sulphur deficiency on coarse textured or shallow soils in low sulphur deposition areas are most likely to occur in second and subsequent cuts, rather than first cut, unless the deficiency is very severe. The Survey estimates show that sulphur fertiliser is applied to a higher proportion of the grassland area cut for silage (five-year mean of 8%), compared to grazed grass or grass for hay cutting (means of 3%) (Table B1.15). However, the extent of sulphur usage on grassland has remained static and at a low level since 1993, when information on sulphur applications was first collected in the Survey. This trend is in marked contrast to the increased use of sulphur fertiliser on arable crops since 1993.

- The significant proportion of heavier textured soil types which occur in the main grassland farming areas, and inputs of available sulphur from slurry applications to silage fields, are among possible reasons for the current low level of sulphur fertiliser use on grassland. Insufficient farmer awareness about the risks of sulphur deficiency in cut grass, particularly for second cut silage, may also be a contributory factor.

Table B1.15 Sulphur use on grassland, Great Britain 1995 - 1999

Dressing cover (%)

	grazed	*silage*	*hay*	*all grass*
1995	4	8	4	5
1996	3	6	1	3
1997	4	8	5	5
1998	3	6	4	3
1999	3	7	2	4

Average application rate (kg/ha SO_3)

	grazed	*silage*	*hay*	*all grass*
1995	33	35	40	34
1996	40	45	24	42
1997	34	43	27	38
1998	32	39	32	34
1999	55	62	34	56

Estimated average field rates of sulphur application rose appreciably, by 23 kg/ha, on both silage grass and grazed grass (which may also be cut) in 1999, to 55 and 62 kg/ha respectively, while the rate for grass cut for hay showed no real change (Table B1.15). Between 1995 and 1998, average field rates had been relatively consistent on both silage and grazed grass, ranging from 35-45 and 32-40 kg/ha respectively. The mean rate for silage grass over the 1995 to 1998 period was 41 kg/ha, which is the same as the recommended rate of 40 kg/ha SO_3 for each susceptible silage cut. The average field rate on grass for hay production has not shown any clear trend since 1995, with rates ranging from 24-40 kg/ha.

B2 LONGER TERM TRENDS

B2.1 LONGER TERM TRENDS FOR GREAT BRITAIN

The British Survey of Fertiliser Practice was first undertaken as an integrated British survey in 1992. Before then, the annual Survey of Fertiliser Practice had been carried out separately for England and Wales and for Scotland. Survey statistics from those earlier surveys have, however, been collated in order to report an aggregated series for total nitrogen, phosphate and potash use on tillage crops and grassland in Great Britain since 1983, when the survey in Scotland started. Data series are also presented in this section for England and Wales, starting from 1969 when the present design of the survey was first used, and for Scotland, beginning in 1983. The aggregated data for Great Britain follow a similar pattern to that observed for England and Wales, because a large proportion of both the tillage and grassland areas in Britain is located in England and Wales.

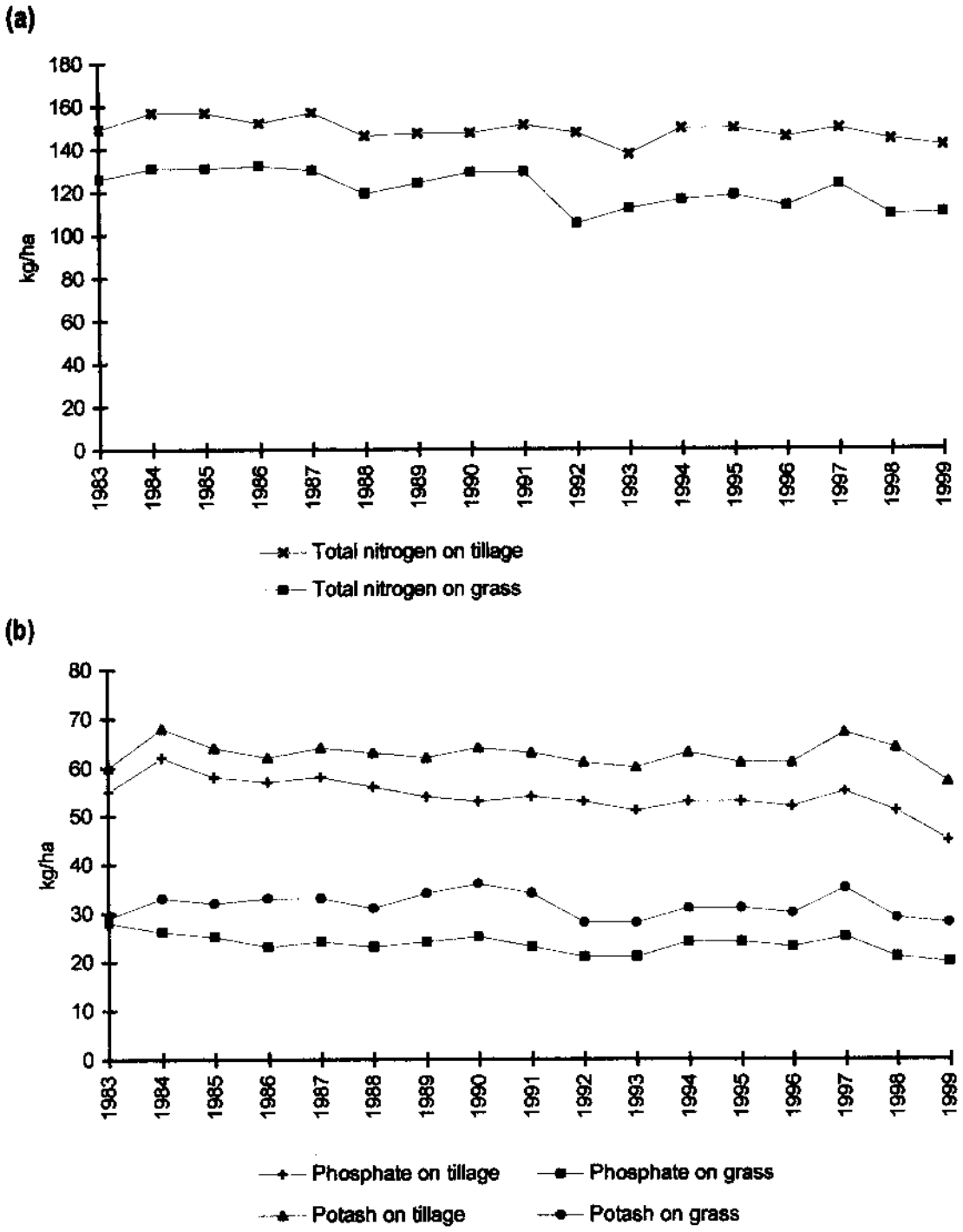
B2.1.1 NITROGEN USE

Table B2.1 Total overall nitrogen application rates (kg/ha), Great Britain 1983 - 1999

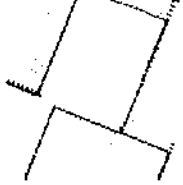
	tillage crops	*grass*	*all crops and grass*
1983	149	126	136
1984	157	131	143
1985	157	131	144
1986	152	132	142
1987	157	130	143
1988	146	119	132
1989	147	124	136
1990	147	129	138
1991	151	129	139
1992	147	105	124
1993	137	112	123
1994	149	116	131
1995	149	118	132
1996	145	113	128
1997	149	123	136
1998	144	109	126
1999	141	110	125

The overall application rates for total nitrogen in Great Britain shown in Figure B2.1(a) are taken from Table B2.1. Nitrogen application rates since 1983 have been consistently higher on tillage crops than on grassland. The longer term trends in nitrogen use on these two categories have, however, been relatively similar, despite some year-to-year differences.

Figure B2.1 Overall application rates (kg/ha) of (a) total nitrogen and (b) phosphate and potash on tillage crops and grassland, Great Britain 1983 - 1999



Total N use on tillage crops peaked in the mid 1980s and subsequently declined, from 157 kg/ha in 1987 down to 141 kg/ha in 1999, with sharp decreases in 1988 and 1993 which were followed by partial recoveries and, latterly, another drop in overall application rate (Figure B2.1(a)). The downward shift in total nitrogen use on tillage crops since the mid to late 1980s was related to both changes in the relative cropping areas of the major tillage crops and to decreases in application rates on particular crops (see Figure B2.2(a)).



Total N use on grassland has shown a similar, but more extreme pattern, resulting in a significant drop in overall application rate, from around 131 kg/ha over the 1985 to 1987 period down to 109-110 kg/ha in 1998-99. This net decline was caused by a combination of sharp falls in 1988 and 1992 and subsequent partial recoveries, followed by a further fall in 1998. The majority of total nitrogen fertiliser used on tillage crops each year was applied as straight nitrogen. On grassland however, just over half the total nitrogen input has been applied in compound form since the late 1980s.

Total nitrogen use over recent years on the all crops and grass category has been higher than in the 1992 to 1993 period, but still well below the rates recorded in the mid to late 1980s (Table B2.1). The mean rate during the 1995 to 1999 period was 129 kg/ha, compared to 123-124 kg/ha in 1992 and 1993 and an average of 143 kg/ha for 1985 to 1987.

B2.1.2 PHOSPHATE AND POTASH USE

Annual overall rates of phosphate and potash on tillage crops and on grassland since 1983 are illustrated in Figure B2.1(b), using the data presented in Table B2.2. Overall rates of phosphate and potash applied to tillage crops were approximately double those used on grassland.

Table B2.2 Overall phosphate and potash application rates (kg/ha), Great Britain 1983 - 1999

	tillage crops		*grass*		*all crops and grass*	
	phosphate	*potash*	*phosphate*	*potash*	*phosphate*	*potash*
1983	55	60	28	29	40	43
1984	62	68	26	33	42	49
1985	58	64	25	32	41	48
1986	57	62	23	33	40	47
1987	58	64	24	33	40	48
1988	56	63	23	31	39	47
1989	54	62	24	34	39	48
1990	53	64	25	36	39	49
1991	54	63	23	34	38	49
1992	53	61	21	28	36	44
1993	51	60	21	28	34	43
1994	53	63	24	31	38	46
1995	53	61	24	31	37	45
1996	52	61	23	30	36	44
1997	55	67	25	35	39	50
1998	51	64	21	29	35	46
1999	45	57	20	28	32	42

Phosphate use on tillage crops has gradually declined since the mid 1980s, from a mean of 59 kg/ha over 1984 to 1986 down to a mean of 50 kg/ha over 1997 to 1999. However, phosphate application rates on grassland have remained relatively stable, at 23-25 kg/ha, over most years since 1985, apart from a lower recorded rate of 21 kg/ha in 1992-93 and again in 1998-99. It is, however, unclear yet whether there has been a sustained small drop of 2-3 kg/ha in phosphate use on grassland, compared to application rates in the mid 1980s.

Overall potash use on tillage crops tended to be slightly lower during 1992 to 1996 (mostly 60-61 kg/ha) compared to earlier years (62-64 kg/ha over the 1985-91 period), but appeared to recover in 1997-98 before falling sharply to 57 kg/ha in 1999. Although annual fluctuations in potash use have been more evident on grassland than on tillage crops, overall rates were (except in 1997) slightly but consistently lower, on average by 3 kg/ha, over 1992 to 1999 compared to the period from 1984 to 1991.

B2.1.3 FERTILISER USE ON MAJOR TILLAGE CROPS

Overall application rates of total nitrogen, phosphate and potash on the main arable crops in Great Britain since 1983 are shown in Figure B2.2.

Nitrogen

Nitrogen application rates have decreased slightly, by about 5-10 kg/ha, on winter cereals crops since the mid 1980s, while nitrogen use on spring barley has shown some sign of recovery after dropping by about 10 kg/ha to consistently lower rates of 89-92 kg/ha between 1989 and 1993.

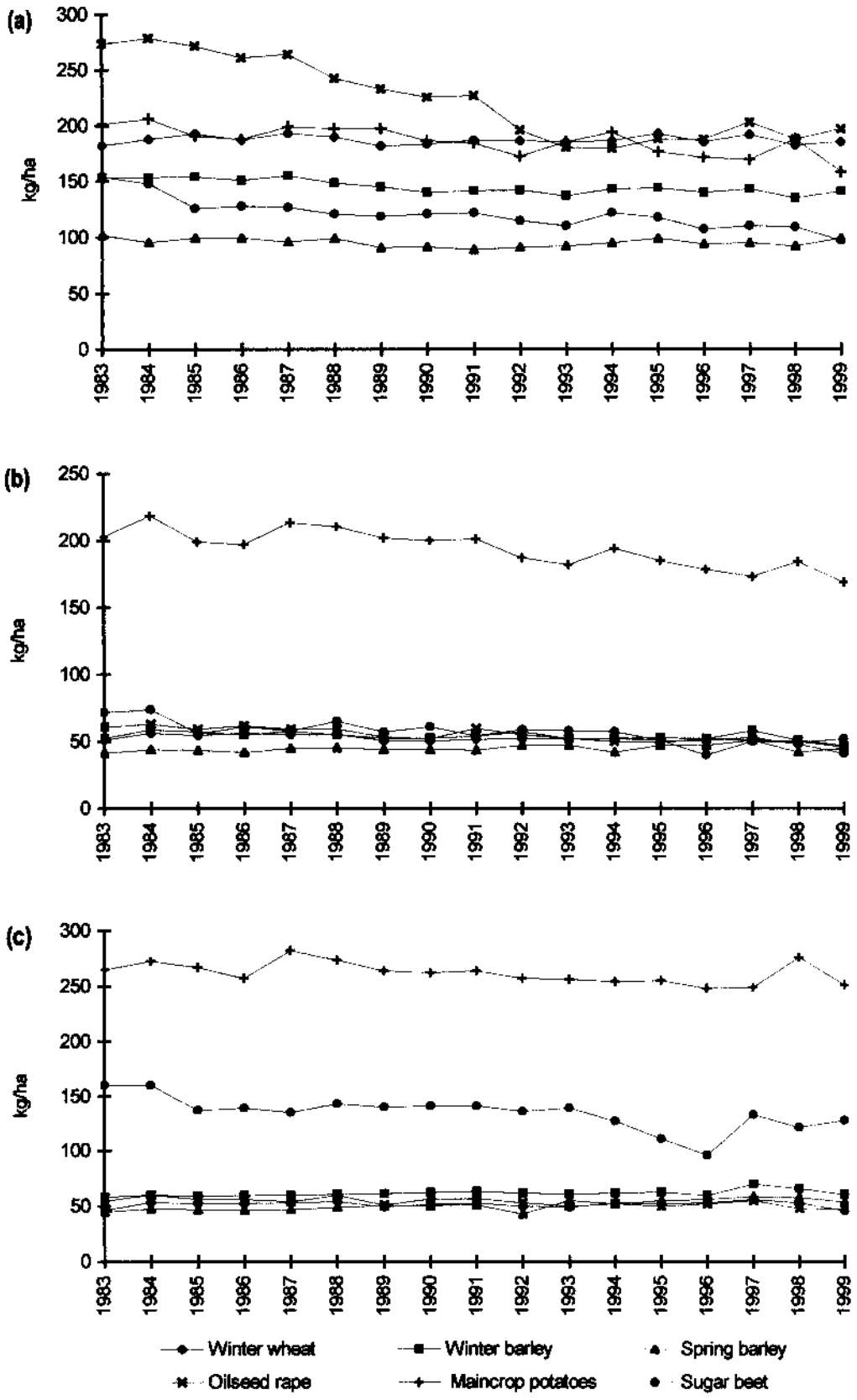
Nitrogen use on oilseed rape decreased between 1984 and 1994 and then partially recovered. Before 1992, this change was mainly caused by reductions in autumn-applied nitrogen, as a result of cutbacks in both area treated and average rate. Between 1992 and 1994 the decreases in total nitrogen use resulted from reduced autumn and spring nitrogen recommendations for oilseed rape, to reflect economic changes associated with the introduction of Arable Area Payments, and an increase in the proportion of spring-sown crops, which have a lower nitrogen requirement than winter oilseed rape.

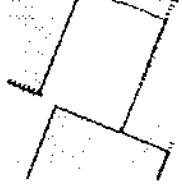
Overall nitrogen rates on maincrop potatoes have decreased slightly, despite some large variability in estimated annual nitrogen rates, since the early 1980s. On sugar beet, nitrogen use decreased markedly in 1985 and continued to decline slightly over subsequent years until 1999. This trend towards lower nitrogen use reflected greater industry and farmer awareness about the adverse effects of excessive nitrogen input on sugar yield, related to the formation of high concentrations of amino-nitrogen compounds in the roots.

Phosphate and potash

Overall application rates of phosphate and potash on the major arable crops showed only minor changes between 1983 and 1997, apart from decreases in phosphate use on maincrop potatoes and in potash use on sugar beet (Figures B2.2(b) and B2.2(c)). However, phosphate and/or potash use showed a marked drop on cereals and oilseed rape in 1999, mainly because of a significant reduction in the actual areas of these crops which received a dressing. This increase in the proportion of these crops which received no phosphate or potash continues a trend initiated in 1997/98.

Figure B2.2 Overall application rates (kg/ha) of (a) total nitrogen and (b) phosphate and (c) potash on major arable crops, Great Britain 1983 - 1999





B2.2 LONGER TERM TRENDS FOR ENGLAND AND WALES

The earlier surveys for England and Wales, which together now account for around 83% (8.7 million ha) of the agricultural land in Britain, provide a longer time series than for Great Britain, based on the present survey design.

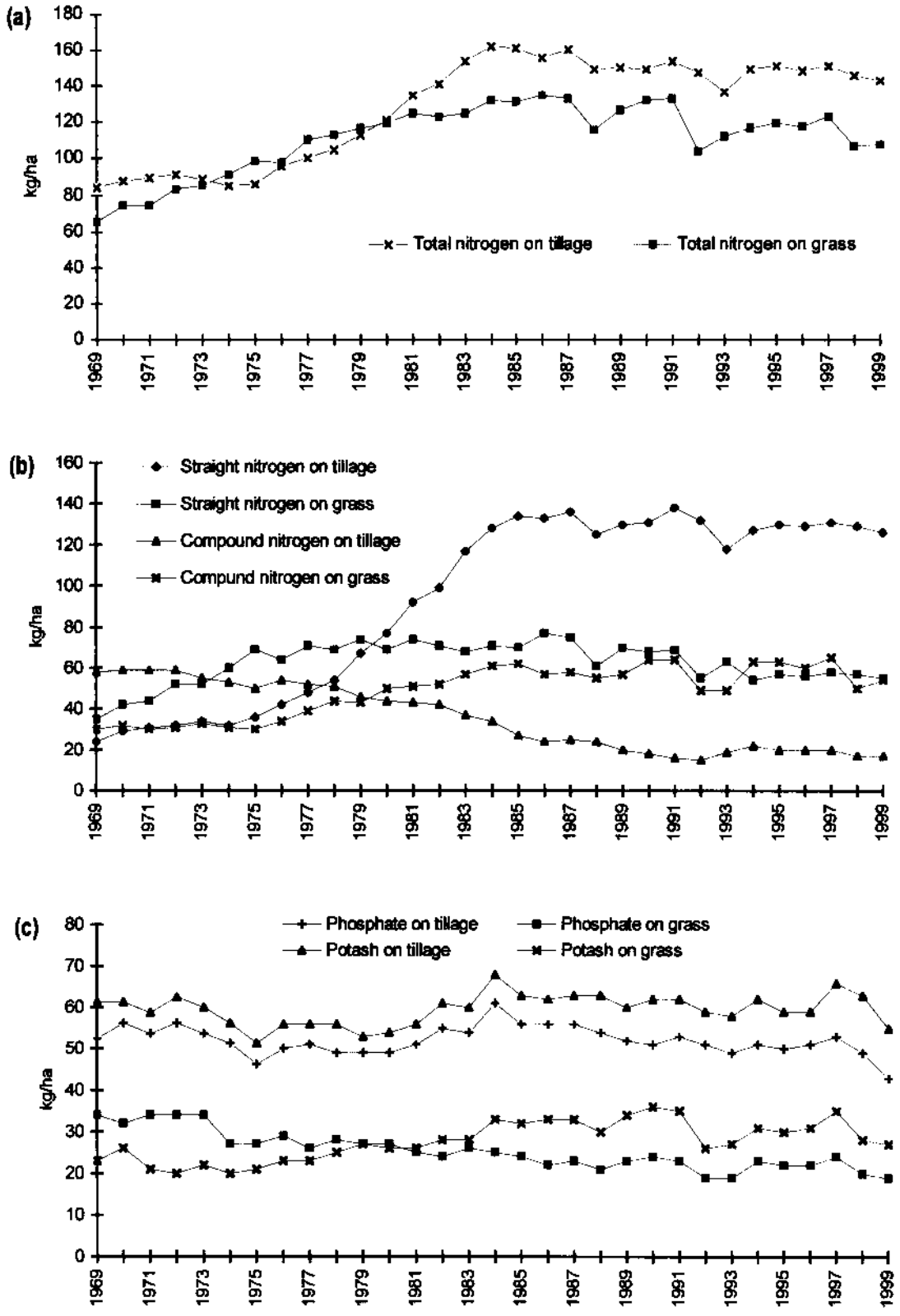
B2.2.1 NITROGEN USE

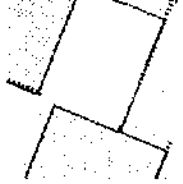
Overall total nitrogen rates, which had been increasing prior to 1969, continued to rise on both tillage crops and grassland until the mid 1980s (Figure B2.3(a)). The more rapid increase in nitrogen use on tillage crops than on grassland over this period can be attributed, in part, to improvements in the breeding and yield potential of cereal cultivars and to the introduction and subsequent expansion of oilseed rape cropping. Nitrogen use on both tillage crops and grassland then remained at a steady level for several years before subsequently showing a net decrease over the last decade. The decline since 1988 was characterised, particularly on grassland, by a repeated pattern of sharp decreases and partial recovery. The drop in nitrogen use on tillage crops in the 1988 and 1999 seasons can be largely attributed to the reduced cropping areas of winter cereal and winter oilseed rape due, except for oilseed rape in 1999, to very wet autumns which restricted drilling opportunities. The large drop in nitrogen use on tillage crops in 1993 also resulted from a fall in the proportion of the total tillage area cropped with cereals and oilseed rape, but this was caused by the introduction of the Arable Area Payment Scheme (AAPS) and widespread adoption of rotational set-aside on arable farms. This scheme halved the commodity price for oilseed rape, thereby reducing the optimum economic fertiliser nitrogen rate for this crop. A big increase in spring instead of winter oilseed rape cropping, in response to rape seed price reductions under the AAPS, was a further contributory factor to the drop in nitrogen use in 1993.

The sharp drop in nitrogen use on grassland in both 1988 and 1992 may have partly reflected the influence of seasonal weather pattern on grass growth and related nitrogen requirements. The increased use of fertiliser nitrogen on grassland during the 1980s had been accentuated by its high cost/benefit ratio, reliability in producing a consistent response and its potential to support high stocking rates and high output. Nitrogen recommendations for grassland were reduced in the early 1990s, in light of further research findings, which could also partly account for the lower use of nitrogen in recent years.

Most nitrogen fertiliser on tillage crops in England and Wales is now applied in straight form, partly because compound nitrogen use decreased between 1970 and 1992 (Figure B2.3(b)). The changes in total nitrogen rate on tillage crops since 1969 largely reflect the pattern of straight nitrogen use. On grassland, however, compound nitrogen usage has increased relative to straight nitrogen and, since the late 1980s, both forms have been used at very similar overall rates.

Figure B2.3 Overall application rates (kg/ha) of (a) total nitrogen, (b) straight and compound nitrogen and (c) phosphate and potash on tillage crops and grassland, England and Wales 1969 - 1999





B2.2.2 AUTUMN AND WINTER APPLICATIONS OF NITROGEN FERTILISER

Overall nitrogen use during the autumn and early winter period has decreased considerably on both winter cereals and winter oilseed rape in England and Wales since 1985 (Figure B2.4). Autumn nitrogen is not normally recommended for winter cereals, as economic yield benefits are rare and autumn-applied nitrogen is vulnerable to leaching loss. This recommendation has been responsible for the major reduction in the proportion of winter wheat and winter barley receiving autumn nitrogen, from 56%-64% in the 1984/85 season to 11%-12% of the crop areas in 1990/91. The dressing covers remained relatively stable between 1991/92 and 1997/98, on average 10% and 12% for winter wheat and winter barley respectively, but decreased to just 5-6% in 1998/99. Average field rates of autumn-applied nitrogen have, however, remained fairly constant at about 20 to 25 kg/ha in most years since 1985, apart from a temporary increase in 1992 and the high rate recorded for winter barley in 1999.

On winter oilseed rape, the overall reductions in autumn-applied nitrogen have occurred because of cutbacks in both the percentage area treated and average field rate. Autumn nitrogen at 30 kg/ha is still recommended for winter oilseed rape, unless the soil has a high nitrogen fertility, as the crop normally requires more nitrogen than winter cereals during the autumn growth period. However, the economic benefits are usually small and, in practice, only a third of the total winter oilseed rape area now receives autumn nitrogen, at a field average rate of around 40 kg/ha.

- The survey results may be taken to indicate the implementation of good agronomic and environmental practice by arable farmers in response to their awareness of research findings and advisory recommendations.

In Scotland, autumn nitrogen is also only recommended for winter oilseed rape, although some farmers still consider that autumn-applied nitrogen reduces the risk of poor establishment of winter cereal crops under the colder and wetter conditions in that part of Britain. In practice, autumn nitrogen is used more widely on these crops in Scotland than in England and Wales, but at similar field rates (Table B2.3).

Table B2.3 Dressing cover (% area) and average application rate (kg/ha) of autumn or winter-applied (August to January) nitrogen on winter cereals and winter oilseed rape by region, 1999

Dressing cover

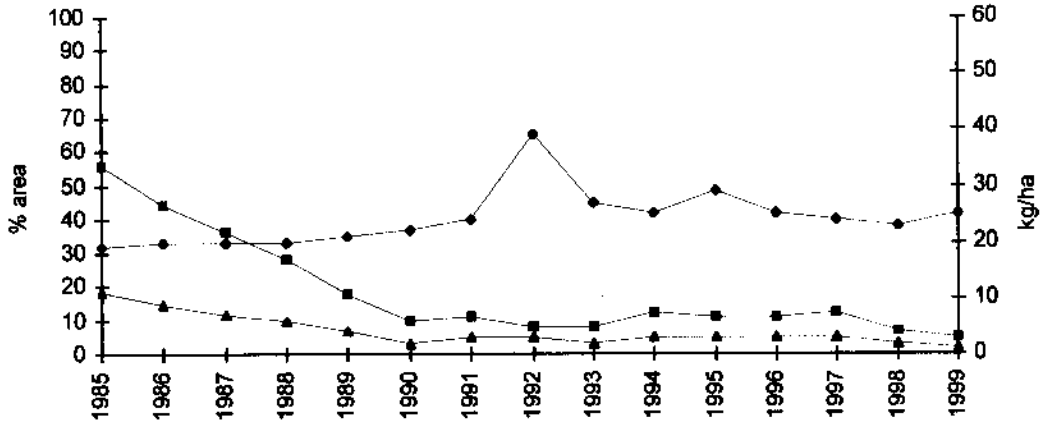
	winter wheat	*winter barley*	*oilseed rape*
England and Wales	5	6	32
Scotland	35	54	72
Great Britain	6	10	35

Application rate

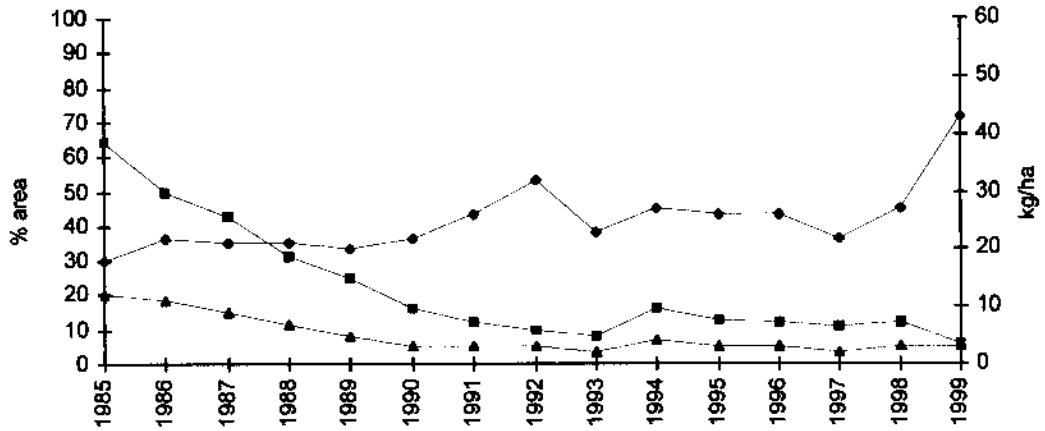
	winter wheat	*winter barley*	*oilseed rape*
England and Wales	25	43	42
Scotland	27	28	45
Great Britain	25	37	43

Figure B2.4 Nitrogen use on winter cereals and winter oilseed rape during the period August to January, England and Wales 1985 - 1999

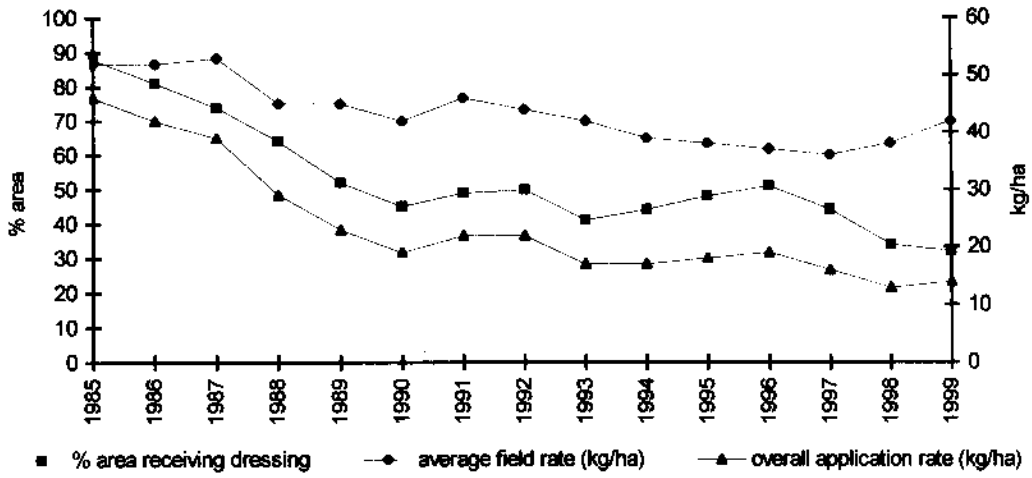
Winter wheat

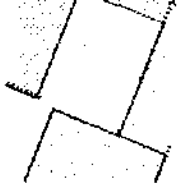


Winter barley



Winter oilseed rape





B2.2.3 PHOSPHATE AND POTASH USE

Overall phosphate and potash rates on tillage crops have shown some similarity in their pattern of annual fluctuations, which have resulted in a net decline of about 10 kg/ha in phosphate, but not in potash use over the last thirty years (Figure B2.3(c)). The marked drop in phosphate use in 1999, however, made a significant contribution to this net change. Annual phosphorus and potassium balances calculated for tillage land in England and Wales from 1969 to 1994, using data from the fertiliser survey to estimate the nutrient inputs from inorganic fertiliser and organic manure sources, showed positive balances for both nutrients[10]. The estimated annual balances decreased over this period from 50 to 23 kg/ha for phosphate and from 53 to 41 kg/ha for potash and would have further decreased since then. Such surpluses should have gradually increased topsoil phosphorus and potassium concentrations but this was not readily apparent in results from the Representative Soil Sampling Scheme, which provides unbiased national estimates of the current nutrient status of soils and monitors the long term trends[11]. This finding may be at least partly explained by a tendency towards deeper cultivations, as tractor power has increased, which would in effect 'dilute' topsoil phosphorous and potassium concentrations. The Representative Soil Sampling Scheme uses a 'rolling' sample of farms which is selected from those taking part in the fertiliser survey, to obtain a representative cross-section of agricultural soils.

On grassland, phosphate use steadily declined between 1969 and 1992, but then subsequently recovered slightly.

- Insoluble phosphate fertilisers, such as basic slag or ground rock phosphate, were still commonly used on grassland in the early 1970s, at application rates which may have supplied relatively large amounts of total phosphate. Since then, phosphate inputs have been largely based on fertiliser products containing water soluble phosphate, which may partly explain the decline in the overall application rate.

In contrast, potash use on grassland has shown a net increase since 1969, despite the more recent falls in 1992 and 1998 in overall application rate.

B2.3 LONGER TERM TRENDS FOR SCOTLAND

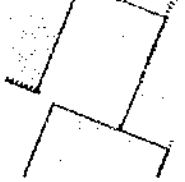
Overall rates for total nitrogen, phosphate and potash use on tillage crops and on grassland since 1983, the first year that the Survey was undertaken in Scotland, are presented in Figure B2.5. The trends differ from those for England and Wales over the same timescale.

B2.3.1 NITROGEN USE

Recorded rates of total nitrogen in Scotland showed large fluctuations on both tillage crops and grassland between 1983 and 1987 and then again, after a period of relatively stable usage, from 1995 until 1997 (Figure B2.5(a)). Total nitrogen rates on tillage crops are about 15% lower than those in England and Wales, largely because of differences in

[10] Garwood, T. Chambers, B., Mitchell, R. & Webb, J. (1996). Nutrient balance: Tillage land in England and Wales from 1969-1994. *MAFF Contract CSA 2845*. MAFF, London.

[11] Skinner, R.J. & Todd, A.D. (1998). Twenty-five years of monitoring the soil pH and nutrient status in England and Wales. *Soil Use and Management* 14, 162-169.



cropping practice and associated nitrogen requirement; malting spring barley and mixed rotations are more common in Scotland than in England and Wales, where winter wheat and oilseed rape are grown on a much higher proportion of the total tillage area.

Before 1985, more nitrogen was applied to tillage crops in compound than in straight form (Figure B2.5(b)). Subsequently, about 60% of the total nitrogen input for tillage crops has been applied in straight form; the corresponding proportion in England and Wales is about 85%.

Compound nitrogen has consistently been the main form of nitrogen fertiliser used on grassland, with higher application rates recorded from 1997 to 1999 compared to earlier years. Straight nitrogen use has decreased since the late 1980s, down to about one quarter of the total nitrogen input on grassland in recent years.

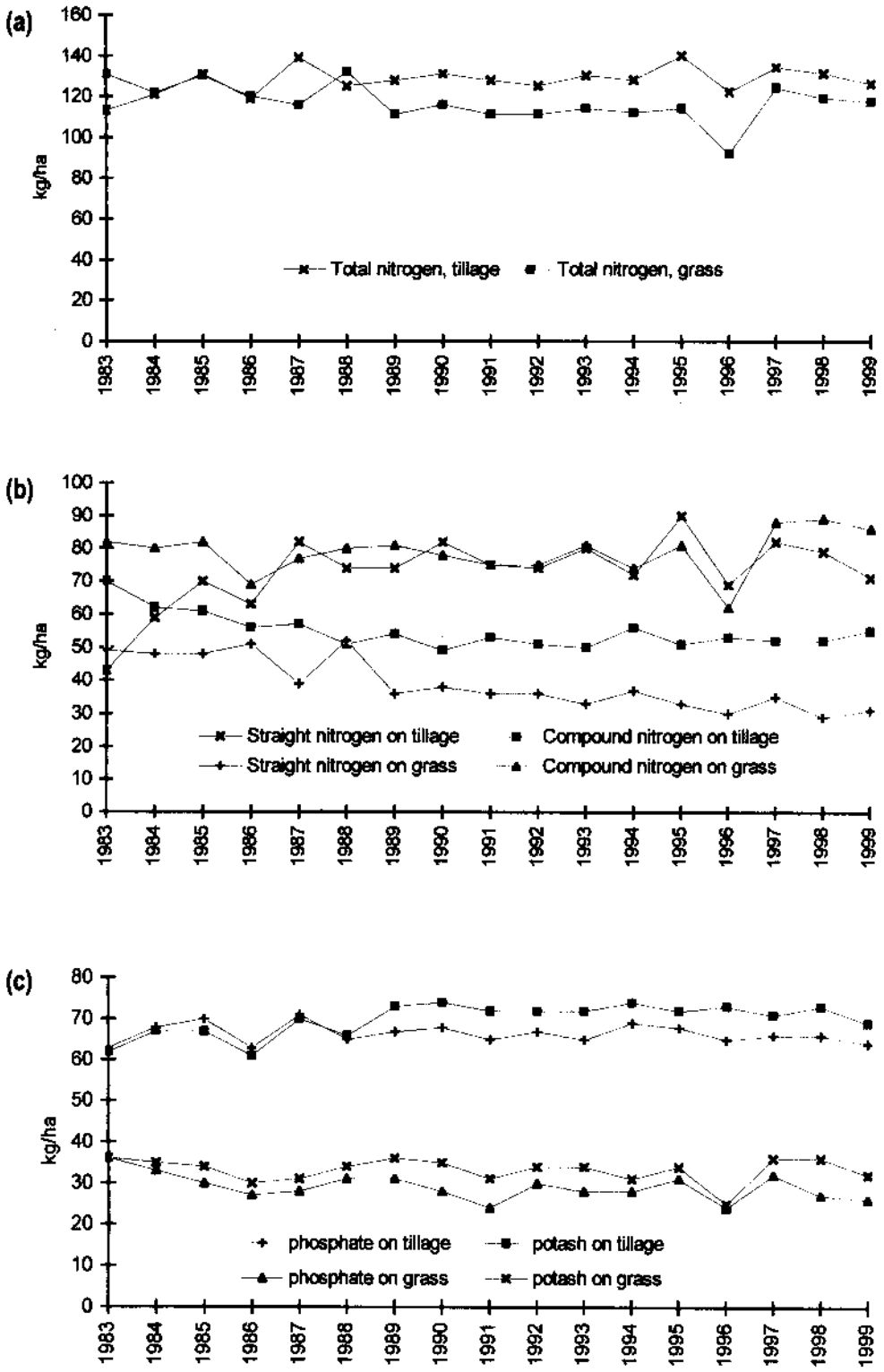
B2.3.2 PHOSPHATE AND POTASH USE

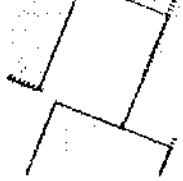
Overall rates of phosphate and potash on tillage crops tended to fluctuate between 1983 and 1989, but have subsequently been relatively stable (Figure B2.5(c)). Phosphate use has shown very little net change since 1983, but potash use appears to have risen slightly, due to increases over the period 1983 to 1989.

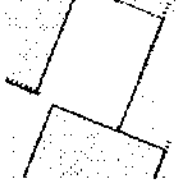
Overall rates of phosphate and potash on grassland show very similar patterns of annual changes. However, the trends suggest a slight drop in phosphate, but little or no net change in potash use, despite the observed fall in potash rate in 1996.

Overall application rates of both nutrients tended to be higher than those used in England and Wales, on both tillage crops and grassland.

Figure B2.5 Overall application rates (kg/ha) of (a) total nitrogen, (b) straight and compound nitrogen, and (c) phosphate and potash on tillage crops and grassland, Scotland 1983 - 1999







SECTION C – TABLES

CONTENTS

The numbering of these tables corresponds to that used in the 1993 - 1998 BSFP Reports

GREAT BRITAIN TABLES 1999

ENGLAND AND WALES TABLES 1999

SCOTLAND TABLES 1999

Note: 1. Row percentages may not sum exactly to 100 due to rounding.
2. No estimates are shown for crops with less than 5 fields in the sample.

Table GB1.1 Total fertiliser use, Great Britain 1999

	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	97	49	45	10	149	64	69	145	31	32	79
Winter wheat	98	57	58	14	189	72	78	185	41	46	2013
Spring barley	98	84	87	31	101	54	62	99	45	54	737
Winter barley	100	76	78	16	142	62	77	141	47	61	675
Oats	96	82	81	20	103	61	69	99	50	56	147
Rye/Triticale/Durum wheat	98	58	73	8	113	54	68	111	31	49	34
Seed potatoes	62	62	62	69	146	188	217	91	117	135	28
Early potatoes	95	98	98	32	169	162	198	160	158	193	17
2nd Early/Maincrop potatoes	88	88	88	33	177	190	283	154	166	248	217
Sugar beet	93	70	84	24	104	75	153	97	52	128	274
Spring oilseed rape	92	50	51	21	161	65	71	148	33	36	50
Winter oilseed rape	98	65	64	6	204	71	76	200	47	49	564
Linseed	81	36	38	8	68	51	60	54	18	23	270
Forage maize	77	65	42	84	63	74	93	48	48	39	136
Rootcrops for stockfeed	88	82	84	63	95	91	96	83	75	81	65
Leafy forage crops	92	66	68	39	98	55	62	90	36	42	44
Arable silage/other fodder crop	43	57	48	41	104	91	106	45	52	50	19
Peas - human consumption	6	25	26	5	19	67	75	1	16	20	121
Peas - animal consumption	12	46	47	12	52	53	71	6	24	33	84
Beans - animal consumption	5	39	34	8	105	58	66	6	23	23	143
Vegetables (brassicae)	94	94	94	6	222	92	170	209	87	160	79
Vegetables (other)	56	60	71	3	116	97	138	65	58	98	116
Soft fruit	44	56	79	0	57	52	94	25	29	75	16
Top fruit	58	40	55	11	190	88	135	111	35	75	41
Other tillage	43	29	24	10	79	53	159	34	15	38	111
All tillage	90	63	64	18	157	71	88	141	45	57	6080
Grass under 5 years	94	64	72	51	198	45	71	187	29	51	899
Grass 5 years and over	76	60	59	42	123	31	40	94	19	23	2637
All grass	79	61	61	44	138	33	46	110	20	28	3536
All crops & grass	84	62	63	31	148	52	67	125	32	42	9616

Source: British Survey of Fertiliser Practice 1999.

Table GB1.2 Use of straight fertiliser, Great Britain 1999

	Crop area receiving dressing (%)			Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	93	2	3	138	65	88	128	1	3	79
Winter wheat	96	5	6	182	86	92	174	4	6	2013
Spring barley	62	1	5	85	72	91	53	1	4	737
Winter barley	95	6	8	134	83	93	127	5	7	675
Oats	72	4	3	103	103	77	74	4	2	147
Rye/Triticale/Durum wheat	93	0	13	111	0	76	103	0	10	34
Seed potatoes	3	0	0	55	0	0	2	0	0	28
Early potatoes	25	5	5	125	100	100	31	5	5	17
2nd Early/Maincrop potatoes	28	4	22	90	142	213	25	5	46	217
Sugar beet	84	6	20	93	122	149	78	7	30	274
Spring oilseed rape	86	10	11	155	102	96	133	10	10	50
Winter oilseed rape	97	6	7	190	88	77	184	5	5	564
Linseed	72	6	8	66	70	76	48	4	6	270
Forage maize	40	7	18	69	56	119	28	4	21	136
Rootcrops for stockfeed	28	0	2	108	0	139	31	0	3	65
Leafy forage crops	40	0	0	100	0	0	40	0	0	44
Arable silage/other fodder crop	28	18	13	117	137	198	32	25	25	19
Peas - human consumption	2	2	3	25	58	73	0	1	3	121
Peas - animal consumption	3	1	4	182	63	58	5	1	2	84
Beans - animal consumption	4	9	4	120	64	72	5	6	3	143
Vegetables (brassicae)	83	1	1	132	25	124	110	0	1	79
Vegetables (other)	39	2	15	96	87	167	38	2	26	116
Soft fruit	1	0	23	43	0	150	0	0	35	16
Top fruit	58	28	55	100	52	69	58	15	38	41
Other tillage	29	0	8	75	0	221	22	0	19	111
All tillage	79	5	8	152	84	107	121	4	8	6080
Grass under 5 years	65	1	4	162	93	95	105	1	3	899
Grass 5 years and over	33	2	1	122	57	94	41	1	1	2637
All grass	39	2	1	134	63	95	52	1	1	3536
All crops & grass	58	3	4	146	79	105	85	2	5	9616

Source: British Survey of Fertiliser Practice 1999.

Table GB1.3 Use of compound fertiliser, Great Britain 1999

	Crop area receiving dressing (%)			Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	29	47	44	59	64	65	17	30	28	79
Winter wheat	19	53	53	57	69	76	11	36	40	2013
Spring barley	68	83	83	68	53	60	46	44	50	737
Winter barley	26	71	72	54	59	74	14	42	53	675
Oats	44	79	80	55	59	67	25	47	54	147
Rye/Triticale/Durum wheat	14	58	60	52	54	66	7	31	40	34
Seed potatoes	62	62	62	143	188	217	89	117	135	28
Early potatoes	79	92	92	163	166	203	129	153	188	17
2nd Early/Maincrop potatoes	80	85	82	162	188	245	129	161	202	217
Sugar beet	23	64	65	85	70	150	19	45	98	274
Spring oilseed rape	20	40	40	71	57	65	15	23	26	50
Winter oilseed rape	36	60	57	46	68	75	17	41	43	564
Linseed	14	30	30	49	48	56	7	14	17	270
Forage maize	52	59	26	40	75	70	21	44	18	136
Rootcrops for stockfeed	79	82	83	66	91	95	53	75	78	65
Leafy forage crops	63	66	68	80	55	62	50	36	42	44
Arable silage/other fodder crop	22	39	39	57	69	65	12	27	25	19
Peas - human consumption	4	23	23	16	68	76	1	16	17	121
Peas - animal consumption	9	45	43	11	52	72	1	23	31	84
Beans - animal consumption	0	30	30	0	57	65	0	17	20	143
Vegetables (brassicae)	93	93	93	106	92	170	99	86	159	79
Vegetables (other)	34	58	58	82	98	124	28	56	72	116
Soft fruit	44	56	56	57	52	71	25	29	40	16
Top fruit	18	18	16	293	110	230	53	20	37	41
Other tillage	21	29	24	60	53	81	13	15	19	111
All tillage	31	59	58	68	69	83	21	41	48	6080
Grass under 5 years	65	63	70	126	44	68	82	27	48	899
Grass 5 years and over	60	59	58	89	30	39	53	18	23	2637
All grass	61	60	60	96	32	44	58	19	27	3536
All crops & grass	46	60	59	87	50	63	40	30	37	9616

Source: British Survey of Fertiliser Practice 1999.

Table GB1.4 Use of lime, Great Britain 1999

	Crop area receiving dressing (%)						Average field rate of CaO equivalent (tonnes/ha)						Fields limed	Fields in sample
	Ground limestone	Ground chalk	Magnesian limestone	Sugar beet lime	Other	All	Ground limestone	Ground chalk	Magnesian limestone	Sugar beet lime	Other	All	Fields	Fields
Spring wheat	.	.	.	.	.	.	.	.	.	.	.	.	3	79
Winter wheat	4	1	2	.	.	6	3.5	3.1	3.4	.	.	3.3	126	2013
Spring barley	5	.	5	.	.	10	2.1	.	1.6	.	.	1.9	83	737
Winter barley	7	1	4	1	1	12	3.3	1.6	3.1	2.1	2.5	3.1	82	675
Oats	1	2	2	.	.	5	1.4	4.0	0.9	.	.	2.0	6	147
Rye/Triticale/Durum wheat	24	.	.	.	.	24	2.6	.	.	.	.	2.6	5	34
Seed potatoes	.	.	.	.	.	.	.	.	.	.	.	.	0	28
Early potatoes	.	.	.	.	.	.	.	.	.	.	.	.	0	17
2nd Early/Maincrop potatoes	.	.	.	.	.	.	.	.	.	.	.	.	1	217
Sugar beet	22	2	4	8	.	35	2.7	1.4	2.2	1.5	.	2.4	92	274
Spring oilseed rape	16	.	2	.	1	18	5.6	.	2.6	.	2.6	5.3	6	50
Winter oilseed rape	5	2	2	.	.	10	3.5	3.6	3.7	.	.	3.7	51	564
Linseed	2	1	.	.	.	3	0.5	1.2	.	.	.	0.9	7	270
Forage maize	14	2	1	.	.	18	1.0	2.1	1.6	.	.	1.2	19	136
Rootcrops for stockfeed	12	.	.	.	7	19	1.7	.	.	.	0.4	1.2	7	65
Leafy forage crops	6	.	7	.	.	13	1.2	.	1.8	.	.	1.5	5	44
Arable silage/other fodder crop	.	.	.	.	.	.	.	.	.	.	.	.	1	19
Peas - human consumption	4	.	5	.	.	9	0.7	.	0.4	.	.	0.5	13	121
Peas - animal consumption	2	8	.	.	.	11	1.2	0.1	.	.	.	0.3	7	84
Beans - animal consumption	1	4	.	.	.	6	2.0	0.2	.	.	.	0.5	7	143
Vegetables (brassicae)	5	.	5	.	.	10	3.3	.	1.7	.	.	2.5	10	79
Vegetables (other)	4	.	2	.	.	6	1.8	.	1.7	.	.	1.8	8	116
Soft fruit	.	.	.	.	.	.	.	.	.	.	.	.	2	16
Top fruit	19	.	.	.	.	19	2.2	.	.	.	.	2.2	8	41
Other tillage	.	.	.	.	.	.	.	.	.	.	.	.	3	111
All tillage	5	1	2	1	.	9	2.9	2.2	2.6	1.8	.	2.6	552	6080
Grass under 5 years	7	.	3	.	.	10	4.5	.	3.1	.	.	4.0	89	899
Grass 5 years and over	2	.	2	.	1	5	3.3	.	1.5	.	1.1	2.1	153	2637
All grass	3	.	2	.	1	6	3.8	.	1.9	.	1.1	2.7	242	3536
All crops & grass	4	1	2	.	1	7	3.2	2.2	2.3	.	1.3	2.7	794	9616

Source: British Survey of Fertiliser Practice 1999.

Table GB2.1 Average fertiliser practice by grassland utilisation, Great Britain 1999

	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Grazed — not mown	73	57	53	29	112	30	29	83	17	15	1794
Grazed — mown	87	66	71	65	165	37	60	144	24	43	1530
All grazings	79	61	61	44	137	33	44	108	20	27	3326
Cut for seed grazed	76	61	68	37	151	27	35	115	16	24	19
Cut for seed not grazed	.	.	.	.	.	.	.	.	.	.	3
All cut for seed	78	62	70	34	149	27	36	116	17	25	22
Cut for silage grazed	93	69	76	69	180	39	65	167	27	50	1139
Cut for silage not grazed	97	77	79	49	191	48	88	184	37	70	148
All cut for silage	93	70	76	68	180	39	67	168	27	51	1287
Cut for hay grazed	71	56	54	53	101	29	37	72	16	20	505
Cut for hay not grazed	70	59	51	18	82	33	37	57	19	19	40
All cut for hay	71	56	54	53	101	29	37	72	16	20	545
All mowings	88	67	72	64	166	37	62	146	25	45	1718
All grass	79	61	61	44	138	33	46	110	20	28	3536

Source: British Survey of Fertiliser Practice 1999.

Table GB3.0 Product and nutrient by month of application, Great Britain 1999.

(a) Product use

row %	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total Product ('000 tonnes)
Straight N	1	0	0	0	0	6	33	35	13	6	3	2	2423
Straight P	20	7	10	0	3	7	30	13	3	1	2	4	62
Straight K	8	13	4	7	4	18	20	12	7	5	1	3	89
Compounds	6	6	2	1	1	6	22	26	13	8	5	5	2519
All fertilisers	4	3	1	1	1	6	27	30	13	7	4	4	5093

(b) Nutrient use

row %	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total Nutrient ('000 tonnes)
N	1	0	0	0	0	5	30	34	15	8	4	3	1217
P_2O_5	12	10	3	1	2	8	23	22	9	3	2	4	315
K_2O	10	10	3	2	1	8	21	20	10	6	3	4	408
Total	5	4	1	1	1	6	27	29	13	7	4	3	1941

Note: product use refers to the total tonnage of the products used by farmers in the survey year 1999

nutrient use refers to the tonnage of each nutrient contained in the products used (e.g. 100 kg of a 20 : 10 : 10 compound contains 20 kg of N, 10 kg of P_2O_5 and 10 kg of K_2O

100 kg of ammonium nitrate, one of the straight N products, contains typically 34.5 kg of N)

Source: British Survey of Fertiliser Practice 1999.

Table EW1.1 Total fertiliser use, England and Wales 1999

	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	97	47	43	10	148	63	70	144	30	30	70
Winter wheat	98	56	57	14	188	71	78	184	40	44	1913
Spring barley	96	72	78	22	105	52	63	101	38	49	447
Winter barley	100	74	77	15	140	60	77	139	45	59	618
Oats	95	77	76	11	106	64	73	100	49	55	102
Rye/Triticale/Durum wheat	98	58	73	8	113	54	68	111	31	49	34
Seed potatoes	•	•	•	•	•	•	•	•	•	•	4
Early potatoes	100	100	100	20	170	174	218	170	174	218	11
2nd Early/Maincrop potatoes	88	88	88	32	180	197	293	158	173	258	179
Sugar beet	93	70	84	24	104	75	153	97	52	128	274
Spring oilseed rape	91	41	42	19	170	64	77	154	26	33	37
Winter oilseed rape	98	63	62	6	203	71	76	200	45	47	506
Linseed	81	35	37	8	68	52	61	54	18	23	268
Forage maize	76	65	41	83	63	75	96	48	49	40	131
Rootcrops for stockfeed	86	76	80	71	107	78	98	93	60	79	34
Leafy forage crops	89	50	53	35	90	58	60	79	29	32	30
Arable silage/other fodder crop	33	50	39	39	85	104	131	28	52	50	15
Peas - human consumption	6	25	26	5	20	67	76	1	17	20	116
Peas - animal consumption	11	45	46	13	44	52	71	5	23	32	80
Beans - animal consumption	5	39	34	8	114	57	65	6	22	22	139
Vegetables (brassicae)	97	97	97	3	225	89	178	219	86	173	61
Vegetables (other)	57	59	71	3	122	97	142	69	57	100	108
Soft fruit	39	52	77	0	58	52	96	23	27	74	14
Top fruit	58	40	55	11	190	88	135	111	35	75	41
Other tillage	43	29	24	10	80	52	160	34	15	38	109
All tillage	89	60	61	16	161	72	90	143	43	55	5341
Grass under 5 years	93	57	68	50	207	47	76	193	27	52	695
Grass 5 years and over	75	59	58	42	123	31	40	93	18	23	2304
All grass	78	58	59	44	139	33	46	108	19	27	2999
All crops & grass	84	59	60	30	150	53	68	126	31	41	8340

Source: British Survey of Fertiliser Practice 1999.

Table EW1.2 Use of straight fertiliser, England and Wales 1999

	Crop area receiving dressing (%)			Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	93	2	4	137	65	88	127	1	3	70
Winter wheat	96	5	7	182	86	92	174	5	6	1913
Spring barley	71	3	8	98	72	96	70	2	7	447
Winter barley	95	6	9	133	83	93	127	5	8	618
Oats	76	5	4	108	103	77	83	5	3	102
Rye/Triticale/Durum wheat	93	0	13	111	0	76	103	0	10	34
Seed potatoes	•	•	•	•	•	•	•	•	•	4
Early potatoes	29	0	0	129	0	0	37	0	0	11
2nd Early/Maincrop potatoes	30	3	22	90	157	219	27	5	48	179
Sugar beet	84	6	20	93	122	149	78	7	30	274
Spring oilseed rape	89	11	13	164	102	96	146	11	12	37
Winter oilseed rape	97	7	8	190	88	77	185	6	6	506
Linseed	72	6	8	66	70	76	48	4	6	268
Forage maize	41	8	18	69	56	119	28	4	21	131
Rootcrops for stockfeed	45	0	3	110	0	139	49	0	4	34
Leafy forage crops	46	0	0	107	0	0	50	0	0	30
Arable silage/other fodder crop	25	21	15	107	137	198	27	29	29	15
Peas - human consumption	2	2	4	25	58	73	0	1	3	116
Peas - animal consumption	2	1	4	180	63	58	4	1	2	80
Beans - animal consumption	5	10	4	120	64	72	5	6	3	139
Vegetables (brassicae)	87	0	0	130	0	0	113	0	0	61
Vegetables (other)	42	1	15	96	80	177	40	1	26	108
Soft fruit	1	0	25	43	0	150	0	0	38	14
Top fruit	58	28	55	100	52	69	58	15	38	41
Other tillage	29	0	9	75	0	221	22	0	19	109
All tillage	81	5	9	155	85	107	126	5	9	5341
Grass under 5 years	71	2	5	168	83	95	119	1	4	695
Grass 5 years and over	34	2	1	126	58	95	43	1	1	2304
All grass	40	2	1	138	62	95	55	1	1	2999
All crops & grass	60	3	5	150	79	105	90	3	5	8340

Source: British Survey of Fertiliser Practice 1999.

Table EW1.3 Use of compound fertiliser, England and Wales 1999

	Crop area receiving dressing (%)			Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	26	45	42	63	63	65	16	28	27	70
Winter wheat	18	52	51	58	68	75	10	35	38	1913
Spring barley	45	70	71	69	51	59	31	36	42	447
Winter barley	23	69	70	55	58	73	13	40	51	618
Oats	30	73	74	58	61	71	18	44	53	102
Rye/Triticale/Durum wheat	14	58	60	52	54	66	7	31	40	34
Seed potatoes	•	•	•	•	•	•	•	•	•	4
Early potatoes	83	100	100	160	174	218	133	174	218	11
2nd Early/Maincrop potatoes	80	86	84	165	194	251	131	168	210	179
Sugar beet	23	64	65	85	70	150	19	45	98	274
Spring oilseed rape	10	30	30	81	50	69	8	15	21	37
Winter oilseed rape	32	58	55	45	68	75	14	39	41	506
Linseed	14	30	30	49	48	56	7	14	17	268
Forage maize	51	58	25	39	76	72	20	45	18	131
Rootcrops for stockfeed	71	76	77	61	78	97	43	60	74	34
Leafy forage crops	46	50	53	65	58	60	30	29	32	30
Arable silage/other fodder crop	8	28	28	15	80	74	1	23	21	15
Peas - human consumption	4	23	23	17	68	76	1	16	17	116
Peas - animal consumption	9	44	42	10	52	72	1	23	30	80
Beans - animal consumption	0	29	29	0	55	64	0	16	19	139
Vegetables (brassicae)	97	97	97	110	89	178	107	86	173	61
Vegetables (other)	32	58	59	88	98	126	28	57	74	108
Soft fruit	39	52	52	58	52	70	23	27	36	14
Top fruit	18	18	16	293	110	230	53	20	37	41
Other tillage	21	29	24	61	52	81	13	15	19	109
All tillage	25	55	54	68	70	85	17	38	46	5341
Grass under 5 years	59	56	66	125	45	71	74	25	47	695
Grass 5 years and over	58	57	57	86	30	38	50	17	22	2304
All grass	58	57	58	92	32	44	54	18	26	2999
All crops & grass	42	56	56	85	50	64	35	28	36	8340

Source: British Survey of Fertiliser Practice 1999.

Table EW1.4 Use of lime, England and Wales 1999

	Crop area receiving dressing (%)						Average field rate of CaO equivalent (tonnes/ha)						Fields Limed	Fields in sample
	Ground limestone	Ground chalk	Magnesian limestone	Sugar beet lime	Other	All	Ground limestone	Ground chalk	Magnesian limestone	Sugar beet lime	Other	All	Fields	Fields
Spring wheat	•	•	•	•	•	•	•	•	•	•	•	•	3	70
Winter wheat	4	1	1	•	•	6	3.5	3.1	3.4	•	•	3.3	117	1913
Spring barley	4	•	2	•	1	6	2.0	•	1.6	•	1.4	1.8	33	447
Winter barley	7	1	3	1	1	11	3.3	1.6	2.7	2.1	2.5	3.0	72	618
Oats	•	•	•	•	•	•	•	•	•	•	•	•	3	102
Rye/Triticale/Durum wheat	24	•	•	•	•	24	2.6	•	•	•	•	2.6	5	34
Seed potatoes	•	•	•	•	•	•	•	•	•	•	•	•	0	4
Early potatoes	•	•	•	•	•	•	•	•	•	•	•	•	0	11
2nd Early/Maincrop potatoes	•	•	•	•	•	•	•	•	•	•	•	•	1	179
Sugar beet	22	2	4	8	•	35	2.7	1.4	2.2	1.5	•	2.4	92	274
Spring oilseed rape	•	•	•	•	•	•	•	•	•	•	•	•	3	37
Winter oilseed rape	6	2	2	1	•	10	3.5	3.6	3.7	5.6	•	3.7	44	506
Linseed	2	1	•	•	•	3	0.5	1.2	•	•	•	0.9	7	268
Forage maize	15	2	1	•	•	18	1.0	2.1	1.3	•	•	1.1	18	131
Rootcrops for stockfeed	17	•	•	•	13	29	2.2	•	•	•	0.4	1.4	6	34
Leafy forage crops	•	•	•	•	•	•	•	•	•	•	•	•	2	30
Arable silage/other fodder crop	•	•	•	•	•	•	•	•	•	•	•	•	0	15
Peas - human consumption	4	•	4	•	•	8	0.7	•	0.4	•	•	0.5	11	116
Peas - animal consumption	2	9	•	•	•	11	1.2	0.1	•	•	•	0.3	7	80
Beans - animal consumption	1	4	•	•	•	6	2.0	0.2	•	•	•	0.5	7	139
Vegetables (brassicae)	•	•	•	•	•	•	•	•	•	•	•	•	3	61
Vegetables (other)	5	•	2	•	•	6	1.8	•	2.0	•	•	1.8	7	108
Soft fruit	•	•	•	•	•	•	•	•	•	•	•	•	2	14
Top fruit	19	•	•	•	•	19	2.2	•	•	•	•	2.2	8	41
Other tillage	•	•	•	•	•	•	•	•	•	•	•	•	3	109
All tillage	5	1	2	1	•	9	2.9	2.2	2.7	1.8	•	2.7	454	5341
Grass under 5 years	8	•	2	•	•	10	4.7	•	3.0	•	•	4.3	73	695
Grass 5 years and over	2	•	2	•	1	5	3.3	•	1.4	•	1.1	2.1	135	2304
All grass	3	•	2	•	1	6	3.9	•	1.7	•	1.1	2.8	208	2999
All crops & grass	4	1	2	•	1	7	3.3	2.2	2.2	•	1.3	2.7	662	8340

Source: British Survey of Fertiliser Practice 1999.

Table EW1.5 Percentage of crop area by field application rate — N, England and Wales 1999

																			Fields in sample
	kg / ha																		
row %	0	<25	25-	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-	400+	
Spring wheat	3	2	0	1	2	15	15	44	13	3	1	.	.	.	.	.	.	.	70
Winter wheat	2	0	1	3	5	3	8	16	19	22	11	6	2	1	1	.	.	.	1913
Spring barley	4	0	4	12	29	24	16	8	2	0	1	0	1	.	.	.	.	.	447
Winter barley	0	0	2	7	7	14	28	22	11	5	2	1	.	.	.	.	.	.	618
Oats	5	0	4	8	38	9	23	6	5	1	1	.	.	.	.	.	.	.	102
Rye/Triticale/Durum wheat	0	0	2	25	19	5	31	13	0	0	0	0	4	.	.	.	.	.	34
Seed potatoes	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
Early potatoes	0	0	0	0	0	0	24	43	13	15	0	4	.	.	.	.	.	.	11
2nd Early/Maincrop potatoes	12	0	7	2	8	4	5	11	15	11	11	8	4	1	0	0	1	.	179
Sugar beet	7	2	15	6	16	24	19	5	2	2	0	2	.	.	.	.	.	.	274
Spring oilseed rape	9	0	2	4	2	6	7	27	18	14	6	4	.	.	.	.	.	.	37
Winter oilseed rape	2	0	1	3	3	3	6	9	21	21	14	8	5	2	2	.	.	.	506
Linseed	19	0	21	30	24	2	1	0	1	.	.	.	.	.	.	.	.	.	268
Forage maize	24	19	15	19	11	4	5	2	1	.	.	.	.	.	.	.	.	.	131
Rootcrops for stockfeed	14	0	13	29	3	11	4	11	7	3	0	2	0	0	3	.	.	.	34
Leafy forage crops	10	0	20	8	22	29	10	.	.	.	.	.	.	.	.	.	.	.	30
Arable silage/other fodder crop	66	8	9	0	0	5	0	11	.	.	.	.	.	.	.	.	.	.	15
Peas - human consumption	93	4	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	116
Peas - animal consumption	89	9	0	0	0	0	0	0	2	.	.	.	.	.	.	.	.	.	80
Beans - animal consumption	95	1	0	0	0	2	0	2	.	.	.	.	.	.	.	.	.	.	139
Vegetables (brassicae)	3	0	3	0	1	0	1	6	2	24	36	20	1	0	3	.	.	.	61
Vegetables (other)	44	2	6	12	10	8	4	8	1	3	2	0	1	0	0	0	0	1	108
Soft fruit	61	5	1	27	0	6	.	.	.	.	.	.	.	.	.	.	.	.	14
Top fruit	42	2	2	8	10	9	4	0	3	4	0	0	0	0	0	0	4	12	41
Other tillage	57	0	7	20	11	2	1	1	0	0	0	1	.	.	.	.	.	.	109
All tillage	11	1	4	6	9	7	11	13	13	13	7	4	1	1	1	.	.	.	5341
Grass under 5 years	5	0	3	5	10	6	9	6	9	9	6	8	4	5	2	4	4	4	695
Grass 5 years and over	24	1	12	17	10	6	7	3	3	4	2	3	2	2	1	0	0	1	2304
All grass	21	1	10	15	10	6	8	4	4	5	3	4	2	2	1	1	1	1	2999
All crops & grass	16	1	7	11	9	7	9	8	8	9	5	4	2	2	1	1	1	1	8340

Source: British Survey of Fertiliser Practice 1999.

Table EW1.6 Percentage of crop area by field application rate — P_2O_5, England and Wales 1999

row %	0	<25	25-	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-	400+	Fields in sample
	kg / ha																		
Spring wheat	53	1	10	24	8	3	0	1	.	.	.	.	.	.	.	.	.	.	70
Winter wheat	44	2	9	23	15	4	1	1	.	.	.	.	.	.	.	.	.	.	1913
Spring barley	27	8	31	19	11	4	1	.	.	.	.	.	.	.	.	.	.	.	447
Winter barley	26	3	22	29	14	2	2	.	.	.	.	.	.	.	.	.	.	.	618
Oats	23	2	25	24	19	5	1	1	.	.	.	.	.	.	.	.	.	.	102
Rye/Triticale/Durum wheat	40	0	19	37	2	.	.	.	.	.	.	.	.	.	.	.	.	.	34
Seed potatoes	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
Early potatoes	0	0	0	12	0	0	7	19	30	27	0	4	.	.	.	.	.	.	11
2nd Early/Maincrop potatoes	12	1	3	4	2	5	10	7	18	8	10	5	6	5	0	1	2	2	179
Sugar beet	31	4	17	24	10	6	3	1	3	0	0	0	0	0	0	0	1	.	274
Spring oilseed rape	59	2	12	12	11	1	0	3	.	.	.	.	.	.	.	.	.	.	37
Winter oilseed rape	36	1	13	30	11	3	2	2	0	0	0	0	0	0	0	1	.	.	506
Linseed	64	1	16	14	4	.	.	.	.	.	.	.	.	.	.	.	.	.	268
Forage maize	35	1	9	29	15	7	2	1	1	.	.	.	.	.	.	.	.	.	131
Rootcrops for stockfeed	24	15	10	4	33	4	4	0	0	5	.	.	.	.	.	.	.	.	34
Leafy forage crops	49	0	14	22	10	3	.	.	.	.	.	.	.	.	.	.	.	.	30
Arable silage/other fodder crop	50	0	0	19	17	0	0	0	14	.	.	.	.	.	.	.	.	.	15
Peas - human consumption	75	0	2	15	5	0	2	.	.	.	.	.	.	.	.	.	.	.	116
Peas - animal consumption	55	1	14	25	4	.	.	.	.	.	.	.	.	.	.	.	.	.	80
Beans - animal consumption	61	0	9	25	5	.	.	.	.	.	.	.	.	.	.	.	.	.	139
Vegetables (brassicae)	3	1	3	38	25	17	0	12	0	0	0	2	.	.	.	.	.	.	61
Vegetables (other)	41	3	11	20	4	6	5	1	5	2	3	0	0	0	0	0	0	1	108
Soft fruit	48	0	10	42	.	.	.	.	.	.	.	.	.	.	.	.	.	.	14
Top fruit	60	2	6	15	0	9	0	0	7	.	.	.	.	.	.	.	.	.	41
Other tillage	71	0	14	5	8	1	.	.	.	.	.	.	.	.	.	.	.	.	109
All tillage	41	2	13	23	12	4	2	1	1	.	.	.	.	.	.	.	.	.	5341
Grass under 5 years	41	13	22	14	5	2	1	.	.	.	.	.	.	.	.	.	.	.	695
Grass 5 years and over	41	27	23	6	1	1	.	.	.	.	.	.	.	.	.	.	.	.	2304
All grass	41	25	23	8	2	1	1	.	.	.	.	.	.	.	.	.	.	.	2999
All crops & grass	40	14	18	15	7	2	1	1	1	.	.	.	.	.	.	.	.	.	8340

Source: British Survey of Fertiliser Practice 1999.

Table EW1.7 Percentage of crop area by field application rate — K_2O, England and Wales 1999

row %	kg / ha																		Fields in sample
	0	<25	25-	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-	400+	
Spring wheat	57	0	8	13	18	1	2	1	.	.	.	.	.	.	.	.	.	.	70
Winter wheat	43	1	8	19	19	7	1	2	1	.	.	.	.	.	.	.	.	.	1913
Spring barley	22	3	29	18	18	9	1	.	.	.	.	.	.	.	.	.	.	.	447
Winter barley	23	2	12	22	27	10	3	1	.	.	.	.	.	.	.	.	.	.	618
Oats	24	2	22	11	27	8	6	.	.	.	.	.	.	.	.	.	.	.	102
Rye/Triticale/Durum wheat	25	0	0	48	23	1	.	.	.	.	.	.	.	.	.	.	.	.	34
Seed potatoes	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4
Early potatoes	0	0	0	0	12	0	0	0	24	27	0	19	0	13	0	0	4	.	11
2nd Early/Maincrop potatoes	12	0	1	0	0	1	0	2	5	9	7	11	8	13	4	13	2	9	179
Sugar beet	17	2	3	7	12	15	8	5	8	10	5	4	2	0	1	0	2	1	274
Spring oilseed rape	57	0	10	6	13	12	1	.	.	.	.	.	.	.	.	.	.	.	37
Winter oilseed rape	38	1	6	26	20	4	2	2	0	0	0	0	1	.	.	.	.	.	506
Linseed	62	3	11	10	12	2	1	.	.	.	.	.	.	.	.	.	.	.	268
Forage maize	58	2	7	6	8	4	4	6	1	1	0	1	.	.	.	.	.	.	131
Rootcrops for stockfeed	20	8	19	0	28	4	3	6	2	0	11	.	.	.	.	.	.	.	34
Leafy forage crops	46	3	14	16	16	3	.	.	.	.	.	.	.	.	.	.	.	.	30
Arable silage/other fodder crop	61	0	0	20	3	7	0	0	0	0	0	0	3	0	0	5	.	.	15
Peas - human consumption	73	0	1	9	12	4	.	.	.	.	.	.	.	.	.	.	.	.	116
Peas - animal consumption	54	0	3	21	18	1	2	.	.	.	.	.	.	.	.	.	.	.	80
Beans - animal consumption	66	0	6	15	12	1	.	.	.	.	.	.	.	.	.	.	.	.	139
Vegetables (brassicae)	3	0	2	1	0	5	6	29	34	11	6	1	0	0	0	0	0	2	61
Vegetables (other)	30	1	5	13	10	4	5	12	8	1	4	0	0	3	4	0	0	1	108
Soft fruit	23	0	5	14	33	0	0	25	.	.	.	.	.	.	.	.	.	.	14
Top fruit	45	0	19	0	9	11	0	0	0	0	0	0	4	12	.	.	.	.	41
Other tillage	76	0	5	2	3	1	1	0	2	0	7	0	0	1	0	0	1	.	109
All tillage	39	1	9	17	18	6	2	2	1	1	1	.	.	.	.	.	.	.	5341
Grass under 5 years	30	9	19	12	9	6	5	3	2	1	1	1	.	.	.	.	.	.	695
Grass 5 years and over	42	20	22	7	4	2	1	.	.	.	.	.	.	.	.	.	.	.	2304
All grass	41	18	22	8	5	3	1	1	.	.	.	.	.	.	.	.	.	.	2999
All crops & grass	39	10	16	13	11	5	2	1	1	1	.	.	.	.	.	.	.	.	8340

Source: British Survey of Fertiliser Practice 1999.

Table EW2.1 Average fertiliser practice by grassland utilisation, England and Wales 1999

	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Grazed — not mown	72	55	51	28	113	30	29	81	16	15	1517
Grazed — mown	87	64	70	65	163	36	60	142	23	42	1328
All grazings	78	59	59	44	138	33	45	108	19	27	2847
Cut for seed grazed	76	61	68	37	151	27	35	115	16	24	19
Cut for seed not grazed	•	•	•	•	•	•	•	•	•	•	3
All cut for seed	78	62	70	34	149	27	36	116	17	25	22
Cut for silage grazed	92	66	74	69	179	38	65	166	25	48	984
Cut for silage not grazed	95	68	72	42	201	55	101	191	37	72	96
All cut for silage	93	66	74	68	180	39	67	167	26	49	1080
Cut for hay grazed	70	54	52	54	98	27	35	68	15	18	435
Cut for hay not grazed	66	59	50	17	79	34	38	52	20	19	34
All cut for hay	69	54	52	54	97	27	35	68	15	18	469
All mowings	87	64	70	63	165	36	61	143	23	43	1458
All grass	78	58	59	44	139	33	46	108	19	27	2999

Source: British Survey of Fertiliser Practice 1999.

Table EW2.2 Percentage of grass area by field application rate — N, England and Wales 1999

																			Fields in sample
	kg / ha																		
row %	0	<25	25-	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-	400+	
Grazed — not mown	28	2	13	19	8	6	7	3	2	4	2	2	2	1	1	0	0	1	1517
Grazed — mown	13	1	7	10	12	7	9	5	5	7	4	6	3	4	1	1	2	1	1328
All grazings	22	1	10	15	10	6	8	4	4	5	3	4	2	2	1	1	1	1	2847
Cut for seed grazed	24	0	8	23	8	7	0	6	1	0	7	2	4	0	11	.	.	.	19
Cut for seed not grazed	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
All cut for seed	22	0	7	21	7	11	0	6	2	1	6	1	4	0	10	.	.	.	22
Cut for silage grazed	8	0	4	8	12	8	10	6	6	9	5	8	4	6	1	2	2	1	984
Cut for silage not grazed	5	0	4	11	2	6	4	6	14	8	12	7	9	3	1	5	0	2	96
All cut for silage	8	0	4	9	12	8	10	6	6	8	5	8	5	5	1	2	2	1	1080
Cut for hay grazed	30	1	16	15	13	5	8	2	3	2	1	1	1	0	0	0	1	.	435
Cut for hay not grazed	34	0	17	13	15	13	9	.	.	.	.	.	.	.	.	.	.	.	34
All cut for hay	31	1	16	15	13	5	8	2	3	2	1	1	1	0	0	0	1	.	469
All mowings	13	1	7	10	12	7	9	5	6	7	4	6	4	4	1	2	2	1	1458
All grass	22	1	10	15	10	6	8	4	4	5	3	4	2	2	1	1	1	1	2999

Source: British Survey of Fertiliser Practice 1999.

Table EW2.3 Percentage of grass area by field application rate — P_2O_5, England and Wales 1999

row %	0	<25	25-	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-	400+	Fields in sample
	kg / ha																		
Grazed — not mown	45	27	20	5	1	1	1	.	.	.	.	.	.	.	.	.	.	.	1517
Grazed — mown	36	23	26	11	3	1	.	.	.	.	.	.	.	.	.	.	.	.	1328
All grazings	41	25	23	7	2	1	.	.	.	.	.	.	.	.	.	.	.	.	2847
Cut for seed grazed	40	30	28	1	2	.	.	.	.	.	.	.	.	.	.	.	.	.	19
Cut for seed not grazed	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
All cut for seed	38	33	27	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	22
Cut for silage grazed	34	21	28	12	3	1	.	.	.	.	.	.	.	.	.	.	.	.	984
Cut for silage not grazed	32	14	22	13	11	3	5	.	.	.	.	.	.	.	.	.	.	.	96
All cut for silage	34	21	28	12	4	1	1	.	.	.	.	.	.	.	.	.	.	.	1080
Cut for hay grazed	46	29	17	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	435
Cut for hay not grazed	42	31	9	19	.	.	.	.	.	.	.	.	.	.	.	.	.	.	34
All cut for hay	47	29	17	8	.	.	.	.	.	.	.	.	.	.	.	.	.	.	469
All mowings	36	23	26	11	3	1	.	.	.	.	.	.	.	.	.	.	.	.	1458
All grass	41	25	23	8	2	1	1	.	.	.	.	.	.	.	.	.	.	.	2999

Source: British Survey of Fertiliser Practice 1999.

Table EW2.4 Percentage of grass area by field application rate — K_2O, England and Wales 1999

row %	kg / ha																		Fields in sample
	0	<25	25-	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-	400+	
Grazed — not mown	49	23	21	5	2	.	.	.	.	.	.	.	.	.	.	.	.	.	1517
Grazed — mown	30	14	22	11	10	6	3	1	1	1	.	.	.	.	.	.	.	.	1328
All grazings	41	19	22	8	5	3	1	1	.	.	.	.	.	.	.	.	.	.	2847
Cut for seed grazed	32	30	17	18	2	0	1	.	.	.	.	.	.	.	.	.	.	.	19
Cut for seed not grazed	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3
All cut for seed	30	33	17	17	1	2	1	.	.	.	.	.	.	.	.	.	.	.	22
Cut for silage grazed	26	11	23	13	12	8	3	2	1	1	0	1	.	.	.	.	.	.	984
Cut for silage not grazed	28	1	15	18	9	3	9	6	1	3	4	2	.	.	.	.	.	.	96
All cut for silage	26	11	23	13	12	7	3	2	1	1	0	1	.	.	.	.	.	.	1080
Cut for hay grazed	47	22	18	6	4	0	1	.	.	.	.	.	.	.	.	.	.	.	435
Cut for hay not grazed	50	12	25	3	10	.	.	.	.	.	.	.	.	.	.	.	.	.	34
All cut for hay	48	22	19	6	4	0	1	.	.	.	.	.	.	.	.	.	.	.	469
All mowings	30	13	22	12	10	6	3	1	1	1	.	.	.	.	.	.	.	.	1458
All grass	41	18	22	8	5	3	1	1	.	.	.	.	.	.	.	.	.	.	2999

Source: British Survey of Fertiliser Practice 1999.

Table EW3.0 Product and nutrient by month of application, England and Wales 1999.

(a) Product use

row %	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total Product ('000 tonnes)
Straight N	1	0	0	0	0	7	33	34	13	6	3	2	2251
Straight P	20	7	10	0	3	7	30	13	3	0	2	4	60
Straight K	8	13	4	7	4	18	19	12	7	5	1	3	87
Compounds	7	7	2	1	1	6	22	23	14	7	5	5	2060
All fertilisers	4	3	1	1	1	7	28	28	13	6	4	4	4458

(b) Nutrient use

row %	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total Nutrient ('000 tonnes)
N	1	0	0	0	0	6	30	33	15	7	4	3	1075
P_2O_5	13	10	4	1	2	8	22	20	9	3	2	4	266
K_2O	11	10	4	2	2	9	21	18	10	6	4	4	351
Total	5	4	1	1	1	7	27	28	13	6	4	3	1692

Note: product use refers to the total tonnage of the products used by farmers in the survey year 1999

nutrient use refers to the tonnage of each nutrient contained in the products used (e.g. 100 kg of a 20 : 10 : 10 compound contains 20 kg of N, 10 kg of P_2O_5 and 10 kg of K_2O

100 kg of ammonium nitrate, one of the straight N products, contains typically 34.5 kg of N)

Source: British Survey of Fertiliser Practice 1999.

Table EW5.1 Average fertiliser practice on dairy farms, England and Wales 1999

	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	100	77	77	14	127	54	80	127	41	61	10
Winter wheat	98	82	81	64	157	71	90	154	58	73	78
Spring barley	88	72	72	65	95	48	54	84	34	39	46
Winter barley	98	82	83	48	125	61	74	123	50	62	52
Oats	•	•	•	•	•	•	•	•	•	•	3
Rye/Triticale/Durum wheat	100	100	100	19	144	68	68	144	68	68	5
Seed potatoes	•	•	•	•	•	•	•	•	•	•	0
Early potatoes	•	•	•	•	•	•	•	•	•	•	0
2nd Early/Maincrop potatoes	•	•	•	•	•	•	•	•	•	•	2
Sugar beet	•	•	•	•	•	•	•	•	•	•	1
Spring oilseed rape	•	•	•	•	•	•	•	•	•	•	3
Winter oilseed rape	90	77	77	25	205	70	62	186	54	48	10
Linseed	55	8	8	31	63	75	75	35	6	6	11
Forage maize	71	56	34	91	52	76	113	37	42	38	68
Rootcrops for stockfeed	78	53	61	92	129	28	49	101	15	30	9
Leafy forage crops	75	59	59	85	55	63	63	42	37	37	5
Arable silage/other fodder crop	•	•	•	•	•	•	•	•	•	•	4
Peas - human consumption	•	•	•	•	•	•	•	•	•	•	2
Peas - animal consumption	•	•	•	•	•	•	•	•	•	•	3
Beans - animal consumption	0	11	11	14	0	60	60	0	6	6	5
Vegetables (brassicae)	•	•	•	•	•	•	•	•	•	•	0
Vegetables (other)	•	•	•	•	•	•	•	•	•	•	0
Soft fruit	•	•	•	•	•	•	•	•	•	•	0
Top fruit	•	•	•	•	•	•	•	•	•	•	0
Other tillage	•	•	•	•	•	•	•	•	•	•	1
All tillage	84	69	64	64	117	65	81	98	45	51	318
Grass under 5 years	98	53	76	67	253	49	87	249	26	66	217
Grass 5 years and over	91	66	71	67	191	33	55	173	22	39	446
All grass	93	62	72	67	209	37	64	194	23	46	663
All crops & grass	91	64	71	67	192	43	67	175	27	47	981

Source: British Survey of Fertiliser Practice 1999.

Table EW5.2 Average fertiliser practice on cattle and sheep farms, England and Wales 1999

	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	•	•	•	•	•	•	•	•	•	•	2
Winter wheat	91	72	88	53	187	65	69	170	47	61	21
Spring barley	93	86	93	53	86	45	50	79	38	47	50
Winter barley	100	91	91	27	121	69	79	121	63	72	36
Oats	100	86	100	17	86	61	63	86	53	63	9
Rye/Triticale/Durum wheat	•	•	•	•	•	•	•	•	•	•	1
Seed potatoes	•	•	•	•	•	•	•	•	•	•	1
Early potatoes	•	•	•	•	•	•	•	•	•	•	0
2nd Early/Maincrop potatoes	•	•	•	•	•	•	•	•	•	•	2
Sugar beet	•	•	•	•	•	•	•	•	•	•	0
Spring oilseed rape	•	•	•	•	•	•	•	•	•	•	0
Winter oilseed rape	•	•	•	•	•	•	•	•	•	•	0
Linseed	79	16	16	13	60	40	34	47	6	6	11
Forage maize	97	97	55	82	55	91	86	53	88	48	16
Rootcrops for stockfeed	95	95	95	61	70	91	95	67	87	90	11
Leafy forage crops	100	100	100	55	65	55	53	65	55	53	5
Arable silage/other fodder crop	•	•	•	•	•	•	•	•	•	•	2
Peas - human consumption	•	•	•	•	•	•	•	•	•	•	0
Peas - animal consumption	•	•	•	•	•	•	•	•	•	•	0
Beans - animal consumption	•	•	•	•	•	•	•	•	•	•	0
Vegetables (brassicae)	•	•	•	•	•	•	•	•	•	•	0
Vegetables (other)	•	•	•	•	•	•	•	•	•	•	1
Soft fruit	•	•	•	•	•	•	•	•	•	•	0
Top fruit	•	•	•	•	•	•	•	•	•	•	1
Other tillage	•	•	•	•	•	•	•	•	•	•	1
All tillage	92	78	76	47	104	66	68	96	52	52	170
Grass under 5 years	92	72	74	55	161	42	60	149	30	45	186
Grass 5 years and over	71	62	59	41	93	28	31	66	17	18	1160
All grass	72	62	60	42	99	29	34	71	18	20	1346
All crops & grass	73	63	61	42	99	31	36	72	19	22	1516

Source: British Survey of Fertiliser Practice 1999.

Table EW5.3 Average fertiliser practice on other livestock/mixed farms, England and Wales 1999

	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	87	80	86	39	136	67	66	118	54	56	20
Winter wheat	96	68	71	29	181	65	73	173	44	52	351
Spring barley	100	80	88	26	105	52	59	105	41	52	94
Winter barley	100	70	74	31	139	59	77	139	42	56	157
Oats	88	60	60	23	99	67	84	87	41	51	26
Rye/Triticale/Durum wheat	•	•	•	•	•	•	•	•	•	•	3
Seed potatoes	•	•	•	•	•	•	•	•	•	•	0
Early potatoes	•	•	•	•	•	•	•	•	•	•	2
2nd Early/Maincrop potatoes	54	54	61	55	175	174	246	94	94	151	15
Sugar beet	100	65	86	74	115	86	158	115	56	136	36
Spring oilseed rape	100	66	66	10	149	92	97	149	61	64	14
Winter oilseed rape	97	74	69	9	180	62	79	174	46	55	87
Linseed	83	65	66	6	63	52	60	52	33	39	37
Forage maize	77	63	43	82	92	60	78	71	38	33	32
Rootcrops for stockfeed	46	73	73	75	91	93	137	42	68	99	5
Leafy forage crops	•	•	•	•	•	•	•	•	•	•	4
Arable silage/other fodder crop	•	•	•	•	•	•	•	•	•	•	1
Peas - human consumption	0	20	20	19	0	75	104	0	15	21	11
Peas - animal consumption	2	57	78	30	87	50	58	2	29	45	17
Beans - animal consumption	2	38	38	28	129	57	67	3	22	25	26
Vegetables (brassicae)	•	•	•	•	•	•	•	•	•	•	4
Vegetables (other)	19	19	19	57	121	121	161	22	22	30	5
Soft fruit	57	57	100	0	64	51	100	37	29	100	6
Top fruit	•	•	•	•	•	•	•	•	•	•	2
Other tillage	88	62	62	42	73	42	215	64	26	133	14
All tillage	89	68	71	30	151	64	80	135	43	57	969
Grass under 5 years	88	65	67	30	177	41	59	156	27	39	132
Grass 5 years and over	77	40	39	26	121	42	48	93	17	19	320
All grass	79	46	46	27	136	42	52	108	19	24	452
All crops & grass	85	59	60	29	145	56	71	124	33	43	1421

Source: British Survey of Fertiliser Practice 1999.

Table EW5.4 Average fertiliser practice on cropping/horticultural farms, England and Wales 1999

	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	100	32	25	0	154	64	70	154	20	18	38
Winter wheat	99	52	52	7	191	73	79	188	38	41	1463
Spring barley	97	67	73	6	110	55	69	106	37	51	257
Winter barley	100	73	76	4	143	60	77	143	44	59	373
Oats	96	82	78	3	110	63	71	106	51	56	64
Rye/Triticale/Durum wheat	97	49	65	6	114	52	66	110	25	43	25
Seed potatoes	•	•	•	•	•	•	•	•	•	•	3
Early potatoes	100	100	100	9	169	166	212	169	166	212	9
2nd Early/Maincrop potatoes	92	92	92	28	181	198	297	167	183	272	160
Sugar beet	92	71	83	15	103	73	153	94	52	127	237
Spring oilseed rape	87	29	30	23	182	47	68	158	13	21	20
Winter oilseed rape	98	61	60	6	208	73	76	205	45	45	409
Linseed	81	33	35	7	69	52	62	56	17	22	209
Forage maize	79	79	77	20	65	72	78	51	57	60	15
Rootcrops for stockfeed	100	79	87	52	161	105	163	161	82	142	9
Leafy forage crops	94	33	39	20	109	63	70	103	21	27	16
Arable silage/other fodder crop	32	54	27	7	48	136	164	15	73	45	8
Peas - human consumption	7	26	28	2	20	67	74	1	17	21	103
Peas - animal consumption	13	41	39	8	43	50	74	5	20	29	60
Beans - animal consumption	6	40	34	2	112	57	65	6	23	22	108
Vegetables (brassicae)	97	97	97	3	228	88	177	223	86	172	57
Vegetables (other)	58	60	72	2	122	97	142	70	58	102	102
Soft fruit	14	44	45	0	25	56	84	4	25	38	8
Top fruit	79	39	60	0	190	99	141	151	39	85	38
Other tillage	31	19	12	3	85	64	116	26	12	14	93
All tillage	89	56	58	7	169	75	95	151	42	55	3884
Grass under 5 years	86	39	39	20	174	60	94	150	23	37	160
Grass 5 years and over	67	45	40	8	115	39	45	77	18	18	378
All grass	72	43	40	11	133	44	57	96	19	23	538
All crops & grass	87	55	56	8	165	72	92	144	40	51	4422

Source: British Survey of Fertiliser Practice 1999.

Table SC1.1 Total fertiliser use, Scotland 1999

	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	100	93	93	13	174	68	64	174	63	59	9
Winter wheat	100	91	92	20	206	84	87	206	77	80	100
Spring barley	100	97	97	41	98	55	61	98	54	59	290
Winter barley	100	98	98	27	169	75	81	169	74	80	57
Oats	100	97	97	48	92	55	59	92	53	57	45
Rye/Triticale/Durum wheat	•	•	•	•	•	•	•	•	•	•	0
Seed potatoes	64	64	64	68	137	184	211	88	118	136	24
Early potatoes	77	89	89	74	165	117	120	126	105	107	6
2nd Early/Maincrop potatoes	85	85	85	39	156	148	220	132	125	186	38
Sugar beet	•	•	•	•	•	•	•	•	•	•	0
Spring oilseed rape	100	100	100	31	112	67	58	112	67	58	13
Winter oilseed rape	98	94	94	4	215	70	76	209	66	71	58
Linseed	•	•	•	•	•	•	•	•	•	•	2
Forage maize	91	91	91	100	87	33	33	79	30	30	5
Rootcrops for stockfeed	90	90	90	51	78	106	92	70	96	83	31
Leafy forage crops	100	100	100	46	114	52	65	114	52	65	14
Arable silage/other fodder crop	•	•	•	•	•	•	•	•	•	•	4
Peas - human consumption	16	25	25	0	13	55	60	2	14	15	5
Peas - animal consumption	•	•	•	•	•	•	•	•	•	•	4
Beans - animal consumption	•	•	•	•	•	•	•	•	•	•	4
Vegetables (brassicae)	79	79	79	21	199	111	119	157	87	94	18
Vegetables (other)	50	71	71	2	55	96	98	27	68	69	8
Soft fruit	•	•	•	•	•	•	•	•	•	•	2
Top fruit	•	•	•	•	•	•	•	•	•	•	0
Other tillage	•	•	•	•	•	•	•	•	•	•	2
All tillage	97	94	94	35	130	68	75	126	64	71	739
Grass under 5 years	99	89	88	54	162	42	57	160	37	50	204
Grass 5 years and over	83	73	68	42	125	32	39	103	23	27	333
All grass	87	77	73	45	135	35	44	117	27	32	537
All crops & grass	91	84	82	41	133	50	59	121	42	48	1276

Source: British Survey of Fertiliser Practice 1999.

Table SC1.2 Use of straight fertiliser, Scotland 1999

	Crop area receiving dressing (%)			Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	87	0	0	171	0	0	149	0	0	9
Winter wheat	97	0	1	187	0	90	182	0	1	100
Spring barley	52	0	1	66	0	38	34	0	0	290
Winter barley	94	0	0	146	0	0	137	0	0	57
Oats	57	0	0	82	0	0	47	0	0	45
Rye/Triticale/Durum wheat	.	.	.	.	.	.	.	.	.	0
Seed potatoes	3	0	0	55	0	0	2	0	0	24
Early potatoes	11	23	23	93	100	100	10	23	23	6
2nd Early/Maincrop potatoes	15	5	20	86	80	172	13	4	34	38
Sugar beet	.	.	.	.	.	.	.	.	.	0
Spring oilseed rape	71	0	0	88	0	0	63	0	0	13
Winter oilseed rape	87	0	0	185	0	0	162	0	0	58
Linseed	.	.	.	.	.	.	.	.	.	2
Forage maize	25	0	0	65	0	0	16	0	0	5
Rootcrops for stockfeed	5	0	0	92	0	0	5	0	0	31
Leafy forage crops	28	0	0	73	0	0	21	0	0	14
Arable silage/other fodder crop	.	.	.	.	.	.	.	.	.	4
Peas - human consumption	0	0	0	0	0	0	0	0	0	5
Peas - animal consumption	.	.	.	.	.	.	.	.	.	4
Beans - animal consumption	.	.	.	.	.	.	.	.	.	4
Vegetables (brassicae)	66	6	6	147	25	124	98	2	8	18
Vegetables (other)	5	20	20	121	90	96	6	18	20	8
Soft fruit	.	.	.	.	.	.	.	.	.	2
Top fruit	.	.	.	.	.	.	.	.	.	0
Other tillage	.	.	.	.	.	.	.	.	.	2
All tillage	60	1	2	118	80	112	71	0	2	739
Grass under 5 years	41	0	0	118	301	0	48	1	0	204
Grass 5 years and over	28	1	0	89	41	75	25	0	0	333
All grass	31	1	0	99	80	75	31	0	0	537
All crops & grass	43	1	1	110	80	108	47	0	1	1276

Source: British Survey of Fertiliser Practice 1999.

Table SC1.3 Use of compound fertiliser, Scotland 1999

	Crop area receiving dressing (%)			Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	86	93	93	29	68	64	25	63	59	9
Winter wheat	51	91	91	48	84	87	25	77	79	100
Spring barley	94	97	97	68	55	61	64	54	59	290
Winter barley	67	98	98	48	75	81	32	74	80	57
Oats	88	97	97	52	55	59	46	53	57	45
Rye/Triticale/Durum wheat	.	.	.	.	.	.	.	.	.	0
Seed potatoes	64	64	64	134	184	211	87	118	136	24
Early potatoes	66	66	66	176	123	127	117	81	84	6
2nd Early/Maincrop potatoes	80	80	73	149	151	209	119	121	153	38
Sugar beet	.	.	.	.	.	.	.	.	.	0
Spring oilseed rape	77	100	100	64	67	58	49	67	58	13
Winter oilseed rape	86	94	94	55	70	76	48	66	71	58
Linseed	.	.	.	.	.	.	.	.	.	2
Forage maize	91	91	91	70	33	33	63	30	30	5
Rootcrops for stockfeed	90	90	90	72	106	92	65	96	83	31
Leafy forage crops	100	100	100	93	52	65	93	52	65	14
Arable silage/other fodder crop	.	.	.	.	.	.	.	.	.	4
Peas - human consumption	16	25	25	13	55	60	2	14	15	5
Peas - animal consumption	.	.	.	.	.	.	.	.	.	4
Beans - animal consumption	.	.	.	.	.	.	.	.	.	4
Vegetables (brassicae)	73	73	73	81	118	118	59	86	86	18
Vegetables (other)	50	50	50	43	99	99	21	50	50	8
Soft fruit	.	.	.	.	.	.	.	.	.	2
Top fruit	.	.	.	.	.	.	.	.	.	0
Other tillage	.	.	.	.	.	.	.	.	.	2
All tillage	82	94	93	67	68	74	55	64	69	739
Grass under 5 years	89	89	88	126	41	57	112	36	50	204
Grass 5 years and over	72	73	68	108	32	39	78	23	27	333
All grass	76	77	73	113	34	44	86	26	32	537
All crops & grass	79	84	82	93	50	58	74	42	48	1276

Source: British Survey of Fertiliser Practice 1999.

Table SC1.4 Use of lime, Scotland 1999

	Crop area receiving dressing (%)						Average field rate of CaO equivalent (tonnes/ha)						Fields limed	Fields in sample
	Ground limestone	Ground chalk	Magnesian limestone	Sugar beet lime	Other	All	Ground limestone	Ground chalk	Magnesian limestone	Sugar beet lime	Other	All	Fields	Fields
Spring wheat	.	.	.	.	.	.	.	.	.	.	.	.	0	9
Winter wheat	2	.	9	.	.	11	3.3	.	3.5	.	.	3.5	9	100
Spring barley	6	.	9	.	.	15	2.2	.	1.6	.	.	1.8	50	290
Winter barley	7	.	18	.	.	25	2.5	.	4.1	.	.	3.7	10	57
Oats	.	.	.	.	.	.	.	.	.	.	.	.	3	45
Rye/Triticale/Durum wheat	.	.	.	.	.	.	.	.	.	.	.	.	0	0
Seed potatoes	.	.	.	.	.	.	.	.	.	.	.	.	0	24
Early potatoes	.	.	.	.	.	.	.	.	.	.	.	.	0	6
2nd Early/Maincrop potatoes	.	.	.	.	.	.	.	.	.	.	.	.	0	38
Sugar beet	.	.	.	.	.	.	.	.	.	.	.	.	0	0
Spring oilseed rape	.	.	.	.	.	.	.	.	.	.	.	.	3	13
Winter oilseed rape	2	.	5	.	.	7	2.2	.	4.0	.	.	3.4	7	58
Linseed	.	.	.	.	.	.	.	.	.	.	.	.	0	2
Forage maize	.	.	.	.	.	.	.	.	.	.	.	.	1	5
Rootcrops for stockfeed	.	.	.	.	.	.	.	.	.	.	.	.	1	31
Leafy forage crops	.	.	.	.	.	.	.	.	.	.	.	.	3	14
Arable silage/other fodder crop	.	.	.	.	.	.	.	.	.	.	.	.	1	4
Peas - human consumption	.	.	.	.	.	.	.	.	.	.	.	.	2	5
Peas - animal consumption	.	.	.	.	.	.	.	.	.	.	.	.	0	4
Beans - animal consumption	.	.	.	.	.	.	.	.	.	.	.	.	0	4
Vegetables (brassicae)	.	.	31	.	.	31	.	.	1.7	.	.	1.7	7	18
Vegetables (other)	.	.	.	.	.	.	.	.	.	.	.	.	1	8
Soft fruit	.	.	.	.	.	.	.	.	.	.	.	.	0	2
Top fruit	.	.	.	.	.	.	.	.	.	.	.	.	0	0
Other tillage	.	.	.	.	.	.	.	.	.	.	.	.	0	2
All tillage	4	.	9	.	.	13	2.2	.	2.3	.	.	2.3	98	739
Grass under 5 years	3	.	6	.	.	9	1.1	.	3.3	.	.	2.6	16	204
Grass 5 years and over	1	.	4	.	.	5	2.6	.	1.8	.	.	2.0	18	333
All grass	2	.	4	.	.	6	2.0	.	2.4	.	.	2.2	34	537
All crops & grass	3	.	6	.	.	9	2.1	.	2.3	.	.	2.3	132	1276

Source: British Survey of Fertiliser Practice 1999.

Table SC1.5 Percentage of crop area by field application rate — N, Scotland 1999

	kg / ha																		Fields in sample
row %	0	<25	25-	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-	400+	
Spring wheat	0	0	0	6	6	0	0	42	7	22	17	•	•	•	•	•	•	•	9
Winter wheat	0	0	0	1	0	1	7	14	20	23	17	10	3	2	•	•	•	•	100
Spring barley	0	0	3	10	38	38	10	0	1	•	•	•	•	•	•	•	•	•	290
Winter barley	0	0	0	0	0	13	27	19	23	15	2	0	0	1	•	•	•	•	57
Oats	0	0	9	22	25	24	12	8	•	•	•	•	•	•	•	•	•	•	45
Rye/Triticale/Durum wheat	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	0
Seed potatoes	36	0	0	3	0	29	13	15	0	0	0	0	5	•	•	•	•	•	24
Early potatoes	23	0	0	0	14	0	6	0	40	17	•	•	•	•	•	•	•	•	6
2nd Early/Maincrop potatoes	15	0	0	9	1	9	36	0	10	11	2	4	0	0	0	0	0	1	38
Sugar beet	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	0
Spring oilseed rape	0	0	11	7	13	38	5	26	•	•	•	•	•	•	•	•	•	•	13
Winter oilseed rape	2	0	0	2	3	4	2	4	19	17	20	12	11	3	•	•	•	•	58
Linseed	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2
Forage maize	9	0	0	21	46	25	•	•	•	•	•	•	•	•	•	•	•	•	5
Rootcrops for stockfeed	10	5	12	36	12	12	0	14	•	•	•	•	•	•	•	•	•	•	31
Leafy forage crops	0	0	0	0	46	20	17	10	0	0	8	•	•	•	•	•	•	•	14
Arable silage/other fodder crop	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	4
Peas - human consumption	84	16	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	5
Peas - animal consumption	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	4
Beans - animal consumption	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	4
Vegetables (brassicae)	21	0	0	0	12	0	0	0	40	7	7	0	6	0	6	•	•	•	18
Vegetables (other)	49	24	5	16	0	0	0	0	4	0	0	0	1	•	•	•	•	•	8
Soft fruit	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2
Top fruit	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	0
Other tillage	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2
All tillage	4	1	2	8	23	24	11	5	7	6	4	2	1	1	•	•	•	•	739
Grass under 5 years	1	0	0	14	14	7	12	10	5	13	6	8	2	0	4	1	•	•	204
Grass 5 years and over	17	0	6	23	10	10	8	10	4	3	2	2	2	1	1	0	1	•	333
All grass	13	0	5	21	11	10	9	10	4	5	3	3	2	1	2	1	1	•	537
All crops & grass	9	0	4	16	16	16	10	8	6	6	3	3	2	1	1	•	•	•	1276

Source: British Survey of Fertiliser Practice 1999.

Table SC1.6 Percentage of crop area by field application rate — P_2O_5, Scotland 1999

																			Fields in sample
									kg / ha										
row %	0	<25	25-	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-	400+	
Spring wheat	7	0	13	56	7	17	•	•	•	•	•	•	•	•	•	•	•	•	9
Winter wheat	9	0	2	26	46	12	5	•	•	•	•	•	•	•	•	•	•	•	100
Spring barley	2	2	28	58	7	1	•	•	•	•	•	•	•	•	•	•	•	•	290
Winter barley	2	4	5	30	53	2	4	•	•	•	•	•	•	•	•	•	•	•	57
Oats	3	4	24	46	23	•	•	•	•	•	•	•	•	•	•	•	•	•	45
Rye/Triticale/Durum wheat	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	0
Seed potatoes	36	0	0	0	0	22	13	15	0	10	0	0	0	0	0	0	0	5	24
Early potatoes	11	0	0	0	40	26	6	0	17	•	•	•	•	•	•	•	•	•	6
2nd Early/Maincrop potatoes	15	5	0	0	8	8	37	2	14	2	2	5	1	1	•	•	•	•	38
Sugar beet	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	0
Spring oilseed rape	0	0	11	55	34	•	•	•	•	•	•	•	•	•	•	•	•	•	13
Winter oilseed rape	5	0	17	36	33	9	•	•	•	•	•	•	•	•	•	•	•	•	58
Linseed	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2
Forage maize	9	7	84	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	5
Rootcrops for stockfeed	10	0	3	10	37	14	13	2	3	7	•	•	•	•	•	•	•	•	31
Leafy forage crops	0	0	44	44	0	12	•	•	•	•	•	•	•	•	•	•	•	•	14
Arable silage/other fodder crop	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	4
Peas - human consumption	75	0	9	16	•	•	•	•	•	•	•	•	•	•	•	•	•	•	5
Peas - animal consumption	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	4
Beans - animal consumption	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	4
Vegetables (brassicae)	21	6	0	0	20	23	5	24	•	•	•	•	•	•	•	•	•	•	18
Vegetables (other)	29	0	0	24	25	2	14	5	•	•	•	•	•	•	•	•	•	•	8
Soft fruit	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2
Top fruit	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	0
Other tillage	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2
All tillage	6	2	19	44	20	5	3	1	1	•	•	•	•	•	•	•	•	•	739
Grass under 5 years	11	15	47	19	6	1	1	•	•	•	•	•	•	•	•	•	•	•	204
Grass 5 years and over	27	28	31	11	2	1	•	•	•	•	•	•	•	•	•	•	•	•	333
All grass	23	25	35	13	3	1	•	•	•	•	•	•	•	•	•	•	•	•	537
All crops & grass	16	16	28	26	10	3	1	•	•	•	•	•	•	•	•	•	•	•	1276

Source: British Survey of Fertiliser Practice 1999.

Table SC1.7 Percentage of crop area by field application rate — K_2O, Scotland 1999

	kg / ha																		Fields in sample
row %	0	<25	25-	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-	400+	
Spring wheat	7	0	13	66	7	7	•	•	•	•	•	•	•	•	•	•	•	•	9
Winter wheat	8	0	2	23	47	17	3	1	•	•	•	•	•	•	•	•	•	•	100
Spring barley	2	2	25	45	24	1	1	•	•	•	•	•	•	•	•	•	•	•	290
Winter barley	2	4	2	25	50	13	4	•	•	•	•	•	•	•	•	•	•	•	57
Oats	3	3	24	41	23	5	•	•	•	•	•	•	•	•	•	•	•	•	45
Rye/Triticale/Durum wheat	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	0
Seed potatoes	36	0	0	0	0	4	3	25	0	9	14	6	0	0	0	0	0	5	24
Early potatoes	11	0	0	0	43	23	0	0	17	0	6	•	•	•	•	•	•	•	6
2nd Early/Maincrop potatoes	15	0	5	0	0	8	0	2	6	30	6	16	6	0	0	2	1	3	38
Sugar beet	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	0
Spring oilseed rape	0	0	41	24	34	•	•	•	•	•	•	•	•	•	•	•	•	•	13
Winter oilseed rape	5	0	18	31	28	13	1	0	2	•	•	•	•	•	•	•	•	•	58
Linseed	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2
Forage maize	9	7	84	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	5
Rootcrops for stockfeed	10	0	3	13	44	18	6	3	3	•	•	•	•	•	•	•	•	•	31
Leafy forage crops	0	0	29	51	0	12	0	8	•	•	•	•	•	•	•	•	•	•	14
Arable silage/other fodder crop	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	4
Peas - human consumption	75	0	0	25	•	•	•	•	•	•	•	•	•	•	•	•	•	•	5
Peas - animal consumption	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	4
Beans - animal consumption	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	4
Vegetables (brassicae)	21	0	0	5	11	34	5	22	0	2	•	•	•	•	•	•	•	•	18
Vegetables (other)	29	0	0	24	25	2	14	5	•	•	•	•	•	•	•	•	•	•	8
Soft fruit	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2
Top fruit	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	0
Other tillage	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	2
All tillage	6	1	18	35	28	6	2	1	1	1	0	1	•	•	•	•	•	•	739
Grass under 5 years	12	11	39	18	9	3	4	2	0	1	•	•	•	•	•	•	•	•	204
Grass 5 years and over	31	26	22	11	4	3	1	•	•	•	•	•	•	•	•	•	•	•	333
All grass	27	23	26	12	6	3	2	1	•	•	•	•	•	•	•	•	•	•	537
All crops & grass	18	14	23	22	15	4	2	1	0	1	•	•	•	•	•	•	•	•	1276

Source: British Survey of Fertiliser Practice 1999.

Table SC2.1 Average fertiliser practice by grassland utilisation, Scotland 1999

	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Grazed — not mown	82	70	64	35	109	29	28	90	20	18	277
Grazed — mown	94	90	89	65	177	44	65	166	39	57	202
All grazings	86	76	72	44	132	34	42	113	26	30	479
Cut for seed grazed	•	•	•	•	•	•	•	•	•	•	0
Cut for seed not grazed	•	•	•	•	•	•	•	•	•	•	0
All cut for seed	•	•	•	•	•	•	•	•	•	•	0
Cut for silage grazed	96	93	92	70	184	45	67	177	42	61	155
Cut for silage not grazed	100	92	92	60	173	40	70	173	37	65	52
All cut for silage	97	93	92	68	182	44	68	177	41	62	207
Cut for hay grazed	90	84	77	42	128	40	54	115	34	41	70
Cut for hay not grazed	100	63	63	23	105	26	28	105	16	18	6
All cut for hay	91	83	77	42	127	40	53	115	33	41	76
All mowings	95	90	89	64	176	43	66	167	39	58	260
All grass	87	77	73	45	135	35	44	117	27	32	537

Source: British Survey of Fertiliser Practice 1999.

Table SC2.2 Percentage of grass area by field application rate — N, Scotland 1999

	kg / ha																		Fields in sample
row %	0	<25	25-	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-	400+	
Grazed — not mown	18	0	6	29	11	11	7	8	2	3	1	2	1	0	0	0	1	.	277
Grazed — mown	6	0	1	9	9	7	13	13	8	8	6	6	5	3	4	1	1	.	202
All grazings	14	0	5	23	10	9	8	10	4	5	2	3	2	1	1	1	1	.	479
Cut for seed grazed	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
Cut for seed not grazed	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
All cut for seed	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
Cut for silage grazed	4	0	1	7	8	7	13	15	8	9	6	7	6	3	4	1	1	.	155
Cut for silage not grazed	0	0	0	0	18	10	12	11	12	11	11	9	3	1	2	.	.	.	52
All cut for silage	3	0	1	5	10	8	13	14	9	9	7	7	5	3	4	1	1	.	207
Cut for hay grazed	10	0	1	18	15	9	14	14	10	3	4	3	.	.	.	.	.	.	70
Cut for hay not grazed	0	0	0	9	52	5	34	.	.	.	.	.	.	.	.	.	.	.	6
All cut for hay	9	0	1	18	16	9	15	13	9	3	4	3	.	.	.	.	.	.	76
All mowings	5	0	1	7	11	8	13	13	9	9	7	7	5	3	4	1	1	.	260
All grass	13	0	5	21	11	10	9	10	4	5	3	3	2	1	2	1	1	.	537

Source: British Survey of Fertiliser Practice 1999.

Table SC2.3 Percentage of grass area by field application rate — P_2O_5, Scotland 1999

row %	0	<25	25-	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-	400+	Fields in sample
	kg / ha																		
Grazed — not mown	30	31	30	7	1	1	.	.	.	.	.	.	.	.	.	.	.	.	277
Grazed — mown	10	14	43	24	7	2	1	.	.	.	.	.	.	.	.	.	.	.	202
All grazings	24	26	34	12	3	1	.	.	.	.	.	.	.	.	.	.	.	.	479
Cut for seed grazed	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
Cut for seed not grazed	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
All cut for seed	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
Cut for silage grazed	7	14	44	25	8	2	1	.	.	.	.	.	.	.	.	.	.	.	155
Cut for silage not grazed	8	19	46	26	2	.	.	.	.	.	.	.	.	.	.	.	.	.	52
All cut for silage	7	15	44	25	7	1	1	.	.	.	.	.	.	.	.	.	.	.	207
Cut for hay grazed	17	15	39	29	0	1	.	.	.	.	.	.	.	.	.	.	.	.	70
Cut for hay not grazed	37	12	51	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
All cut for hay	17	15	39	29	0	1	.	.	.	.	.	.	.	.	.	.	.	.	76
All mowings	10	15	43	24	6	1	.	.	.	.	.	.	.	.	.	.	.	.	260
All grass	23	25	35	13	3	1	.	.	.	.	.	.	.	.	.	.	.	.	537

Source: British Survey of Fertiliser Practice 1999.

Table SC2.4 Percentage of grass area by field application rate — K_2O, Scotland 1999

	kg / ha																		Fields in sample
row %	0	<25	25-	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-	400+	
Grazed — not mown	36	29	25	9	1	.	.	.	.	.	.	.	.	.	.	.	.	.	277
Grazed — mown	11	12	28	17	13	9	5	2	1	1	.	.	.	.	.	.	.	.	202
All grazings	28	24	26	12	5	3	2	1	.	.	.	.	.	.	.	.	.	.	479
Cut for seed grazed	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
Cut for seed not grazed	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
All cut for seed	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
Cut for silage grazed	8	12	28	18	15	10	6	2	1	1	.	.	.	.	.	.	.	.	155
Cut for silage not grazed	8	10	26	19	18	7	5	5	0	2	.	.	.	.	.	.	.	.	52
All cut for silage	8	11	27	18	16	9	6	3	1	1	.	.	.	.	.	.	.	.	207
Cut for hay grazed	23	9	30	17	17	1	0	3	.	.	.	.	.	.	.	.	.	.	70
Cut for hay not grazed	37	12	51	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	6
All cut for hay	23	9	31	16	17	1	0	3	.	.	.	.	.	.	.	.	.	.	76
All mowings	11	12	28	18	14	9	5	2	1	1	.	.	.	.	.	.	.	.	260
All grass	27	23	26	12	6	3	2	1	.	.	.	.	.	.	.	.	.	.	537

Source: British Survey of Fertiliser Practice 1999.

Table SC3.0 Product and nutrient by month of application, Scotland 1999.

(a) Product use

row %	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total Product ('000 tonnes)
Straight N	0	0	0	0	0	4	22	41	15	9	6	3	172
Straight P	0	0	0	0	0	25	25	21	0	29	0	0	1
Straight K	8	0	0	0	0	32	59	0	0	0	0	0	2
Compounds	3	3	0	0	0	3	24	38	11	10	4	4	459
All fertilisers	3	2	0	0	0	3	24	39	12	10	5	4	633

(b) Nutrient use

row %	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Total Nutrient ('000 tonnes)
N	1	0	0	0	0	2	22	41	13	11	5	4	142
P_2O_5	6	7	0	0	0	4	28	33	9	7	2	4	50
K_2O	5	7	0	0	0	4	27	33	9	9	3	4	57
Total	3	3	0	0	0	3	24	38	11	10	4	4	249

Note: product use refers to the total tonnage of the products used by farmers in the survey year 1999
nutrient use refers to the tonnage of each nutrient contained in the products used (e.g. 100 kg of a 20 : 10 : 10 compound contains 20 kg of N, 10 kg of P_2O_5 and 10 kg of K_2O
100 kg of ammonium nitrate, one of the straight N products, contains typically 34.5 kg of N)

Source: British Survey of Fertiliser Practice 1999.

Table SC5.1 Average fertiliser practice on general cropping farms, Scotland 1999

	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	.	.	.	.	.	.	.	.	.	.	2
Winter wheat	100	96	100	9	215	80	89	215	77	89	31
Spring barley	100	100	100	19	104	55	65	104	55	65	88
Winter barley	100	100	100	8	184	87	96	184	87	96	13
Oats	100	100	100	0	103	58	66	103	58	66	17
Rye/Triticale/Durum wheat	.	.	.	.	.	.	.	.	.	.	0
Seed potatoes	59	59	59	73	142	181	221	83	106	130	17
Early potatoes	.	.	.	.	.	.	.	.	.	.	2
2nd Early/Maincrop potatoes	81	81	81	23	173	148	229	140	120	186	24
Sugar beet	.	.	.	.	.	.	.	.	.	.	0
Spring oilseed rape	100	100	100	20	147	69	46	147	69	46	7
Winter oilseed rape	92	92	92	1	227	64	72	209	59	66	25
Linseed	.	.	.	.	.	.	.	.	.	.	1
Forage maize	.	.	.	.	.	.	.	.	.	.	0
Rootcrops for stockfeed	100	100	100	9	71	105	111	71	105	111	5
Leafy forage crops	.	.	.	.	.	.	.	.	.	.	2
Arable silage/other fodder crop	.	.	.	.	.	.	.	.	.	.	0
Peas - human consumption	16	25	25	0	13	55	60	2	14	15	5
Peas - animal consumption	.	.	.	.	.	.	.	.	.	.	1
Beans - animal consumption	.	.	.	.	.	.	.	.	.	.	2
Vegetables (brassicae)	86	86	86	15	214	109	122	185	94	106	15
Vegetables (other)	49	70	70	0	55	96	98	27	67	69	7
Soft fruit	.	.	.	.	.	.	.	.	.	.	2
Top fruit	.	.	.	.	.	.	.	.	.	.	0
Other tillage	.	.	.	.	.	.	.	.	.	.	1
All tillage	93	93	94	17	139	73	87	128	68	82	267
Grass under 5 years	97	71	53	6	175	52	66	170	37	35	39
Grass 5 years and over	55	36	36	3	131	27	31	72	10	11	23
All grass	78	55	45	5	161	45	53	125	25	24	62
All crops & grass	90	86	84	15	142	69	84	128	60	71	329

Source: British Survey of Fertiliser Practice 1999.

Table SC5.2 Average fertiliser practice on dairy farms, Scotland 1999

	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	•	•	•	•	•	•	•	•	•	•	1
Winter wheat	100	100	100	89	185	81	81	185	81	81	8
Spring barley	100	100	100	86	87	49	49	87	49	49	25
Winter barley	100	100	100	100	160	73	73	160	73	73	5
Oats	•	•	•	•	•	•	•	•	•	•	0
Rye/Triticale/Durum wheat	•	•	•	•	•	•	•	•	•	•	0
Seed potatoes	•	•	•	•	•	•	•	•	•	•	0
Early potatoes	•	•	•	•	•	•	•	•	•	•	0
2nd Early/Maincrop potatoes	•	•	•	•	•	•	•	•	•	•	0
Sugar beet	•	•	•	•	•	•	•	•	•	•	0
Spring oilseed rape	•	•	•	•	•	•	•	•	•	•	0
Winter oilseed rape	•	•	•	•	•	•	•	•	•	•	0
Linseed	•	•	•	•	•	•	•	•	•	•	0
Forage maize	•	•	•	•	•	•	•	•	•	•	3
Rootcrops for stockfeed	•	•	•	•	•	•	•	•	•	•	1
Leafy forage crops	•	•	•	•	•	•	•	•	•	•	1
Arable silage/other fodder crop	•	•	•	•	•	•	•	•	•	•	0
Peas - human consumption	•	•	•	•	•	•	•	•	•	•	0
Peas - animal consumption	•	•	•	•	•	•	•	•	•	•	0
Beans - animal consumption	•	•	•	•	•	•	•	•	•	•	1
Vegetables (brassicae)	•	•	•	•	•	•	•	•	•	•	0
Vegetables (other)	•	•	•	•	•	•	•	•	•	•	0
Soft fruit	•	•	•	•	•	•	•	•	•	•	0
Top fruit	•	•	•	•	•	•	•	•	•	•	0
Other tillage	•	•	•	•	•	•	•	•	•	•	0
All tillage	100	100	100	89	111	56	56	111	55	56	45
Grass under 5 years	100	99	99	95	175	42	63	175	41	63	29
Grass 5 years and over	100	99	97	69	156	38	51	156	37	49	63
All grass	100	99	97	76	161	39	54	161	38	53	92
All crops & grass	100	99	98	78	154	41	55	153	41	53	137

Source: British Survey of Fertiliser Practice 1999.

Table SC5.3 Average fertiliser practice on mixed farms, Scotland 1999

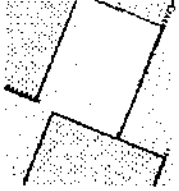
	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	.	.	.	.	.	.	.	.	.	.	1
Winter wheat	100	87	87	55	185	65	79	185	56	68	14
Spring barley	99	95	95	65	97	55	60	97	52	57	66
Winter barley	100	97	97	38	171	66	78	171	64	76	11
Oats	100	100	100	66	71	59	61	71	59	61	8
Rye/Triticale/Durum wheat	.	.	.	.	.	.	.	.	.	.	0
Seed potatoes	.	.	.	.	.	.	.	.	.	.	2
Early potatoes	.	.	.	.	.	.	.	.	.	.	3
2nd Early/Maincrop potatoes	100	100	100	99	132	157	189	132	157	189	8
Sugar beet	.	.	.	.	.	.	.	.	.	.	0
Spring oilseed rape	.	.	.	.	.	.	.	.	.	.	2
Winter oilseed rape	.	.	.	.	.	.	.	.	.	.	4
Linseed	.	.	.	.	.	.	.	.	.	.	0
Forage maize	.	.	.	.	.	.	.	.	.	.	1
Rootcrops for stockfeed	71	71	71	60	97	123	87	68	87	61	9
Leafy forage crops	.	.	.	.	.	.	.	.	.	.	2
Arable silage/other fodder crop	.	.	.	.	.	.	.	.	.	.	0
Peas - human consumption	.	.	.	.	.	.	.	.	.	.	0
Peas - animal consumption	.	.	.	.	.	.	.	.	.	.	1
Beans - animal consumption	.	.	.	.	.	.	.	.	.	.	0
Vegetables (brassicae)	.	.	.	.	.	.	.	.	.	.	1
Vegetables (other)	.	.	.	.	.	.	.	.	.	.	1
Soft fruit	.	.	.	.	.	.	.	.	.	.	0
Top fruit	.	.	.	.	.	.	.	.	.	.	0
Other tillage	.	.	.	.	.	.	.	.	.	.	1
All tillage	98	94	94	62	113	63	70	110	59	65	135
Grass under 5 years	99	94	94	57	178	38	53	177	35	50	49
Grass 5 years and over	90	72	63	38	117	25	31	105	18	19	62
All grass	93	79	72	44	137	29	40	127	23	29	111
All crops & grass	95	85	81	52	127	45	54	120	38	44	246

Source: British Survey of Fertiliser Practice 1999.

Table SC5.4 Average fertiliser practice on farms in Less Favoured Areas, Scotland 1999

	Crop area receiving dressing (%)				Average field rate (kg/ha)			Overall application rate (kg/ha)			Fields in sample
	N	P_2O_5	K_2O	FYM	N	P_2O_5	K_2O	N	P_2O_5	K_2O	
Spring wheat	•	•	•	•	•	•	•	•	•	•	3
Winter wheat	100	100	100	73	189	80	82	189	80	82	9
Spring barley	99	96	96	64	80	49	51	79	47	49	74
Winter barley	100	100	100	48	179	54	56	179	54	56	9
Oats	100	93	93	72	72	56	58	72	52	54	14
Rye/Triticale/Durum wheat	•	•	•	•	•	•	•	•	•	•	0
Seed potatoes	•	•	•	•	•	•	•	•	•	•	1
Early potatoes	•	•	•	•	•	•	•	•	•	•	2
2nd Early/Maincrop potatoes	•	•	•	•	•	•	•	•	•	•	3
Sugar beet	•	•	•	•	•	•	•	•	•	•	0
Spring oilseed rape	•	•	•	•	•	•	•	•	•	•	3
Winter oilseed rape	•	•	•	•	•	•	•	•	•	•	1
Linseed	•	•	•	•	•	•	•	•	•	•	1
Forage maize	•	•	•	•	•	•	•	•	•	•	4
Rootcrops for stockfeed	100	100	100	62	67	102	85	67	102	85	14
Leafy forage crops	100	100	100	51	108	50	65	108	50	65	13
Arable silage/other fodder crop	•	•	•	•	•	•	•	•	•	•	4
Peas - human consumption	•	•	•	•	•	•	•	•	•	•	1
Peas - animal consumption	•	•	•	•	•	•	•	•	•	•	0
Beans - animal consumption	•	•	•	•	•	•	•	•	•	•	0
Vegetables (brassicae)	•	•	•	•	•	•	•	•	•	•	1
Vegetables (other)	•	•	•	•	•	•	•	•	•	•	0
Soft fruit	•	•	•	•	•	•	•	•	•	•	0
Top fruit	•	•	•	•	•	•	•	•	•	•	0
Other tillage	•	•	•	•	•	•	•	•	•	•	0
All tillage	98	96	96	63	93	55	57	92	52	55	157
Grass under 5 years	99	91	93	66	150	44	61	149	40	57	85
Grass 5 years and over	83	77	72	45	124	32	40	103	25	29	225
All grass	86	79	75	49	129	35	45	110	27	34	310
All crops & grass	88	82	78	51	123	38	47	108	31	37	467

Source: British Survey of Fertiliser Practice 1999.



SECTION D

ANALYSIS OF SUPPLEMENTARY SURVEY INFORMATION

Introduction

General and supplementary information is collected for each farm holding that is surveyed, as well as details of fertiliser, lime and manure use on each field. The supplementary questions vary each year and tend to look specifically at a topic related to fertiliser use. In 1999, farmers were asked a number of questions about their use of soil and plant analysis and also the methods they use to decide on fertiliser application rates.

Soil sampling and analysis

Soil samples are taken for routine testing of topsoil pH and/or extractable nutrient status or, more occasionally, as depth samples (to 60 or 90cm) for soil mineral nitrogen and extractable sulphur analysis, to determine lime and/or fertiliser requirements. Samples are usually taken by either a lime or other (e.g. agricultural merchant) supplier, consultant or farm staff and, in 1999, soil sampling was undertaken on almost half (46%) of the farms surveyed (Table D1.1). Soil sampling was used most commonly on general cropping farms and least on cattle/sheep farms. The Survey had previously collected information on topsoil sampling and analysis for a number of years up to 1991. Data from 1986 to 1991 also showed that, on average, sampling was undertaken on half (52%; range: 48-55%) the farms surveyed each year, to test for pH and/or nutrient status.

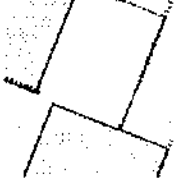
Table D1.1 Percentage (%) of farms using each sampler category in 1999

robust group row %	lime supplier	other supplier	consultant	farm staff	farms taking samples in 1999	number of farms
Cereals	21	15	23	11	58	261
General cropping	26	33	30	10	77	168
Horticulture	13	17	9	9	52	23
Pigs and poultry	.	.	.	.	.	7
Dairy	11	13	13	5	39	182
Cattle and sheep LFA	7	8	5	4	23	254
Cattle and sheep	10	7	6	4	25	126
Mixed	15	11	25	8	53	157
All farms	15	14	17	7	46	1178[12]

Note: more than one sampling method is used on some farms.

In 1999, lime/other suppliers and consultants were involved to a similar extent in soil sampling, with each category of sampler covering 14-17% of all farms, while farm staff were used to the least extent (7% of all farms) for sampling work. More than one type of sampling person was used on some farms. Individual farm types also showed a broadly similar distribution of sampler type except for mixed farms where proportionately more farms used a consultant for soil sampling.

[12] Analysis within the main body of the report uses information collected from 1211 farms. Unfortunately, of these, 33 were not received in time to be included in the analysis presented in this section.



Information on the type of sampler from the 1988 to 1990 Surveys, when grouped into equivalent categories to those used in 1999, showed that topsoil samples were, on average, taken by lime suppliers, other suppliers, consultants and farm staff on 15, 26, 13 and 5% of farms respectively (with 50% of all farms being sampled). In comparison, the results in 1999, compared to these earlier findings, indicate no change in the percentage of farms where the sampling was done by a lime supplier; slight increases in the consultant (+4%) and farm staff (+2% of farms) sampler categories; but a large drop (-12% of farms) in the 'other supplier' category. This shift is a reflection of the major changes that have occurred in the agricultural supply industry and fertiliser distribution during the 1990s. This observed decrease in 'other supplier' sampling can largely be accounted for by the increased use of consultants and farm staff combined with the 4% difference in the proportion of farms sampled in 1988-90 (50%) and 1999 (46%).

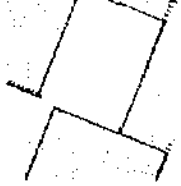
Table D1.2 Percentage (%) of farms taking soil samples for different analyses in 1999

robust group	topsoil samples			soil depth samples		number of
row %	pH	P K Mg	trace elements	N	S	farms
Cereals	55	47	16	6	5	261
General cropping	71	68	32	5	1	168
Horticulture	48	43	22	4	4	23
Pigs and poultry	.	.	.	.	.	7
Dairy	36	29	11	2	1	182
Cattle and sheep LFA	22	17	9	2	2	254
Cattle and sheep	23	19	10	0	0	126
Mixed	48	40	17	4	1	157
All farms	43	36	16	3	2	1178

Farmers who had soil samples taken during the 1998/99 season were also asked what the samples were analysed for (Table D1.2). Nearly half (43%) of all farms (i.e. including those farms where no soil sampling was undertaken), had topsoils tested for pH/lime requirement and about a third (36%) had topsoils analysed for extractable phosphorus (P), potassium (K) and magnesium (Mg). It is likely that most if not all soil samples which were analysed for major nutrient (PKMg) status would also have had laboratory analysis for pH. One sixth (16%) of farms had some form of trace element analysis on topsoil samples, but details were not collected on the range of trace elements tested. Each farm type group, where topsoil samples were taken, also showed the same order of pH>PKMg>trace element testing and in a similar ratio to that for the all farms grouping.

Survey results from 1986 to 1991 on topsoil testing showed that, on average, pH analysis was used on 45% of farms and nutrient analysis (PKMg and/or trace elements) on 42% of farms. The supplementary information obtained in the 1999 survey suggests very little or no change in general topsoil testing practice on farms in Britain over the last decade, except for the type of sampler who does the sampling.

Soil mineral nitrogen testing is a useful technique for the prediction of nitrogen fertiliser requirement in cropping situations where the available soil nitrogen supply is likely to be high, for example where manures are regularly applied or following ploughed out intensive grassland or some vegetable crops. These high fertility situations do not, however, occur very frequently and depth sampling for soil mineral nitrogen was carried out on only 3% of all farms in 1999 (Table D1.2). Depth samples can also be analysed for soil extractable sulphur, to help assess the risk of sulphur deficiency in susceptible crops, and



this approach was used on 2% of all farms. Soil depth sampling for nitrogen and/or sulphur was mainly used on arable and mixed, rather than livestock farms.

Farmers in the 1999 Survey were also asked how frequently they had their soils tested for pH and for extractable nutrient status (PKMg) (Table D1.3). On half (51%) of all farms, topsoil pH was tested every three to five years, while 15% of farms had soil pHs checked more frequently, after only one or two years. On 11% of farms, the frequency interval for pH testing was more than five years and a total of 19% of all farmers either never tested for pH, presumably because their soils were naturally calcareous and never required liming, or they did not know how frequently, if at all, testing had been done in the past. The arable, mixed, horticultural and dairy farm types showed a similar frequency distribution for pH testing, but the frequency on beef/sheep farms, which had the highest percentage of farms where testing was never done, was more evenly spread across the frequency intervals.

Table D1.3 Frequency of topsoil testing

Percentage (%) of farms using pH testing at different intervals

robust group	interval, years									
row %	1	2	3	4	5	6	>6	never	do not know	number of farms
Cereals	10	10	27	17	20	3	5	3	6	261
General cropping	13	10	32	22	17	4	1	2	2	168
Horticulture	4	9	22	13	26	0	4	13	9	23
Pigs and poultry	14	0	14	14	29	0	14	0	14	7
Dairy	9	10	26	10	15	3	10	7	9	182
Cattle and sheep LFA	6	4	8	5	14	3	15	20	24	254
Cattle and sheep	5	9	13	7	12	4	13	17	20	126
Mixed	11	8	24	24	16	2	4	3	8	157
All farms	9	8	21	14	16	3	8	9	12	1178

Percentage (%) of farms using P K and Mg testing at different intervals

robust group	interval, years									
row %	1	2	3	4	5	6	>6	never	do not know	number of farms
Cereals	6	7	26	16	25	3	5	4	8	261
General cropping	9	8	31	17	20	4	3	4	5	168
Horticulture	4	9	17	13	26	0	0	13	17	23
Pigs and poultry	14	0	14	14	14	0	14	29	0	7
Dairy	5	8	19	10	14	2	8	15	20	182
Cattle and sheep LFA	4	3	6	4	11	2	18	25	26	254
Cattle and sheep	3	8	12	6	8	4	10	22	27	126
Mixed	6	6	24	23	18	2	4	6	11	157
All farms	6	6	19	12	17	3	8	13	16	1178

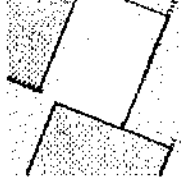


Table D1.3 Frequency of topsoil testing - continued

Percentage (%) of farms testing proportion of farm

robust group	% of farm tested						
row % of farms	0	1 to 20	21 to 40	41 to 60	61 to 80	>80	number of farms
Cereals	10	12	52	7	2	18	261
General cropping	4	9	69	6	1	11	168
Horticulture	30	9	30	4	0	26	23
Pigs and poultry	14	0	29	14	0	43	7
Dairy	17	18	43	10	2	10	182
Cattle and sheep LFA	42	33	18	3	0	4	254
Cattle and sheep	34	19	28	7	1	11	126
Mixed	10	17	46	11	1	15	157
All farms	20	19	42	7	1	12	1178

The trends in sampling frequency for PKMg analysis were very similar to those for pH testing, which is a further indication that most soil samples sent for laboratory PKMg testing are also tested for pH at the same time. Nearly a third (29%) of all farmers had either never tested topsoils for PKMg or did not know how often their soils had been analysed in the past, whereas the corresponding figure for pH testing was lower (21%). This may suggest that some farmers attach greater priority to preventing soil acidity than to checking soil nutrient status. These findings are in close agreement with data obtained on soil sampling frequency in recent manure surveys in the livestock (beef; dairy; pig; poultry) sectors.[13].

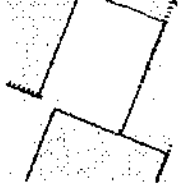
Table D1.3 shows that pH and PKMg testing is used at some stage on about 80 and 70% of all farms respectively. However, only 46% of farms actually used soil analysis in 1999, as recorded by Table D1.1.

Excluding those farms (20%) which did not use soil sampling, about half the farms (52%) had between 21 and 40% of the whole farm tested each time samples are taken (Table D1.3). A quarter (23%) had no more than 20% of the total area tested and the remainder had between 40% and the whole farm tested. If the frequency of sampling fields is once every three to five years on the majority of farms, and half these farms have about a third of the total area sampled each time, then some sampling would need to be done on a part of the farm either annually or biennially.

Plant testing

Farmers were also asked in 1999 about their use of plant tissue testing, either as an aid to predicting crop nutrient requirements or to diagnose a suspected deficiency problem (Table D1.4). Plant testing for nutrient status was used on 4% of all farms, with samples analysed both for major nutrients (NPKMgS) and trace elements to about the same extent. Plant testing was most frequently used on horticultural farms (13%, but the

[13] Anon (1997). *Animal Manure Practices in the Poultry Industry*. Survey Report to MAFF.
Anon (1997a). *Animal Manure Practices in the Pig Industry*. Survey Report to MAFF.
Anon (1998). *Animal Manure Practices in the Beef Industry*. Survey Report to MAFF.
Anon (1998a). *Animal Manure Practices in the Dairy Industry*. Survey Report to MAFF.



sample size was only 23 farms) and least used on livestock farms (0-2%). Most farmers reported that they had plant tissue testing done for both diagnostic and predictive reasons.

Plant testing according to crop type was greatest on top fruit (but based on a very small sample of only 10 farms), followed in decreasing order by vegetables, sugar beet and other major arable crops. However, no herbage analysis appeared to be carried out on grassland, despite the proven benefits of this technique as a decision tool for monitoring the effects of, and adjusting, fertiliser applications in grassland production. Herbage analysis is also a reliable guide to sulphur deficiency risk in intensively cut grassland. Apart from the lack of sulphur analysis on top fruit samples, as sulphur nutrition is not a problem in fruit crops, tissue samples taken from most crops were analysed for a range of both major nutrients and trace elements.

Table D1.4 Percentage (%) of farms taking crop tissue samples

By robust group

robust group	sample element					reason		number of
row %	N	P K	S	Mg	trace elements	diagnose	predict	farms
Cereals	6	6	10	7	8	7	4	261
General cropping	8	4	7	7	8	10	8	168
Horticulture	17	17	9	13	13	13	13	23
Pigs and poultry	.	.	.	.	.	.	.	7
Dairy	3	2	1	1	2	3	3	182
Cattle and sheep LFA	1	1	0	0	0	0	0	254
Cattle and sheep	1	1	1	2	1	2	0	126
Mixed	4	3	4	4	4	5	3	157
All farms	4	3	4	4	4	4	3	1178

By crop

crop	sample element					reason		number of
row %	N	P K	S	Mg	trace elements	diagnose	predict	farms
Cereals	3	2	3	3	3	3	3	758
Oilseed rape	1	2	4	2	2	3	2	294
Potatoes	3	2	3	3	4	3	3	162
Sugar beet	4	5	3	5	5	3	1	124
Vegetables	5	5	5	5	7	5	5	56
Top fruit	30	20	0	20	20	30	20	10
Grass	0	0	0	0	0	0	0	1014
All farms	4	3	4	4	4	4	3	1178

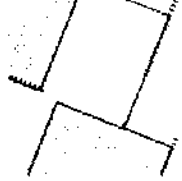


Table D1.5 Percentage (%) of farms using different methods to decide on fertiliser application rates

Nitrogen

robust group

row %	published table	computer system	advice	press/ trade info	own judgement	other	number of farms
Cereals	11	5	45	7	59	1	261
General cropping	11	3	56	4	66	1	168
Horticulture	13	0	35	0	61	0	23
Pigs and poultry	0	14	14	0	43	0	7
Dairy	8	1	30	5	81	0	182
Cattle & sheep LFA	2	0	15	2	82	0	254
Cattle & sheep	5	1	13	2	73	1	126
Mixed	6	2	48	7	65	3	157
All farms	7	2	34	4	71	1	1178

Phosphate, Potash and Magnesium

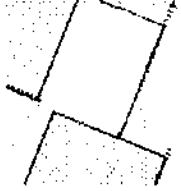
robust group

row %	published table	computer system	advice	press/ trade info	own judgement	other	number of farms
Cereals	10	4	48	6	55	1	261
General cropping	12	2	57	2	62	1	168
Horticulture	13	0	35	0	43	0	23
Pigs and poultry	0	14	14	0	29	0	7
Dairy	7	0	30	5	68	0	182
Cattle & sheep LFA	3	0	16	2	77	0	254
Cattle & sheep	6	1	13	2	60	0	126
Mixed	6	1	48	7	59	2	157
All farms	7	2	35	4	63	1	1178

Sulphur

robust group

row %	published table	computer system	advice	press/ trade info	own judgement	other	number of farms
Cereals	9	4	41	5	51	1	261
General cropping	10	2	51	2	54	1	168
Horticulture	13	0	30	0	43	0	23
Pigs and poultry	0	14	0	0	29	0	7
Dairy	5	0	25	5	57	0	182
Cattle & sheep LFA	2	0	12	1	69	0	254
Cattle & sheep	4	1	10	1	52	0	126
Mixed	3	1	38	8	52	2	157
All farms	6	1	29	3	56	1	1178



Estimating fertiliser application rates

Farmers were asked about the methods they used to decide on fertiliser application rates of nitrogen, phosphate, potash, magnesium and sulphur (Table D1.5). The extent to which each particular method was used, both for all farms and for each farm type, was similar for all the fertiliser nutrients. The majority (71%) of farmers used their own judgement, which would be based on their knowledge and experience of the soils and cropping potential on the farm. Advice, presumably obtained from a consultant or fertiliser supplier, was the second most common method, as used by a third (34%) of farmers. The other methods listed - published tables (7%), computerised recommendation systems (2%) or press/trade information (4% of farmers) - were only used to a small or very small extent. The relative use of these methods was the same for each farm type as for all farms, except for greater use of computer systems on pig and poultry farms. Consultant or supplier advice was used much less by livestock farmers, apart from dairy farmers, than by farmers with other types of farm.

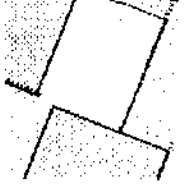
Over half (58-62%) of farmers using organic manures on their farms said that they reduced fertiliser nitrogen, phosphate and potash rates to allow for the available nutrient content in manure applications (Table D1.6). A third (37%) of farmers also claimed to reduce sulphur fertiliser inputs where they applied organic manures. However, a smaller proportion of livestock farmers, apart from dairy farmers, appeared to take account of the nutrient content of manures.

Table D1.6 Percentage (%) of farms applying organic manure and also reducing fertiliser applications to take account of the nutrient content of manures

robust group row %	N	P	K	S	farms applying manure
Cereals	65	57	57	38	127
General cropping	77	75	75	49	88
Horticulture	57	71	71	57	7
Pigs and poultry	43	43	43	29	7
Dairy	73	65	67	39	171
Cattle and sheep LFA	45	45	46	33	210
Cattle and sheep	49	44	45	23	113
Mixed	74	71	71	45	143
All farms	62	58	59	37	866

Organic manures were used on almost three quarters (74%) of farms in 1999. Very similar estimates were obtained from the supplementary information collected in the 1995 (69%) and 1997 (73% of farms) Surveys[14]. Farmers were also asked what method, if any, they used to estimate the available nutrient content of manures applied on their farm. At least one method was used on about two thirds (62%) of farms where manures were applied. For available nitrogen content, the farmer's own judgement was the most common method (65% of farms actually using some estimation method), followed by use of a published table (23%) and consultant/trade advice (18%). However, very limited use was made of either laboratory analysis (6%) or portable testing (2%) of manure samples. Similarly, only 2% of farmers who made some assessment of available nitrogen content used a

[14] Anon (1999). '*Report on the supplementary question on farm record keeping for fertiliser application*'. (Unpublished) British Survey of Fertiliser Practice 1997. Edinburgh University Data Library, Edinburgh.



computer-based system. The same general trends were obtained for each farm type group, except that horticultural and pig and poultry farmers made greater use of laboratory analysis instead of obtaining consultant/trade advice. The overall trends in the use of different methods for estimating available phosphate, potash and sulphur contents in manure applications were also broadly similar to those for nitrogen.

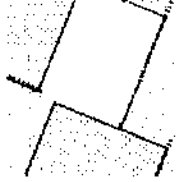
The recent manure surveys indicated that about a quarter (pigs/poultry) to a half (beef/dairy cows) of livestock farmers used some means of estimating the nitrogen, phosphate and potash content of manures and that the majority of farmers, particularly on beef and dairy units, made some adjustment in fertiliser nitrogen, phosphate and potash inputs to allow for the nutrient content of applied manures[15]. Supplementary information from the 1994 fertiliser Survey indicated that the majority of all farmers using manures said they made some allowance for the nutrient value of the applied manures[16]. Analysis of the Survey data to compare fertiliser application rates with or without manure application suggests that, in practice, some allowance is made for the nitrogen, but little for the phosphate and potash fertiliser value of manures applied to arable crops[17]. However, such broad comparisons take no account of other factors which may influence fertiliser requirement. An equivalent comparison for total grassland is misleading, as manure applications are more likely to be associated with intensive dairying, where large fertiliser inputs are needed for adequate forage production, than with less intensive beef and/or sheep farms.

---

[15] Anon (1997). *Animal Manure Practices in the Poultry Industry*. Survey Report to MAFF.
Anon (1997a). *Animal Manure Practices in the Pig Industry*. Survey Report to MAFF.
Anon (1998). *Animal Manure Practices in the Beef Industry*. Survey Report to MAFF.
Anon (1998a). *Animal Manure Practices in the Dairy Industry*. Survey Report to MAFF.

[16] Anon (1995). '*Use of organic manure*'. Supplementary report (Unpublished). British Survey of Fertiliser Practice 1994. Edinburgh University Data Library, Edinburgh.

[17] Chalmers, A G, Renwick, A, Johnston, A E and Dawson, C J (1999). '*Design, development and use of* a *national survey of fertiliser applications*'. Proceedings No. 437, The International Fertiliser Society, York. ISBN 0 85310 072 1.



APPENDIX

SAMPLING VARIATION

Table A1 Standard errors of application rates for the major crops in 1999

Great Britain

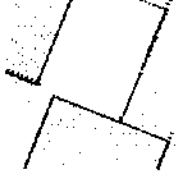
	standard error for overall application rate (kg/ha)					standard error for average field rates (kg/ha)					fields in sample
	total N	str t N	comp N	total P_2O_5	total K_2O	total N	str t N	comp N	total P_2O_5	total K_2O	
winter wheat	2.2	1.2	2.2	2.6	2.8	0.3	20.4	1.1	5.7	5.3	2013
oilseed rape	0.7	1.8	6.9	3.0	0.2	1.5	3.5	4.2	2.4	0.8	737
winter barley	1.6	4.2	0.2	0.3	0.6	1.8	1.8	0.8	0.4	0.3	675
spring barley	8.3	36.2	7.0	5.3	28.1	7.4	4.7	0.7	5.4	19.3	217
m/c potatoes	2.8	1.0	38.0	0.1	6.5	4.9	8.7	9.0	1.7	2.1	274
sugar beet	8.9	7.0	3.7	5.0	12.1	3.8	10.0	0.8	4.1	8.9	564
all tillage crops	3.8	3.4	1.9	0.6	1.7	1.5	8.3	0.0	2.9	3.5	6080
all grass	0.9	2.6	4.2	1.8	0.2	1.7	1.6	1.2	0.2	1.3	3536

England and Wales

	standard error for overall application rate (kg/ha)					standard error for average field rates (kg/ha)					fields in sample
	total N	str t N	comp N	total P_2O_5	total K_2O	total N	str t N	comp N	total P_2O_5	total K_2O	
winter wheat	2.3	0.6	6.6	3.7	3.0	0.2	0.3	0.1	6.6	5.6	1913
oilseed rape	2.1	2.7	3.3	1.3	1.6	3.8	2.1	1.8	0.9	3.4	447
winter barley	2.1	3.9	7.9	0.1	0.7	2.2	1.1	1.1	0.8	0.1	618
spring barley	7.0	40.3	10.0	4.2	26.4	12.6	12.0	0.6	11.4	27.2	179
m/c potatoes	2.8	1.0	38.0	0.1	6.5	4.9	4.2	9.0	1.7	2.1	274
sugar beet	9.0	6.8	0.0	4.2	11.6	3.2	0.2	3.4	2.7	7.6	506
all tillage crops	4.8	4.6	1.6	1.4	1.9	2.5	1.3	1.2	3.9	4.2	5341
all grass	1.7	0.2	2.6	2.1	0.4	3.1	3.0	0.1	0.2	2.1	2999

Scotland

	standard error for overall application rate (kg/ha)					standard error for average field rates (kg/ha)					fields in sample
	total N	str t N	comp N	total P_2O_5	total K_2O	total N	str t N	comp N	total P_2O_5	total K_2O	
winter wheat	2.4	15.8	37.8	12.6	0.7	2.4	25.9	28.3	21.6	9.2	100
oilseed rape	1.5	2.4	8.8	4.7	1.7	1.4	11.8	10.4	6.0	3.2	290
winter barley	0.2	8.1	38.5	0.9	1.2	0.2	24.5	24.7	0.7	0.5	57
spring barley	17.7	15.8	12.0	14.6	43.6	15.3	10.9	4.4	16.4	5.8	38
m/c potatoes	7.7	9.1	16.3	13.8	17.1	16.4	39.1	22.7	15.4	18.7	58
all tillage crops	2.3	1.7	10.9	3.9	0.6	5.8	8.3	14.1	7.9	3.9	739
all grass	3.9	18.9	12.2	0.2	3.3	7.5	3.4	10.8	0.6	3.7	537



ESTIMATING THE STANDARD ERROR

The standard errors quoted in Table A1 are derived using replication. The simplest method of replication is to select two half-samples, each using exactly the same sampling scheme. The survey estimates are computed twice, once for each half sample. Calculation of the standard error is based on the difference between the values obtained in each half sample. This approach has the advantage that it takes account of the gain in reliability from the implicit stratification in the systematic selection (from the geographically ordered list). It is also computationally simple and applicable to a wide variety of survey statistics. In 1999 there were four replicates for England and Wales; in Scotland there were two, these being systematically subdivided post survey.

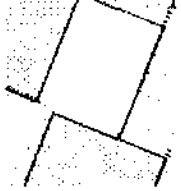
An alternative approach to estimation of overall rates

Table A2 Re-estimation of overall total fertiliser use (kg/ha), Great Britain 1999

		straight nitrogen	compound nitrogen	total nitrogen	total phosphate	total potash
all tillage		121	21	141	45	57
	revised estimate	122	22	143	48	59
all grass		52	58	110	20	28
	revised estimate	55	59	115	22	29
all crops & grass		85	40	125	32	42
	revised estimate	85	43	127	33	42

It is in the nature of random sampling that the characteristics of each achieved sample will differ in several respects from one another, and from the underlying population. In particular, the proportion of different crops grown will differ in the achieved sample from that in the population. The method of adjustment used here in these alternative estimates attempts to counter this by 'post-stratifying' or 'weighting' by the distribution of area of the major crops reported to the Agricultural Census (June 1999).

In general, the adjusted estimates shown in Table A2 are very close to those reported in Section, B although they do moderate the estimate of the overall rates of total nitrogen on *'all tillage'* and *'all grass'*.



RESPONSE RATE

Table A3 summarises information regarding the response received to the main and reserve samples.

Table A3 Response to main and reserve samples

	1999
Issued from main sample	1474
Non-response (including 3 invalid[1])	500
Response to main sample	974
Issued from reserve sample	425
Non-response (including 1 invalid[1])	188
Response to reserve sample	237
Achieved sample response	1211

[1] Farms found not to conform to survey specifications are classified as invalid.

Net response rate	1995 %	1996 %	1997 %	1998 %	1999 %
Overall achieved rate	81	79	66	64	64
Refusal rate	14	16	26	26	22
Non-contact rate	4	8	5	10	14

Net response by sample	1995 %	1996 %	1997 %	1998 %	1999 %
Main sample	84	82	69	69	66
Reserve sample	67	76	55	47	56

Main reasons for refusal	1995 %	1996 %	1997 %	1998 %	1999 %
Too busy	28	42	28	38	35
Not interested	29	21	32	32	26
Do not do surveys	15	6	4	10	10
Want payment	5	3	2	4	2
Too much paperwork (IACS)	6	14	2	3	1
Other	17	14	32	13	26