

PESTICIDE USAGE SURVEY REPORT 255

GRASSLAND & FODDER CROPS IN THE UNITED KINGDOM

2013



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DATA USES

The data are used for a number of purposes including:

- Informing the pesticide risk assessment (authorisation) process;
- Policy, including assessing the economic and/or environmental implications of the introduction of new active substances and the withdrawal/non-authorisation of pesticide products (the data reported to organisations such as the OECD and EU enabling the UK to honour international agreements); evaluating changes in growing methods and Integrated Pest Management where this has an impact on pesticide usage;
- Informing the targeting of monitoring programmes for residues in food and the environment;
- Contributing to assessing the impact of pesticide use, principally as part of the Pesticides Forum's Annual Report;
- Quantifying pesticide usage and changes in the use of active substances over time;
- Responding to enquiries (for example, Parliamentary Questions, correspondence, queries under the Freedom of Information Act or Environmental Information Regulations, etc.);
- Providing information to assist research projects which can support all of the above activities;
- Training/teaching programmes which are designed to improve practice in the use of pesticides by the farming/training industries;
- Informing the Wildlife Incident Investigation Scheme (WIIS) programme to help identify potential misuse of pesticides.

REVISIONS POLICY

The figures presented in this report are finalised. We will provide information on any revisions we make to the report or the datasets if any inaccuracies or errors occur. Details of any revisions, including the date upon which they were changed, will appear on the following website:

<http://www.fera.defra.gov.uk/landUseSustainability/surveys>.

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EXECUTIVE SUMMARY

Information is given concerning maize; turnips & swedes; fodder beet & mangolds; kale, cabbage & rape; other crops for stock feeding; and stubble turnips & catch crops as well as different grassland types including newly sown leys (direct sown and undersown crops); grassland less than five years old; permanent pasture; and rough grazing.

Data on pesticide usage on these crops were collected from 10,330 examples (fields) grown on 688 holdings growing fodder crops throughout the United Kingdom and from 842 holdings returning either a grassland postal questionnaire (329 holdings), grassland data collected by personal visit (230 holdings) or grassland pesticide usage data collected as part of the British Survey of Fertiliser Practice (BSFP) (283 holdings). Additional data on grassland was collected alongside the visits to 630 of the fodder holdings. The sample accounted for 8% of the total fodder crop area and for 2% of the area of grassland grown in the United Kingdom in 2013.

Permanent pasture, including rough grazing, accounted for 85% of the total area of crops grown in the survey, grassland less than five years old for 12% and all fodder crops 3%. Maize was the major fodder crop grown, comprising 66% of the total area of fodder crops, with other crops for stock feeding, fodder beet & mangolds and stubble turnips & catch crops accounting for a further 15%, 7% and 5% respectively. 31% of the total area of fodder crops was grown in South West region, 12% in West Midlands, 12% in London & South East region, 10% in Wales, 8% in North West region, 7% in Scotland, 6% in East Midlands region, 6% in Yorkshire & the Humber region, 5% in Eastern region, 2% in Northern Ireland and one percent in North East region.

The usage of pesticides more closely reflected the area of fodder crops alone rather than the area of fodder and grassland crops combined, indicating the minimal use of pesticides on grassland. For example Scotland, with 39% of the total area of grassland and fodder crops, accounted for only 8% of the total treated area. However, South West region, growing 11% of all grassland and fodder crops, accounted for 28% of the total treated area. Similarly, West Midlands region, with 5% of the total area of fodder crops grown, accounted for 10% of the total treated area. The relatively high usage of herbicides in the West Midlands reflects, in part, the use of repeat low dose herbicides on fodder beet, with 21% of the United Kingdom area of this crop grown in this region.

The use of fungicides on grassland & fodder crops accounted for 4% of the total area treated, with undersown new leys and other crops for stock feeding (which includes cereals grown for whole crop silage) accounting for 82% of all usage. For both crop groups fungicide usage would have been targeted to control diseases within cereal crops, either those being grown as a nurse crop to an undersown new ley or to those being grown for whole crop silage.

Herbicides accounted for 72% of the total pesticide-treated area of grassland and fodder crops grown in the United Kingdom in 2013, seed treatments 21%, fungicides 4%, insecticides 2%, growth regulators 1% and molluscicides and sulphur less than one percent each. In terms of weight of active substances applied, herbicides accounted for 92%, seed treatments 4%, fungicides 2%, insecticides 2%, growth regulators one percent and molluscicides and sulphur less than one percent each.

The area of fodder crops grown in 2013 increased by 10% compared with 2009, and 35% compared with 2005. There were corresponding increases in the pesticide-treated area of 12% since 2009, and 35% since 2005. By contrast the weight of pesticides applied increased by 17% since 2009 but decreased by 8% since 2005. The discrepancy between the increases in area treated and weight applied are largely due to the increased area of maize, a 20% increase since 2009, with resultant increases in the use of herbicides such as terbuthylazine and fluroxypyr which are applied at comparatively low rates. An increased use of maize, particularly in Eastern, East Midlands, South West and London & the South East regions for anaerobic digestion, has contributed towards the overall increase in the maize area.

There was a 4% decrease in the area of grassland in the United Kingdom compared with 2009, and a 1% decrease since 2005. There was an 18% decrease in the pesticide-treated area between 2009 and 2013 but a 23% decrease since 2005. There were decreases in the use of the major pesticide groups, including herbicides, fungicides and insecticides, possibly reflecting the wet weather conditions of autumn 2012 and spring of 2013. The wet weather certainly prevented the drilling of direct sown new leys in autumn 2012, with potential reductions in the use of herbicides and insecticides to establish these crops. The spring of 2013 was cold which would also have delayed crop planting and restricted disease development and therefore resulted in reductions in fungicide treatments.

INTRODUCTION

The Advisory Committee on Pesticides advises government on all aspects of pesticide use. In order to discharge this function, the Committee must regularly monitor the usage of all pesticides. It needs accurate data on the usage of individual pesticides. Pesticide usage data are now also required under the EU Statistics Regulation (1185/2009/EC).

As part of the on-going process for obtaining data, the Pesticide Usage Survey Teams of the Food & Environment Research Agency, an executive agency of the Department for Environment, Food & Rural Affairs; Science & Advice for Scottish Agriculture, a division of the Scottish Government's Agriculture, Food and Rural Communities Directorate and the Agri-Food & Biosciences Institute, a Non-Departmental Public Body of DARD, conducted surveys of pesticide usage on grassland and fodder crops in 2012/13 by visiting holdings throughout the United Kingdom during the winter of 2013/14. Supplementary surveys of grassland holdings were also obtained as part of the British Survey of Fertiliser Practice (BSFP) in England & Wales and postal surveys in both Scotland and Northern Ireland. The data in these supplementary surveys have been used to complement data on grassland collected during visits to fodder holdings and increase the overall representativeness of the grassland data.

Since 2010 all surveys of pesticide usage in agriculture and horticulture have been fully co-ordinated by the survey teams of England & Wales, Scotland and Northern Ireland. The methodology used for sample selection and the collection of data from sample holdings is identical in each region. Reports are produced of pesticide usage throughout the United Kingdom. Whilst the teams in England and Northern Ireland have recently completed United Kingdom Statistics Authority (UKSA) audits, the team in Scotland is currently undertaking its first audit. However, the data published by the team in Scotland are part of the official statistics for Scotland.

This was the first survey of pesticide usage on grassland & fodder crops in the United Kingdom. The previous report for Great Britain covered pesticide usage in 2009 (Garthwaite *et.al.* 2010); for Scotland in 2009 (Reay, 2010); and for Northern Ireland pesticide usage in 2009 (Withers *et.al.* 2010).

Additional data on crop agronomy are collected for all surveys but may not be presented within the report. For additional data relating to the surveys please refer to the contacts below.

Information on all aspects of pesticide usage in the United Kingdom as a whole, or for Wales or the Defra regions of England, may be obtained from the Pesticide Usage Survey Team at the Food & Environment Research Agency, Sand Hutton, York, UK YO41 1LZ.

For further information please contact:

Pesticide Usage Survey Team – e-mail: PUS@fera.gsi.gov.uk

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Or visit the websites: <http://www.fera.defra.gov.uk/landUseSustainability/surveys/>

<http://pusstats.fera.defra.gov.uk/>

Alternatively please contact: FERA at: science@fera.gsi.gov.uk

Further data relating specifically to Scotland may be obtained from the Pesticide Usage Survey Team at Science and Advice for Scottish Agriculture, Edinburgh. Also available at:

<http://www.sasa.gov.uk/pesticides/pesticide-usage/pesticide-usage-survey-reports>

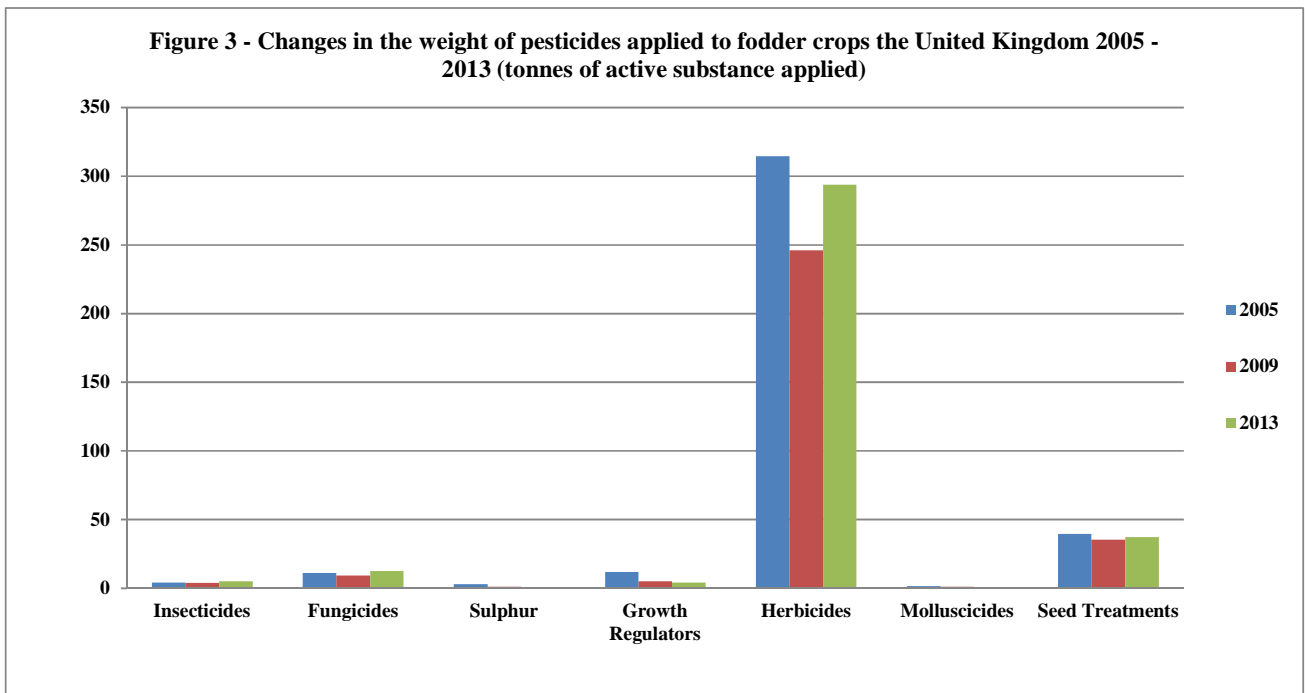
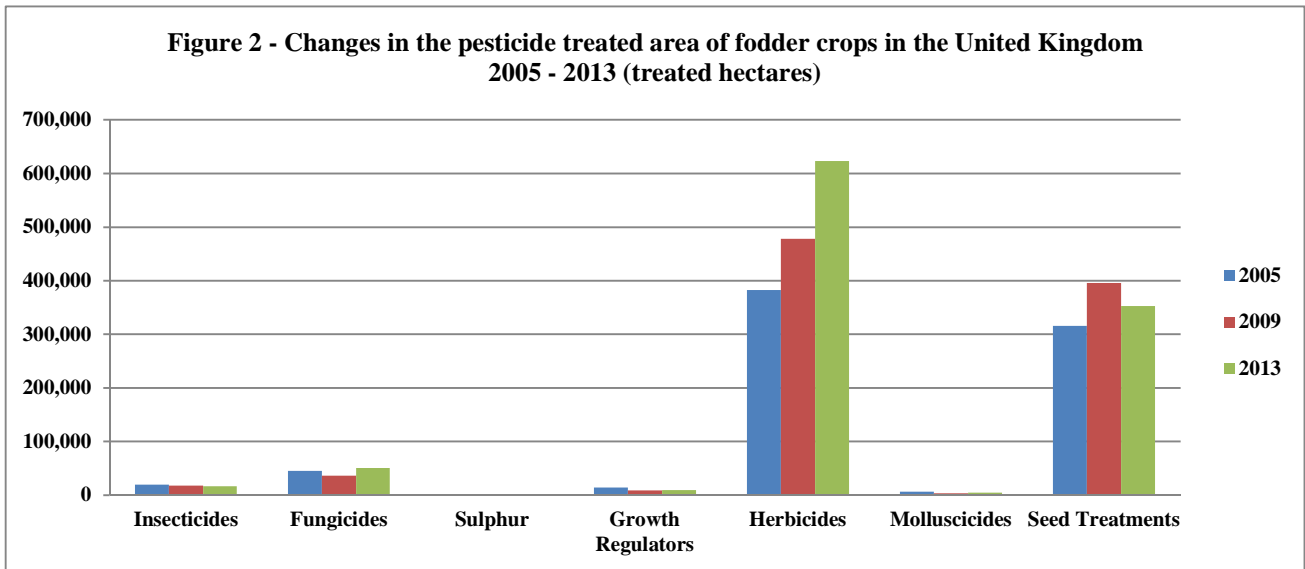
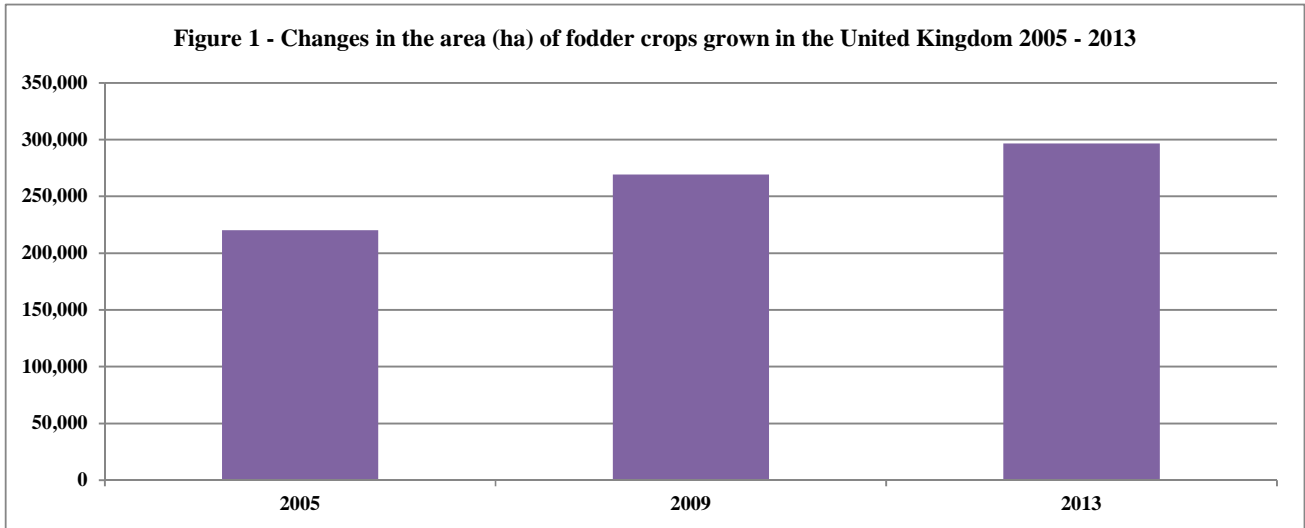
Copies of reports on pesticide usage in Northern Ireland may be obtained from Her Majesty's Stationery Offices. Also available at:

<http://www.afbini.gov.uk/index/services/specialist-advice/pesticide-usage-overview.htm>

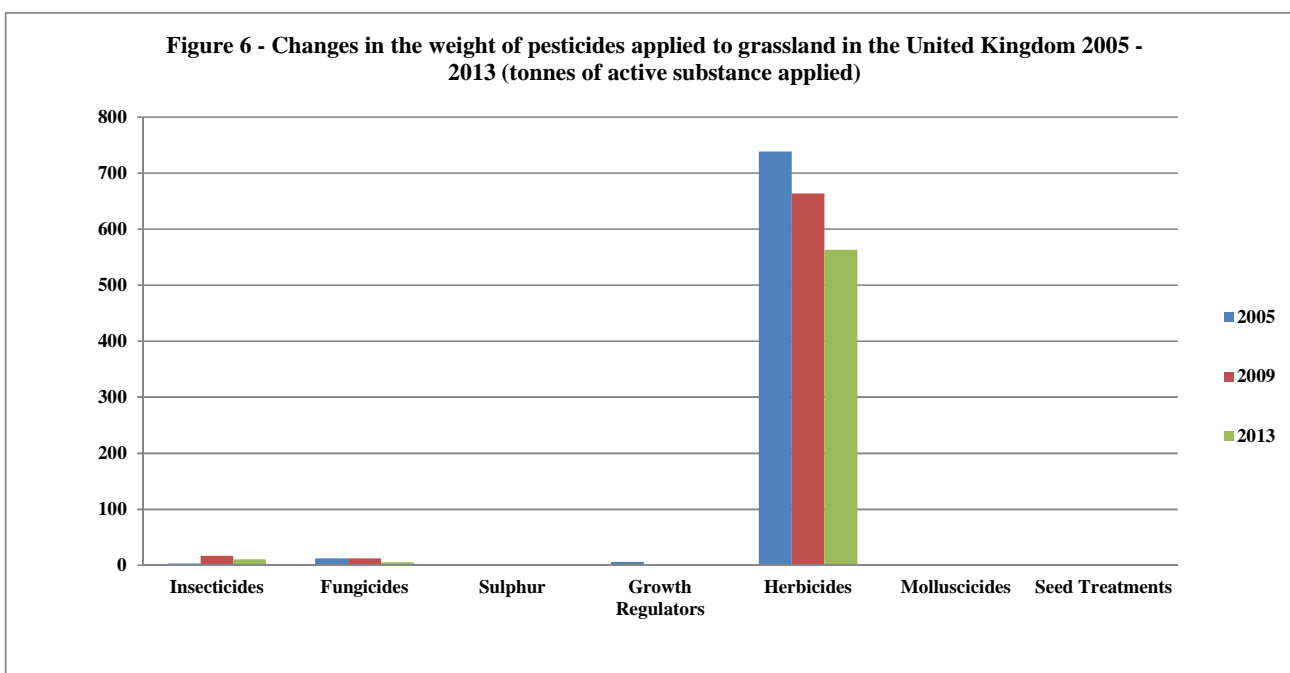
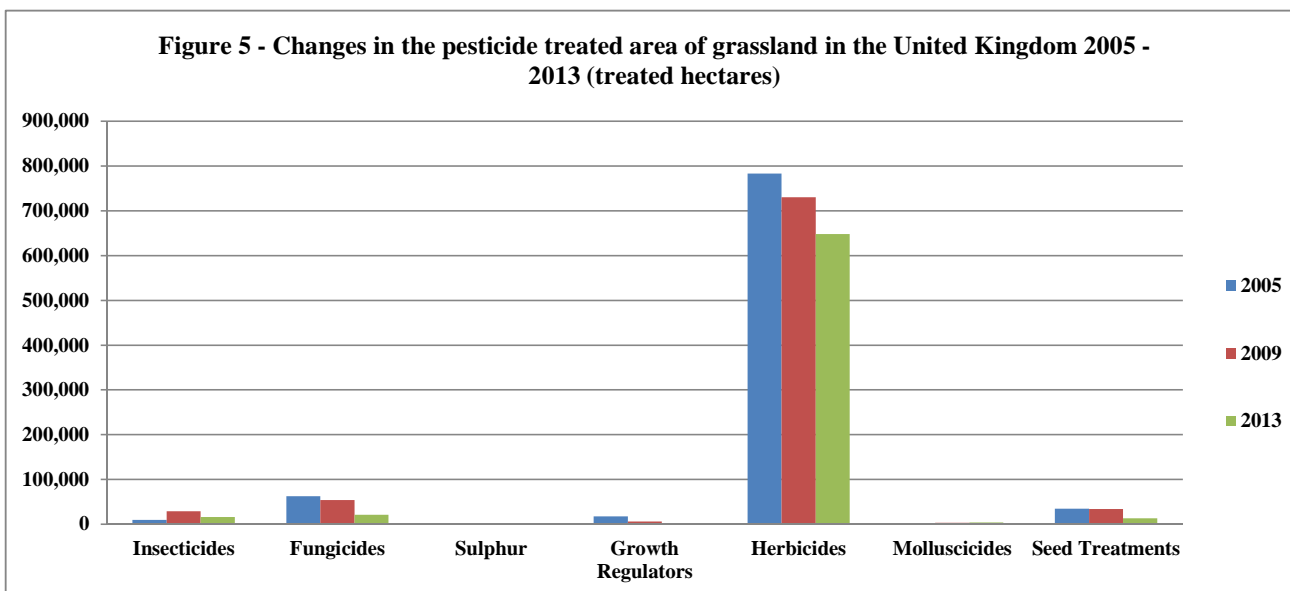
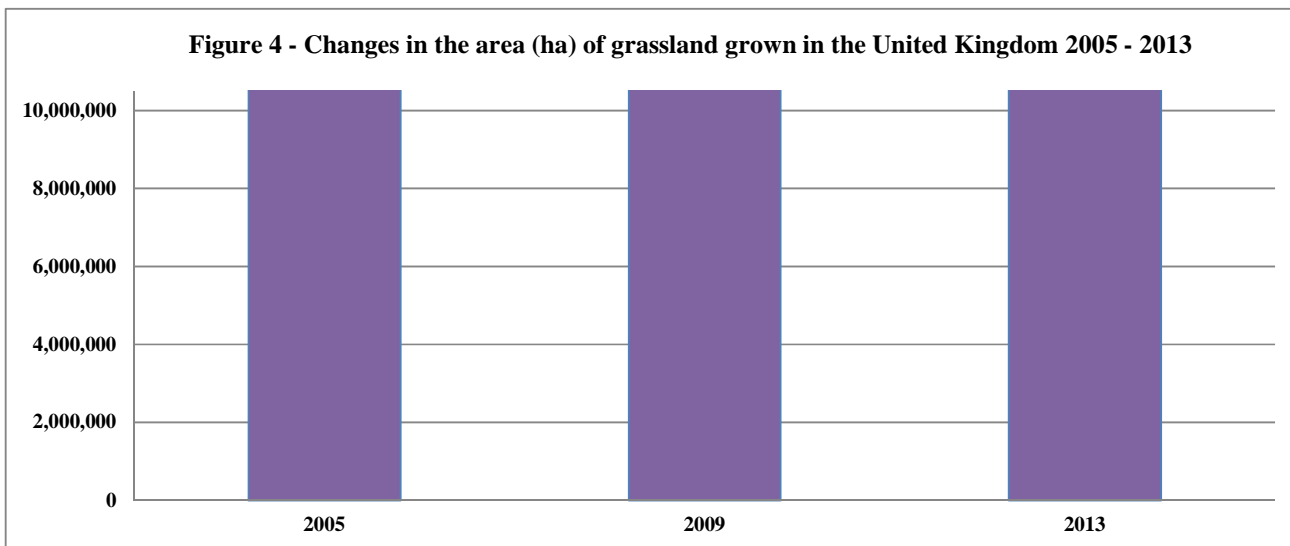
Recently-published reports for the United Kingdom, Great Britain, England & Wales and Northern Ireland can also be viewed and downloaded on the Internet at:

<http://www.fera.defra.gov.uk/landUseSustainability/surveys/>

TRENDS – FODDER CROPS



TRENDS – GRASSLAND



CROPS

Information is given concerning maize; turnips & swedes; fodder beet & mangolds; kale, cabbage & rape; other crops for stock feeding; and stubble turnips & catch crops as well as different grassland types including newly sown leys (direct sown and undersown crops); grassland less than five years old; permanent pasture; and rough grazing. Data on pesticide usage on these were collected from 10,330 examples (fields) grown on 688 holdings growing fodder crops throughout the United Kingdom and from 842 holdings returning either a grassland postal questionnaire, grassland data collected by personal visit or grassland pesticide usage data collected as part of the British Survey of Fertiliser Practice (BSFP). The sample accounted for 8% of the total fodder crop area and for 2% of the area of grassland grown in the United Kingdom in 2013.

Figure 7 - Regional distribution of fodder crops in the United Kingdom - 2013 (area grown)

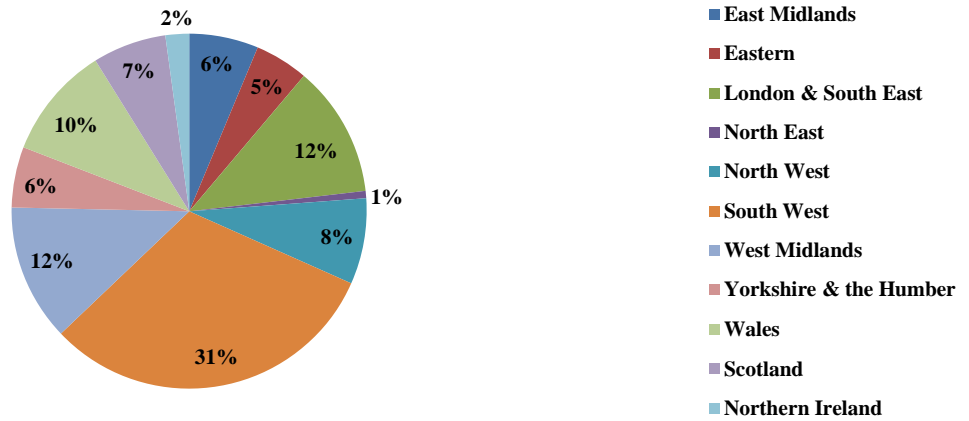
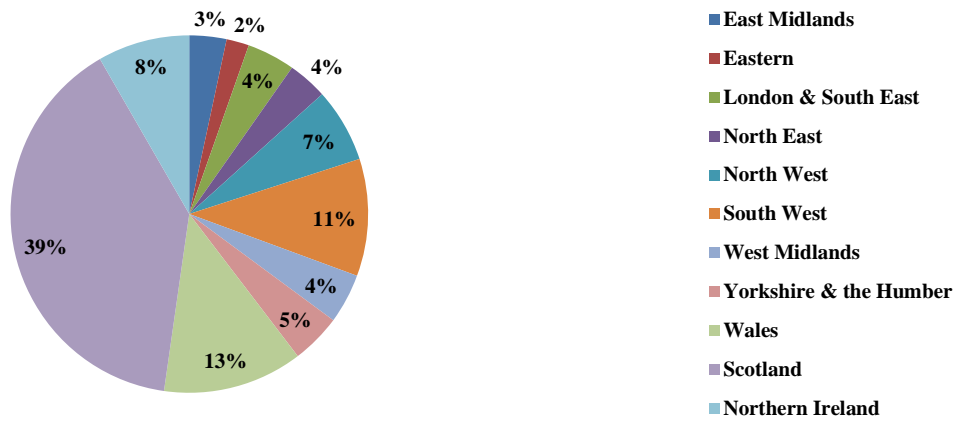
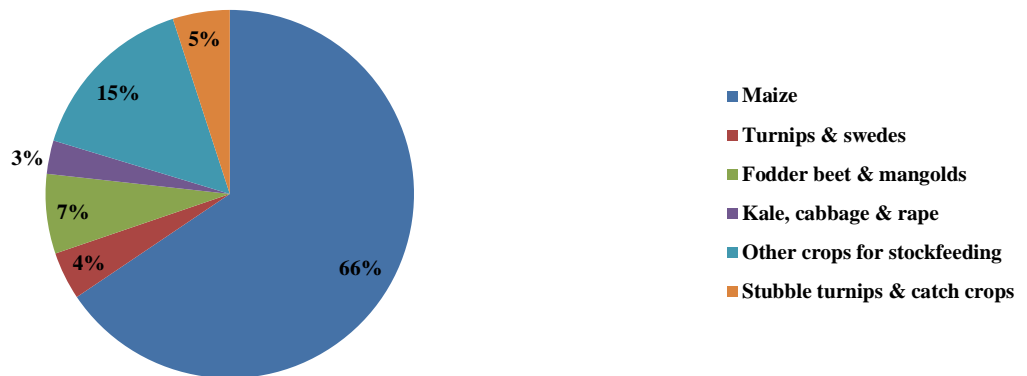


Figure 8 - Regional distribution of grassland in the United Kingdom - 2013 (area grown)

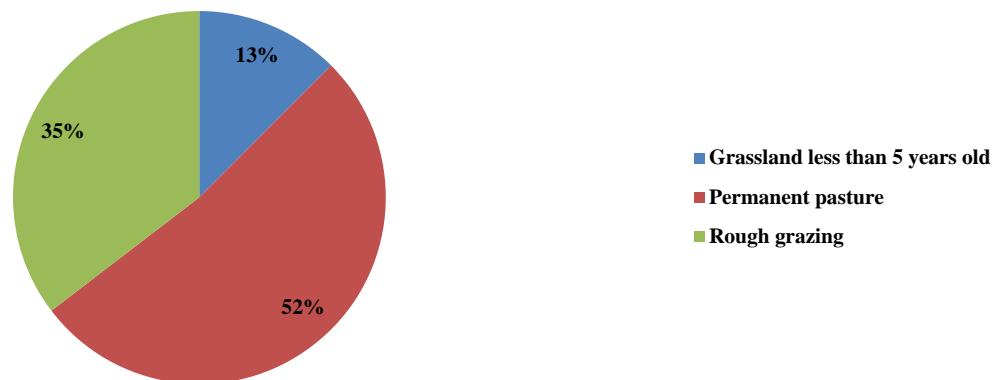


CROPS (continued)

**Figure 9 - Relative importance of fodder crops in the United Kingdom - 2013
(area grown)**

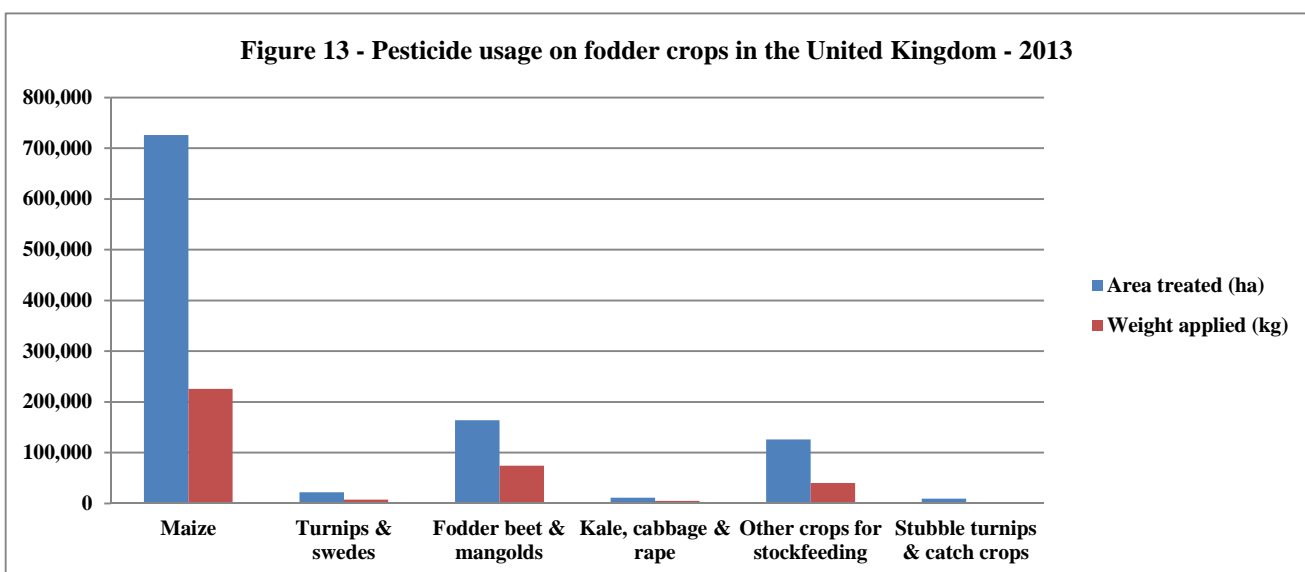
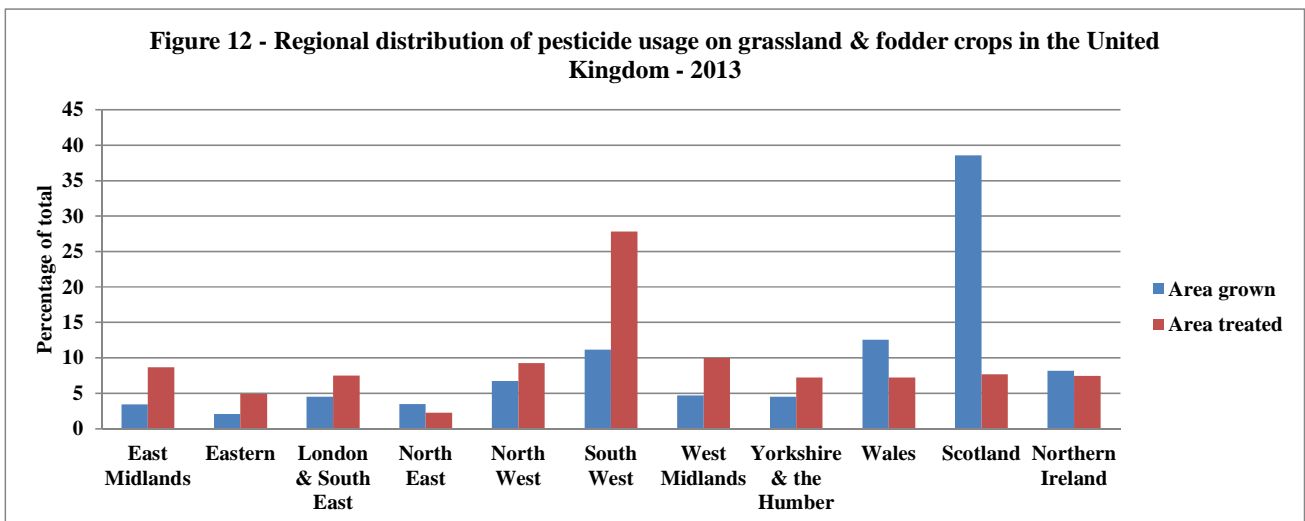
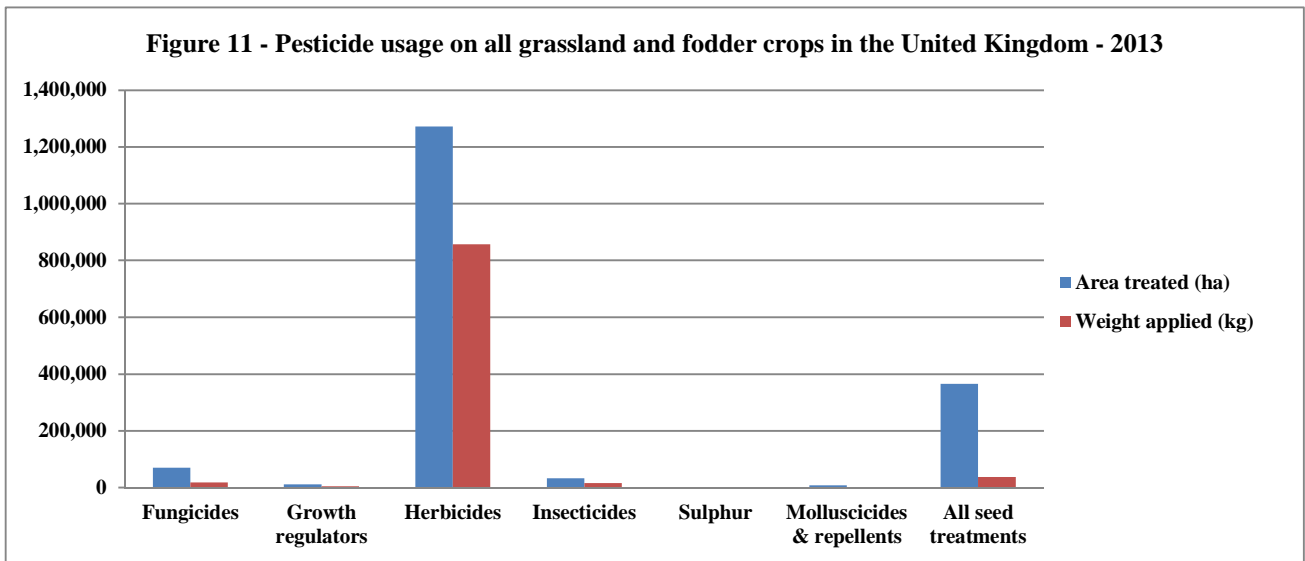


**Figure 10 - Relative importance of grassland crops in the United Kingdom - 2013
(area grown)¹**

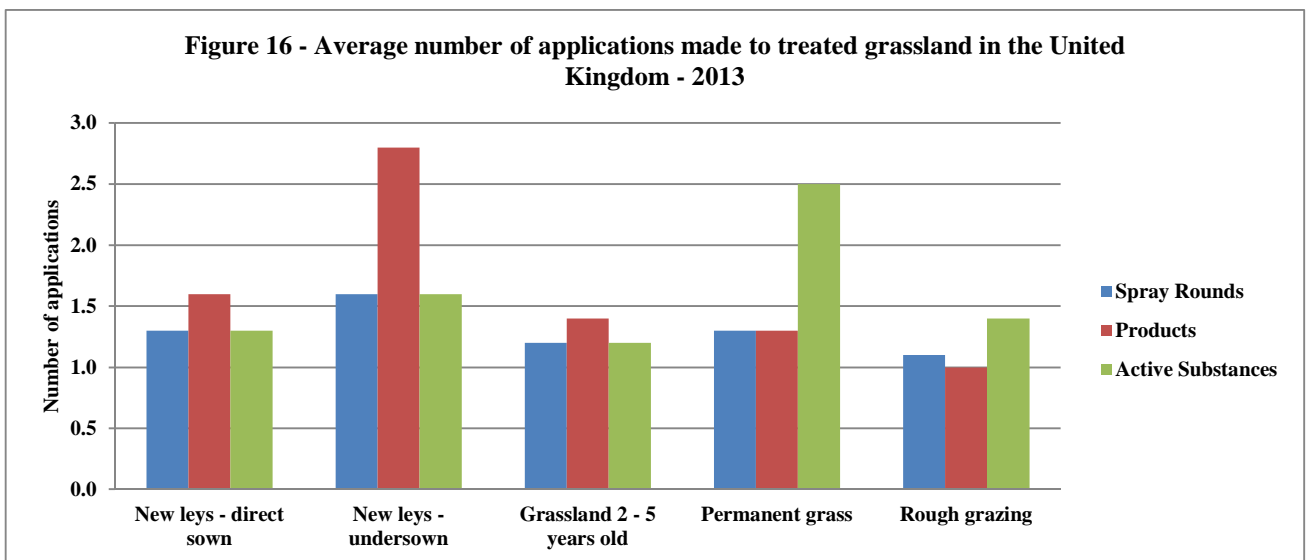
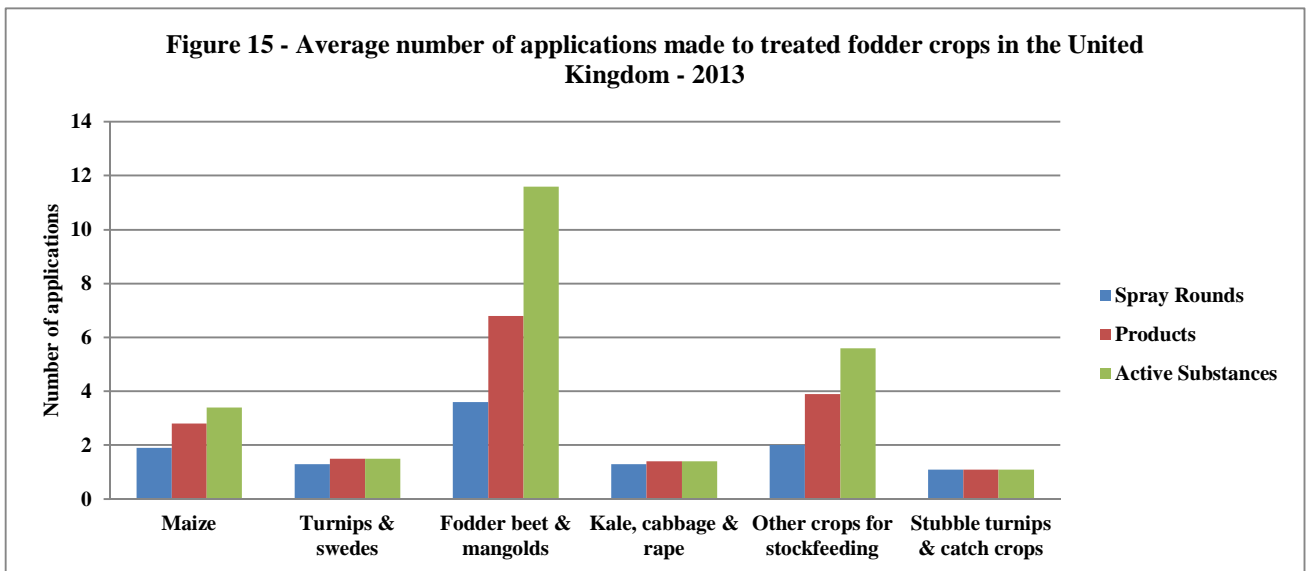
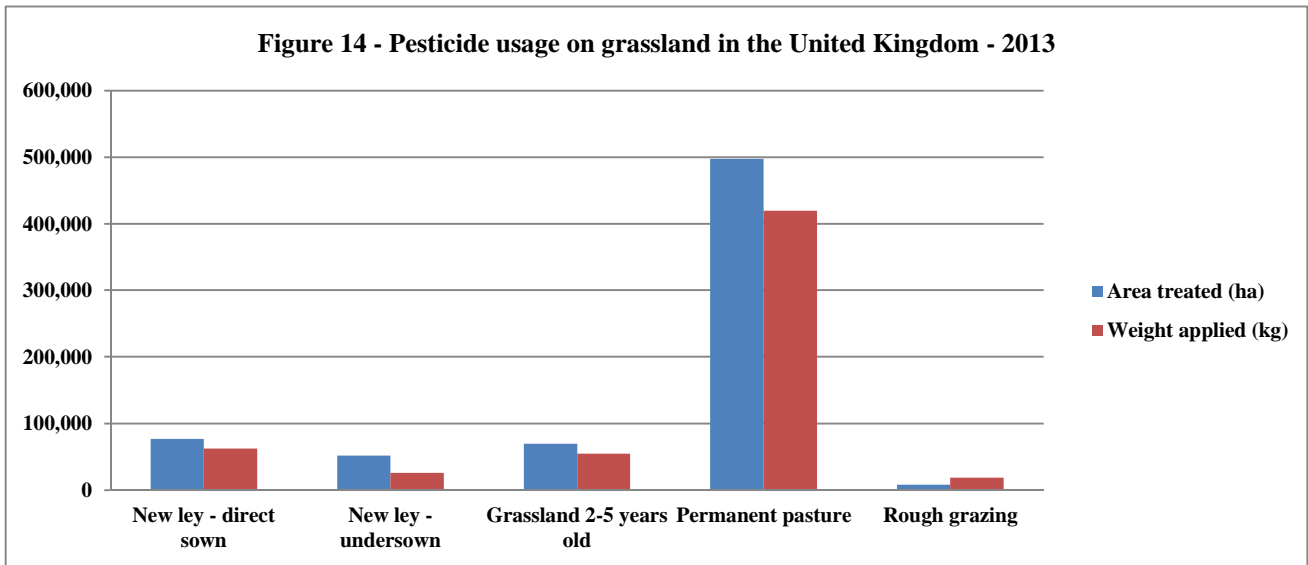


¹Grassland less than 5 years old includes established grass leys between 2 and 5 years old and direct and undersown new leys.

PESTICIDE USAGE



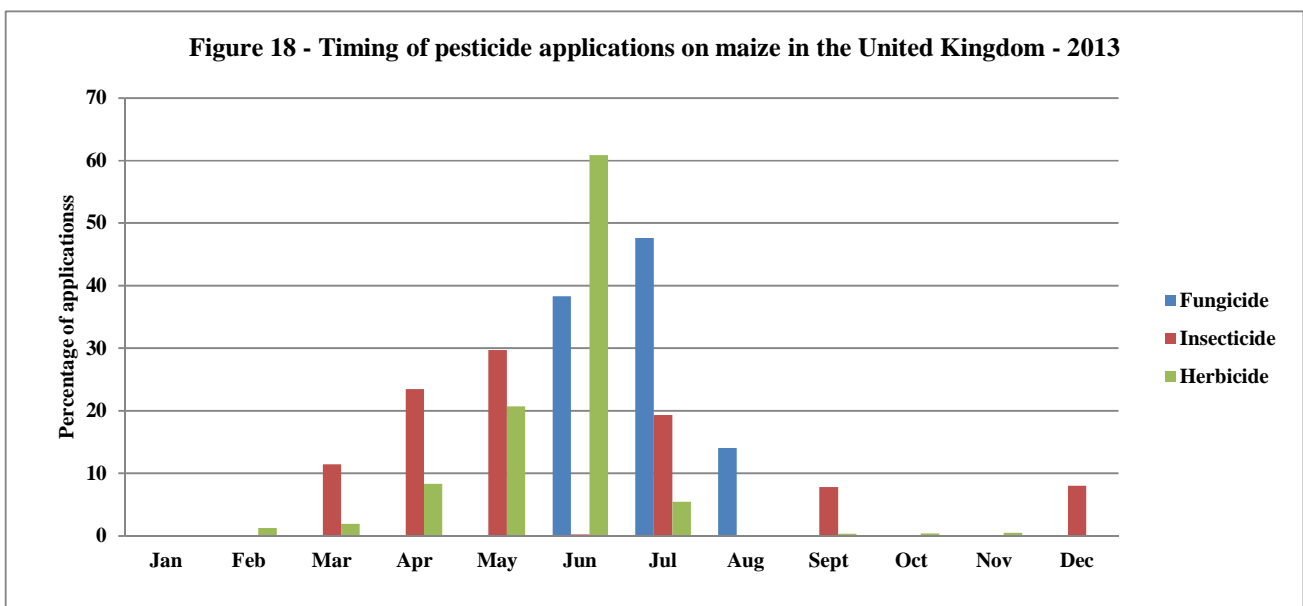
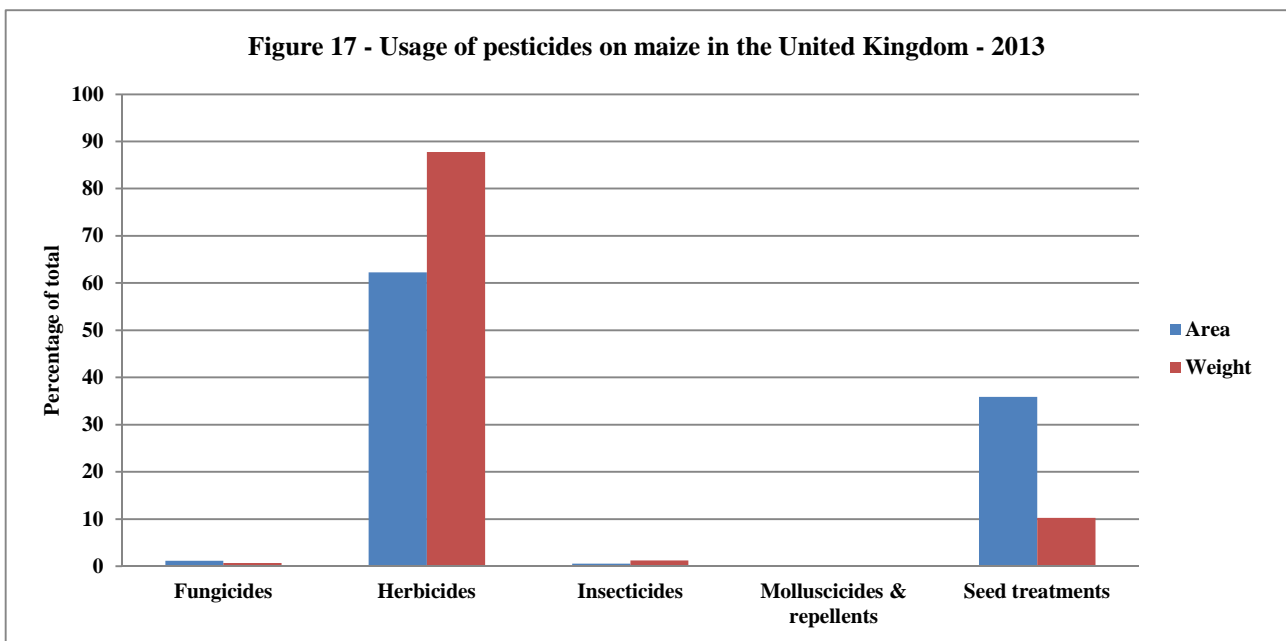
PESTICIDE USAGE (continued)



PESTICIDE USAGE ON FODDER CROPS

MAIZE

- 194,476 hectares of maize grown in the United Kingdom
- 726,035 treated hectares
- 225.83 tonnes of active substances applied
- 1% maize remained untreated
- Where treated, maize received an average of 2 sprays with 3 products and 3 active substances
- Maize grown for forage accounted for 88% of the total area grown, anaerobic digestion 10%, grain maize 2% and game cover less than one percent

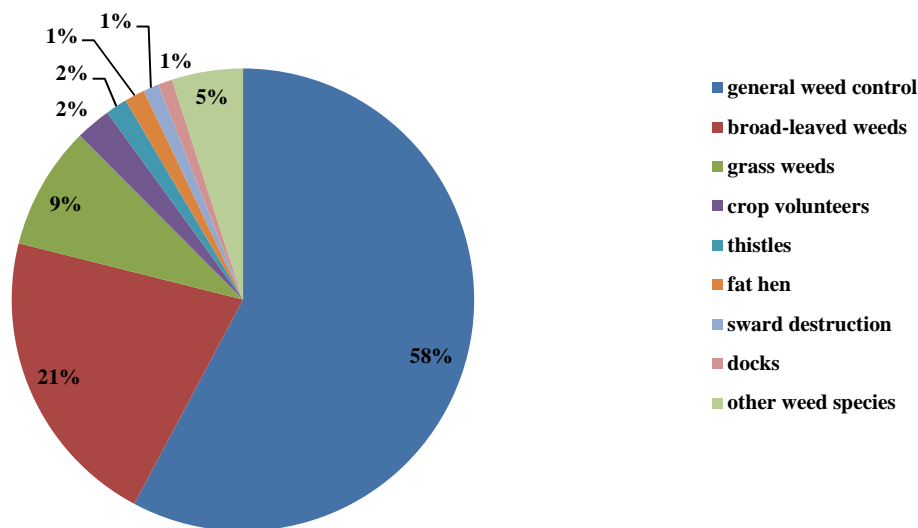


Maize – Herbicides

- **Formulation area treated: 452,250 hectares**
- **Weight of active substances applied: 198.26 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of herbicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Nicosulfuron	113,663	3,775	0.25	0.57	1.01	0.75
Mesotrione	79,644	6,654	0.18	0.40	1.03	0.56
Mesotrione/terbuthylazine	65,463	26,713	0.14	0.33	1.03	0.68
Glyphosate	51,777	51,265	0.11	0.25	1.02	0.55
Pendimethalin	49,084	61,364	0.11	0.25	1.02	0.84

Figure 19 - Maize - reasons for use of herbicides (where given)



Maize – Fungicides

- **Formulation area treated: 8,242 hectares**
- **Weight of active substances applied: 1.59 tonnes**
- **The only formulations encountered were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of fungicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Pyraclostrobin	5,672	1,162	0.69	0.03	1.00	0.82
Flusilazole	2,570	431	0.31	0.01	1.00	1.07

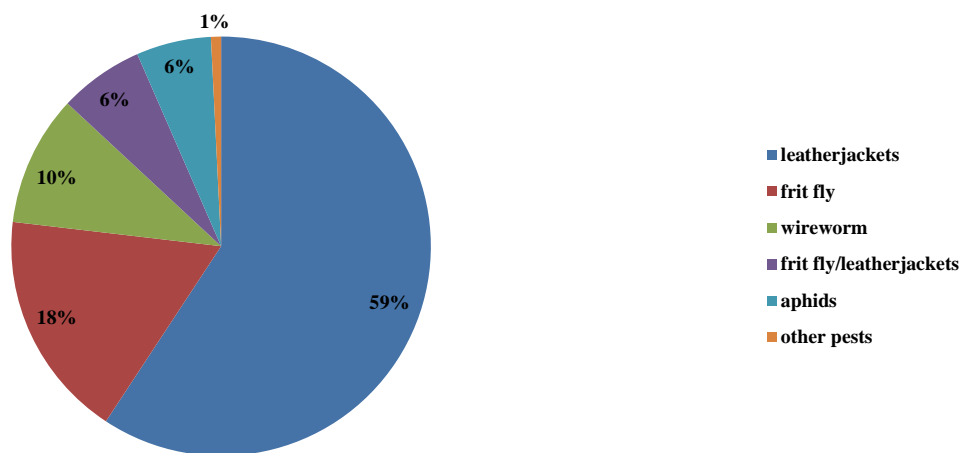
The only reason specified for disease control on maize was eyespot.

Maize – Insecticides

- **Formulation area treated: 4,154 hectares**
- **Weight of active substances applied: 2.75 tonnes**
- **The only formulations encountered were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of insecticide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Chlorpyrifos	3,911	2,733	0.94	0.02	1.00	0.94
Lambda-cyhalothrin	121	1	0.03	<0.01	1.00	0.67
Pirimicarb	121	17	0.03	<0.01	1.00	1.00

Figure 20 - Maize - reasons for use of insecticides (where given)



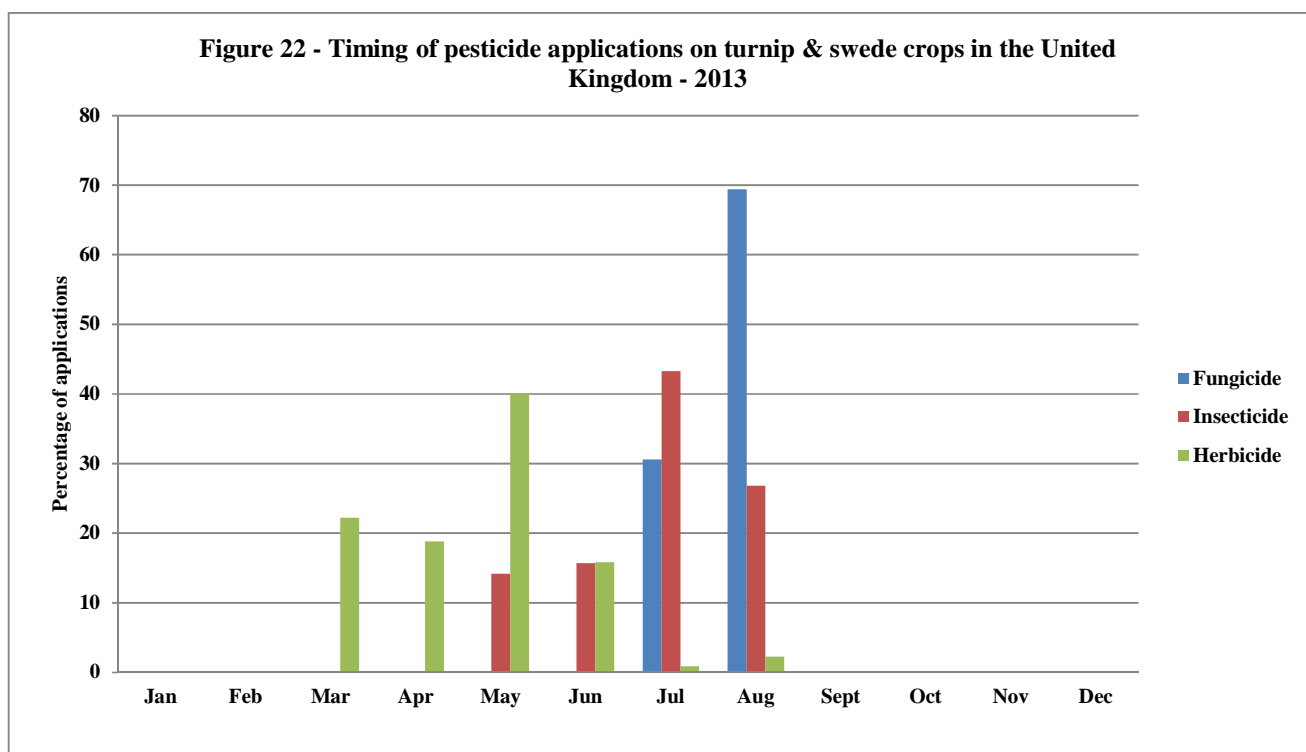
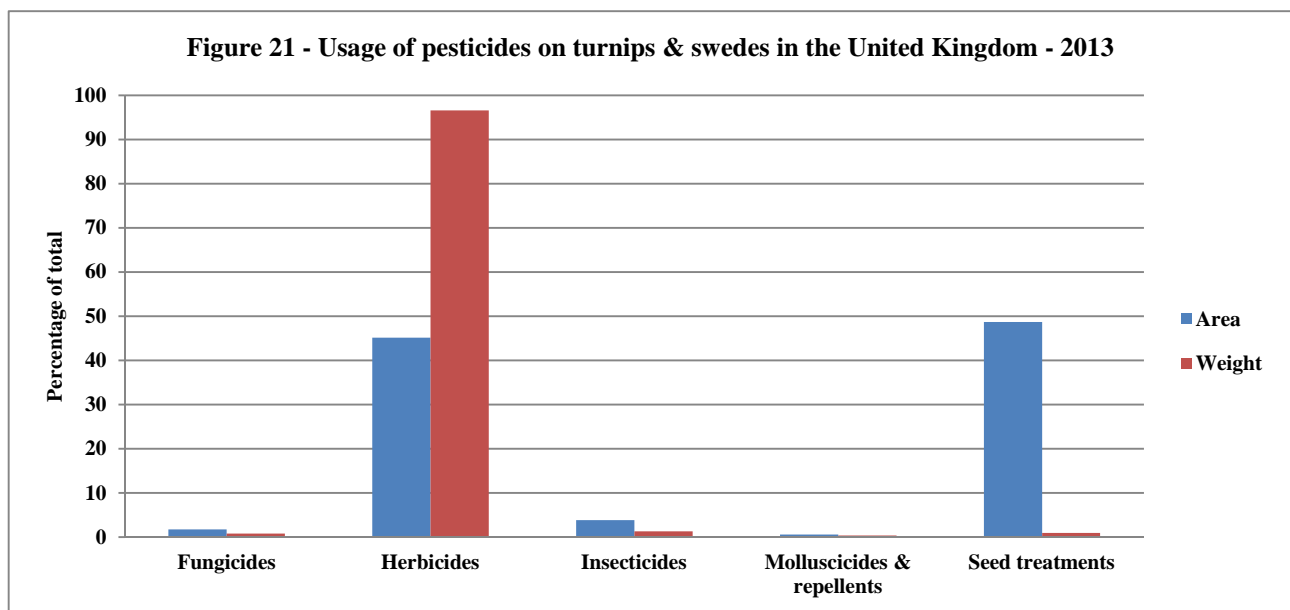
Maize – Seed Treatments

- **Formulation area treated: 260,438 hectares**
- **Weight of active substances applied: 23.07 tonnes**
- **Less than one percent of the seed remained untreated**
- **Where specified the most common formulations (excluding unspecified treatments) were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of seed treatment area	Proportion of census area treated
Methiocarb	147,614	16,247	0.66	0.76
Thiram	34,765	1,055	0.15	0.18
Fludioxonil/metalaxyl-M	18,587	22	0.08	0.10
Clothianidin	10,150	526	0.05	0.05
Imidacloprid	7,975	5,191	0.04	0.04

TURNIPS & SWEDES

- 12,465 hectares of turnips & swedes grown in the United Kingdom
- 21,642 treated hectares
- 7.50 tonnes applied
- 33% of turnips & swedes remained untreated
- Where treated, turnips & swedes received an average of 1 spray with 2 products and 2 active substances
- There was only limited use of fungicides and molluscicides

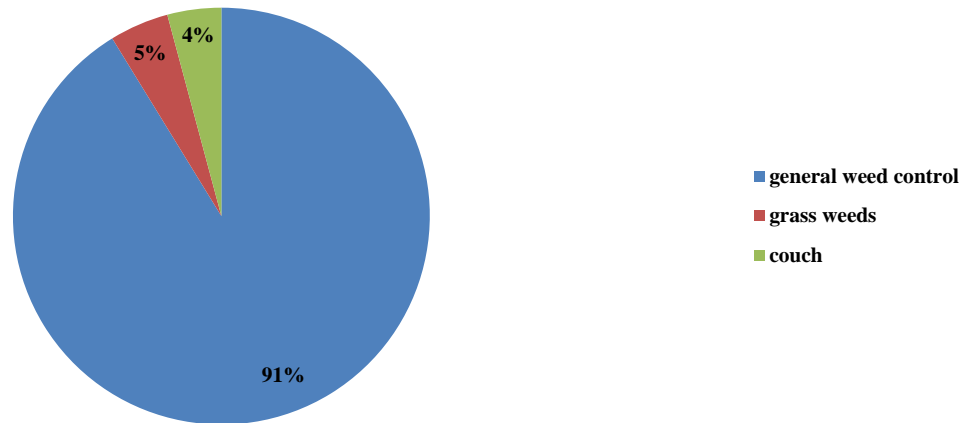


Turnips & swedes – Herbicides

- **Formulation area treated: 9,767 hectares**
- **Weight of active substances applied: 7.24 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of herbicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Metazachlor	4,584	3,147	0.47	0.37	1.00	0.83
Glyphosate	3,774	3,888	0.39	0.29	1.04	0.57
Clomazone	1,133	78	0.12	0.09	1.00	0.76
Clopyralid	117	23	0.01	0.01	1.00	1.00
Pyridate	112	101	0.01	0.01	1.00	1.00

Figure 23 - Turnips & swedes - reasons for use of herbicides (where given)

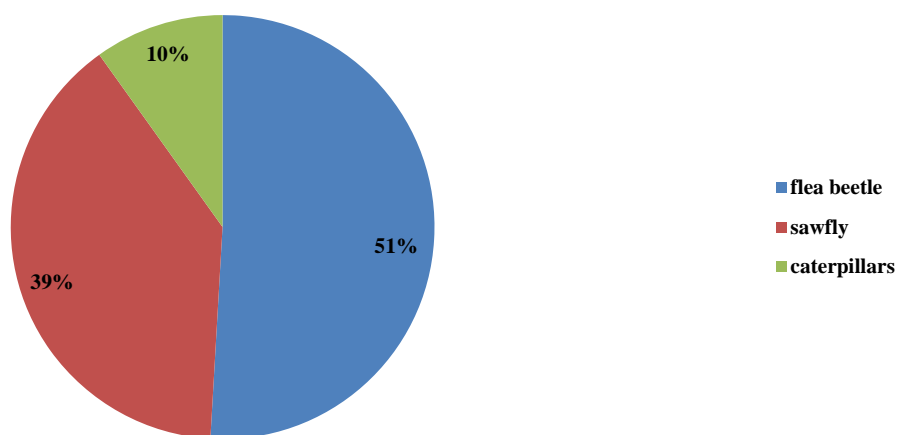


Turnips & swedes – Insecticides

- **Formulation area treated: 829 hectares**
- **Weight of active substances applied: 0.10 tonnes**
- **The only formulations encountered were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of insecticide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Deltamethrin	504	3	0.61	0.03	1.35	0.85
Chlorpyrifos	118	85	0.14	0.01	1.00	0.75
Pirimicarb	115	11	0.14	0.01	1.00	0.48
Lambda-cyhalothrin	92	0	0.11	0.01	1.00	0.50

Figure 24 - Turnips & swedes - reasons for use of insecticides (where given)



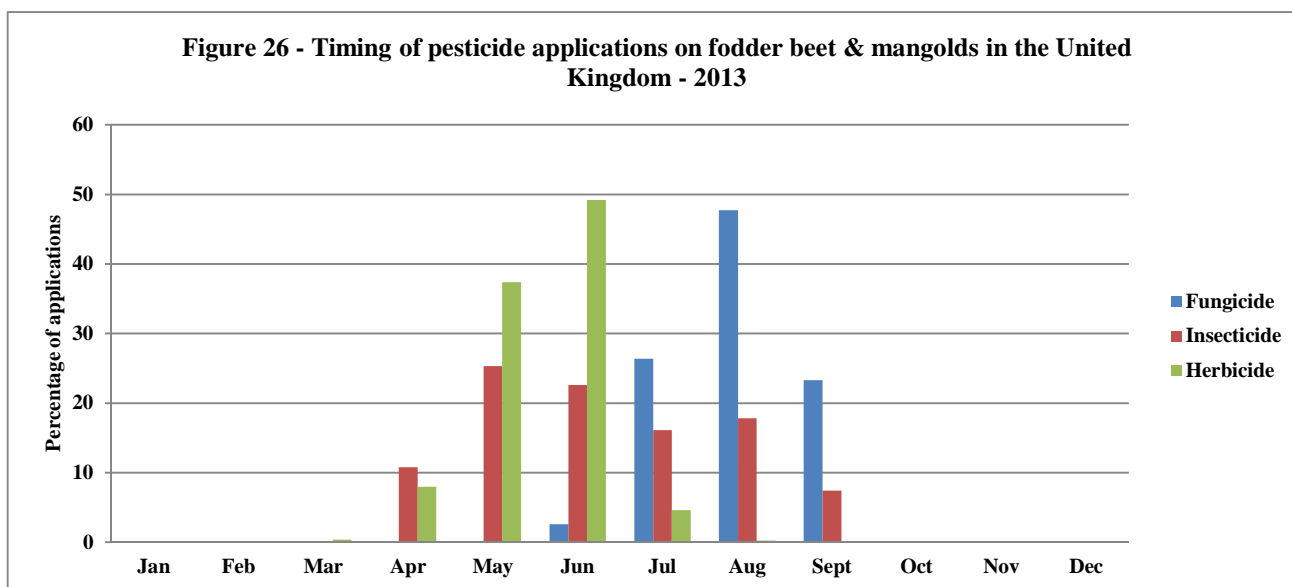
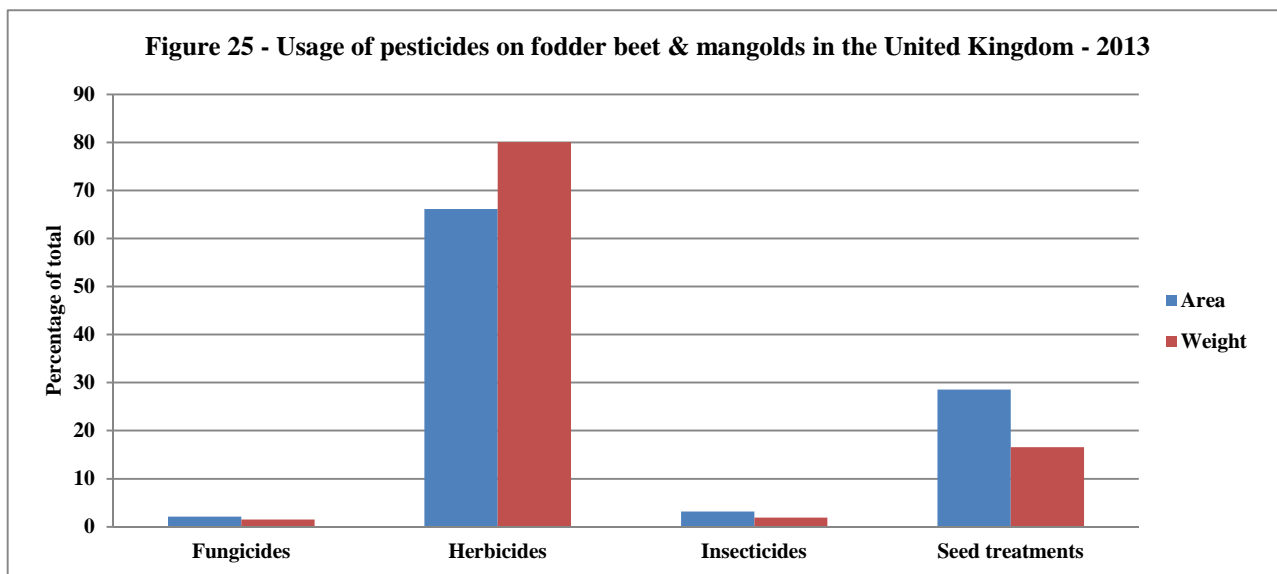
Turnips & swedes – Seed Treatments

- **Formulation area treated: 10,540 hectares**
- **Weight of active substances applied: 0.07 tonnes**
- **37% of the seed remained untreated**
- **Where specified, the most common formulations (excluding unspecified treatments) were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of seed treatment area	Proportion of census area treated
Thiamethoxam	3,108	58	0.42	0.25
Thiram	3,030	5	0.41	0.18
Fludioxonil/metalaxyl-M/ thiamethoxam	316	7	0.04	0.03
<i>Bacillus subtilis</i>	248	2	0.03	0.02

FODDER BEET & MANGOLDS

- 20,700 hectares of fodder beet & mangolds grown in the United Kingdom
- 163,848 treated hectares
- 74.43 tonnes applied
- 5% of fodder beet & mangolds remained untreated
- Where treated, fodder beet & mangolds received an average of 4 sprays with 7 products and 12 active substances

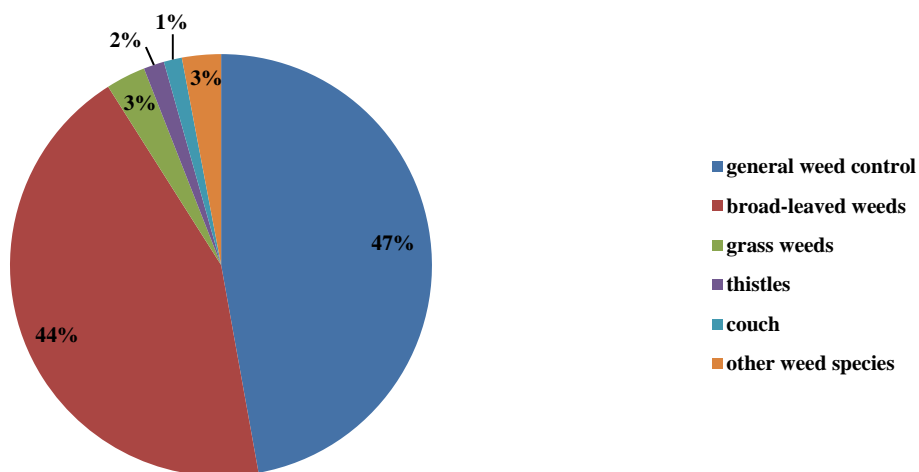


Fodder beet & mangolds – Herbicides

- **Formulation area treated: 108,377 hectares**
- **Weight of active substances applied: 59.58 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of herbicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Metamitron	30,856	32,900	0.28	0.65	2.25	0.46
Desmedipham/ethofumesate/lenacil/phenmedipham	17,745	3,960	0.16	0.42	2.06	0.71
Triflusalufuron-methyl	13,761	182	0.13	0.44	1.52	0.88
Phenmedipham	12,622	3,355	0.12	0.32	1.91	0.60
Desmedipham/ethofumesate/phenmedipham	4,921	1,691	0.05	0.13	1.88	0.68

Figure 27 - Fodder beet & mangolds - reasons for use of herbicides (where given)



Fodder beet & mangolds – Fungicides

- **Formulation area treated: 3,420 hectares**
- **Weight of active substances applied: 1.12 tonnes**
- **The only formulations encountered were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of fungicide-treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Difenoconazole/fenpropidin	1,488	707	0.44	0.06	1.31	1.00
Azoxystrobin/cyproconazole	1,262	290	0.37	0.05	1.31	0.91
Cyproconazole/trifloxystrobin	512	96	0.15	0.02	1.00	1.00
Flusilazole	86	14	0.03	<0.01	1.00	1.01
Epoxiconazole/pyraclostrobin	72	13	0.02	<0.01	1.00	1.00

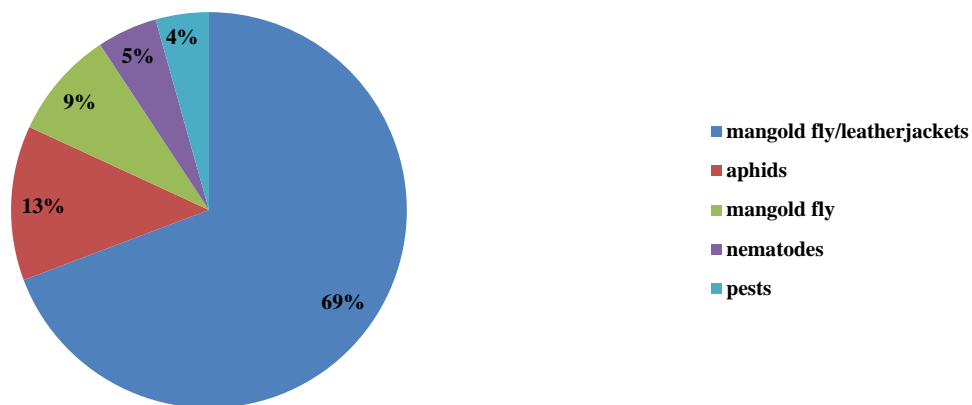
No individual reasons were cited for fungicide usage, with most farmers citing general disease control.

Fodder beet & mangolds – Insecticides

- **Formulation area treated: 5,244 hectares**
- **Weight of active substances applied: 1.41 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of insecticide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Lambda-cyhalothrin	1,788	12	0.34	0.06	1.51	1.00
Chlorpyrifos	1,333	961	0.25	0.06	1.00	0.94
Pirimicarb	985	119	0.19	0.05	1.00	0.87
Cypermethrin	515	13	0.10	0.02	1.00	1.00
Oxamyl	508	305	0.10	0.02	1.00	0.67

Figure 28 - Fodder beet & mangold - reasons for use of insecticides (where given)



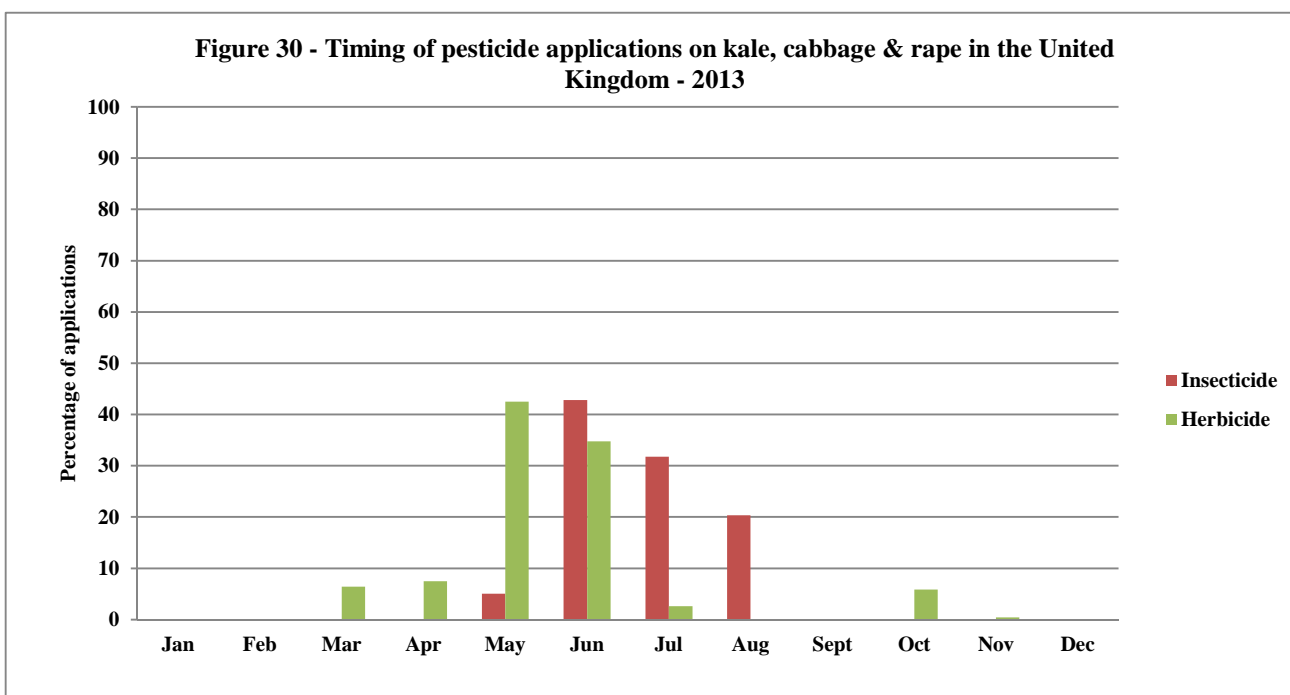
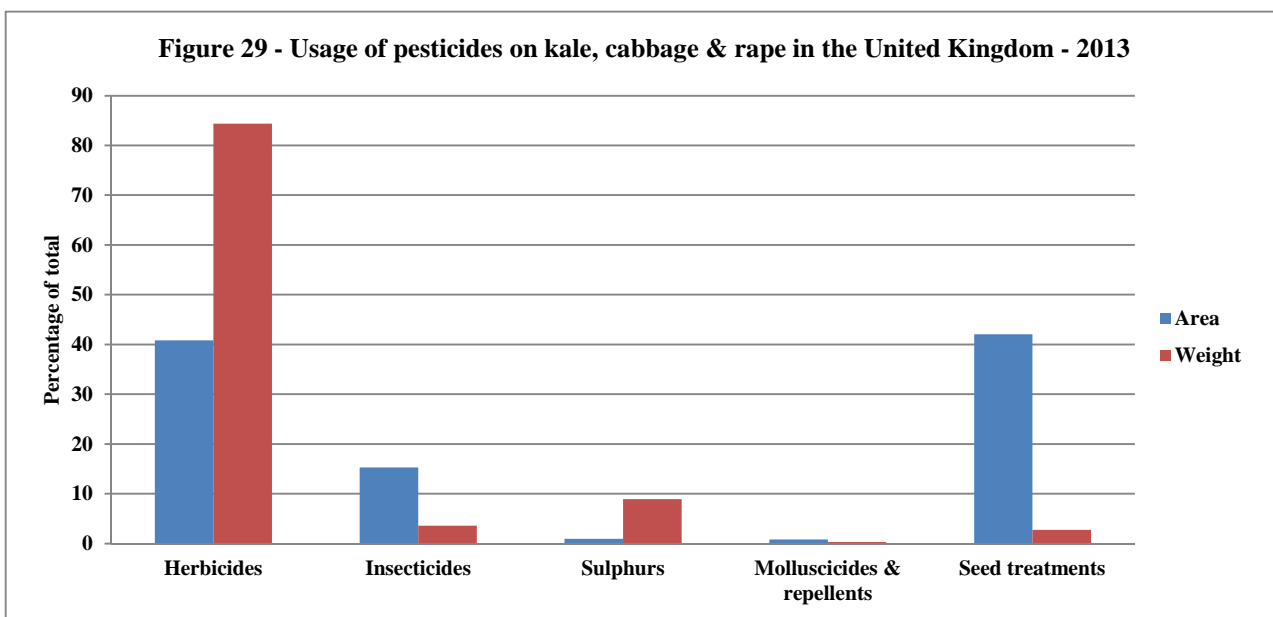
Fodder beet & mangolds – Seed Treatments

- **Formulation area treated: 46,806 hectares**
- **Weight of active substances applied: 12.32 tonnes**
- **5% of the seed remained untreated**
- **Where specified, the most common formulations (excluding unspecified treatments) were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of seed treatment area	Proportion of census area treated
Thiram	13,736	11,877	0.33	0.66
Hymexazol	11,820	132	0.28	0.57
Tefluthrin	6,762	75	0.16	0.33
Iprodione	5,592	14	0.13	0.27
Imidacloprid	2,924	173	0.07	0.14

KALE, CABBAGE & RAPE

- 8,778 hectares of kale, cabbage & rape grown in the United Kingdom
- 11,308 treated hectares
- 4.75 tonnes applied
- 43% of kale, cabbage & rape remained untreated
- Where treated, kale, cabbage & rape received an average of 1 spray with a single product and active substance
- There was minimal usage of sulphur and molluscicides



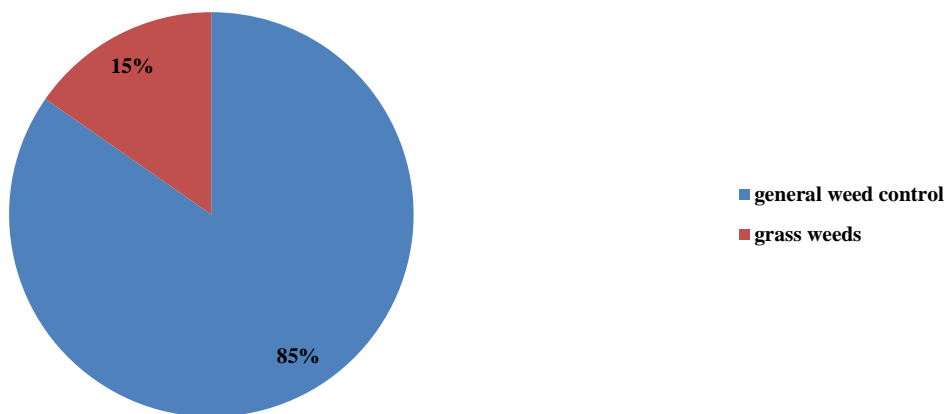
Kale, cabbage & rape – Herbicides

- **Formulation area treated: 4,618 hectares**
- **Weight of active substances applied: 4.01 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of herbicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Glyphosate	2,307	2,817	0.50	0.26	1.00	0.81
Metazachlor	1,181	690	0.26	0.13	1.00	0.78
MCPB	309	309	0.07	0.04	1.00	0.56
Pyridate	174	156	0.04	0.02	1.00	1.00
Clomazone	153	8	0.03	0.02	1.00	0.60

Whilst the use of MCPB on this crop may seem inappropriate, it was used to remove docks in a grass/fodder rape mix, with the rape being sacrificed in order to control the docks.

Figure 31 - Kale, cabbage & rape - reasons of use of herbicides (where given)

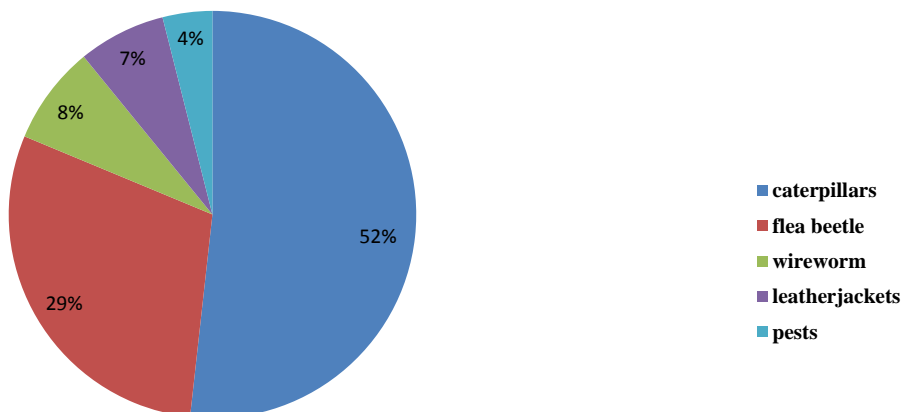


Kale, cabbage & rape – Insecticides

- **Formulation area treated: 1,733 hectares**
- **Weight of active substances applied: 0.17 tonnes**
- **The only formulations encountered were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of herbicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Deltamethrin	1,072	7	0.62	0.08	1.51	0.92
Cypermethrin	366	9	0.21	0.04	1.00	1.00
Chlorpyrifos	217	154	0.13	0.02	1.00	0.79
Esfenvalerate	40	0	0.02	0.00	1.00	1.00
Alpha-cypermethrin	38	1	0.02	0.00	1.00	0.75

Figure 32 - Kale, cabbage & rape - reasons for use of insecticides (where given)



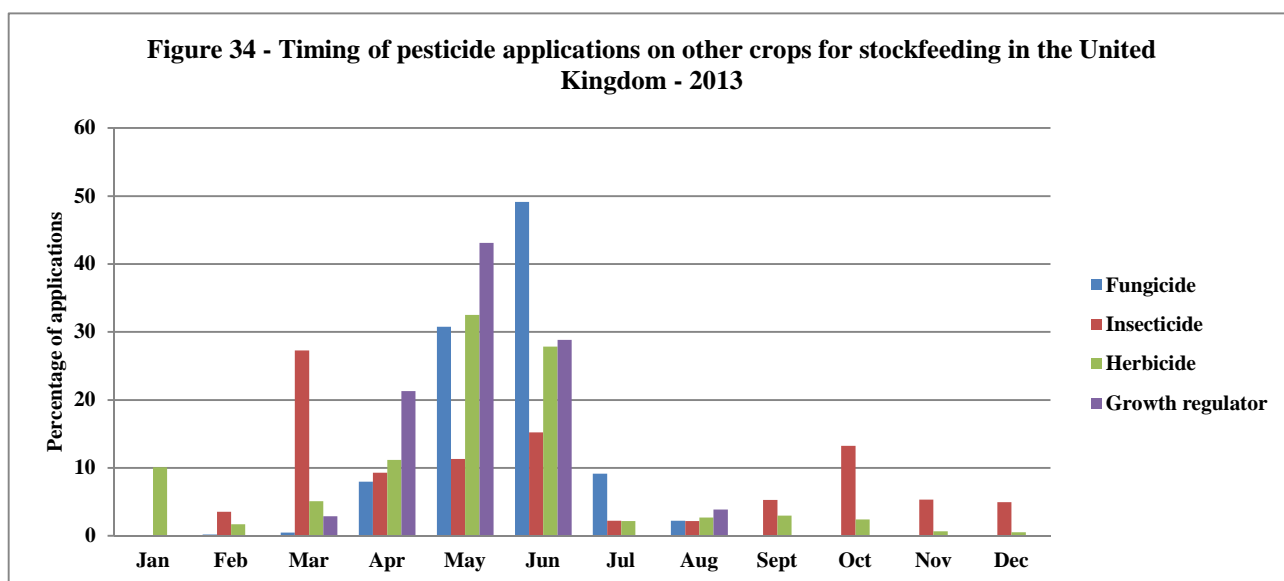
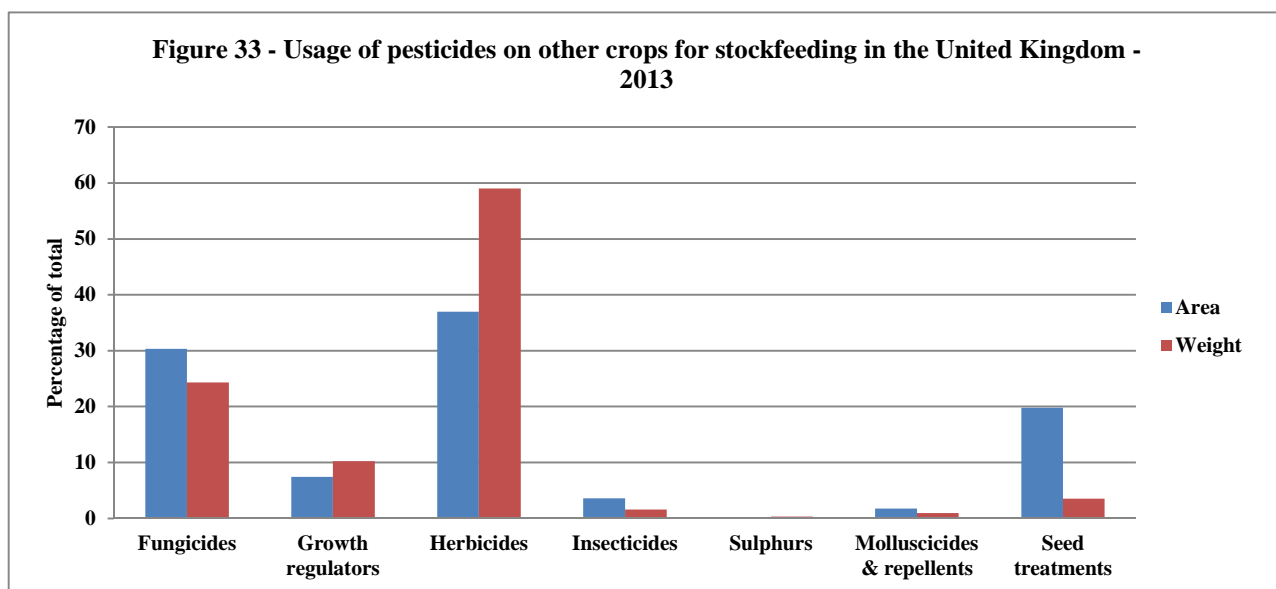
Kale, cabbage & rape – Seed Treatments

- **Formulation area treated: 4,758 hectares**
- **Weight of active substances applied: 0.13 tonnes**
- **68% of the seed remained untreated**
- **Where specified the most common formulations (excluding unspecified treatments) were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of seed treatment area	Proportion of census area treated
Thiamethoxam	1,996	49	0.52	0.23
Thiram	995	14	0.26	0.11
Tefluthrin	410	59	0.11	0.05
Fludioxonil/metalaxyl-M/ thiamethoxam	363	8	0.10	0.04
<i>Bacillus subtilis</i>	50	2	0.01	0.01

OTHER CROPS FOR STOCKFEEDING

- Other crops for stockfeeding included arable silage mixes or whole-cropped fields of the following crops: barley, wheat, lucerne, brassica/cereal mixes, sainfoin, lupins, oats, fodder peas, quinoa, vetches, rye and triticale
- 45,380 hectares of other crops for stockfeeding grown in the United Kingdom
- 125,683 treated hectares
- 40.27 tonnes applied
- 41% of other crops for stockfeeding remained untreated
- Where treated, other crops for stockfeeding received an average of 2 sprays with 4 products and 6 active substances
- There was minimal usage of sulphur

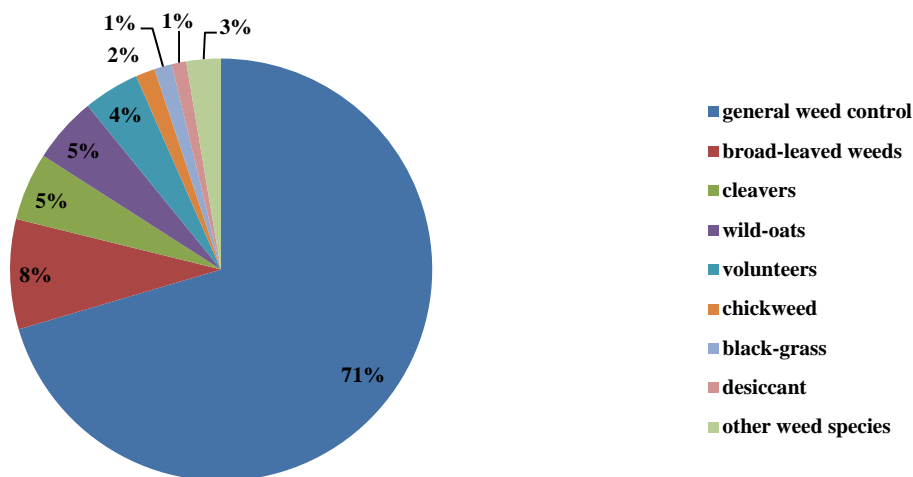


Other crops for stockfeeding– Herbicides

- **Formulation area treated: 46,479 hectares**
- **Weight of active substances applied: 23.78 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of herbicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Glyphosate	6,670	7,574	0.14	0.15	1.00	0.70
Fluroxypyr	5,325	611	0.11	0.12	1.00	0.31
Metsulfuron-methyl	3,321	16	0.07	0.07	1.01	0.84
Metsulfuron-methyl/thifensulfuron-methyl	2,632	105	0.06	0.06	1.02	0.80
Metsulfuron-methyl/tribenuron-methyl	2,605	31	0.06	0.06	1.00	0.92

Figure 35 - Other crops for stock feeding - reasons for use of herbicides (where given)



Other crops for stockfeeding – Molluscicides

- **Formulation area treated: 2,226 hectares**
- **Weight of active substances applied: 0.39 tonnes**

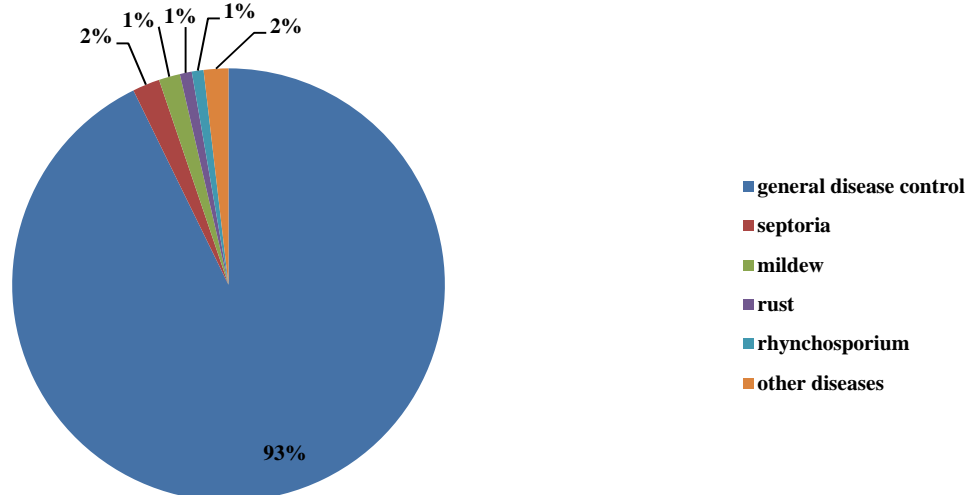
Metaldehyde accounted for 56% of the area treated, ferric phosphate the remaining 44%.

Other crops for stockfeeding– Fungicides

- **Formulation area treated: 38,136 hectares**
- **Weight of active substances applied: 9.79 tonnes**
- **Fungicide usage would primarily have been directed at cereals grown for whole crop silage**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of fungicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Chlorothalonil	3,872	1,978	0.10	0.07	1.23	0.39
Prothioconazole	2,827	330	0.07	0.06	1.06	0.59
Prothioconazole/tebuconazole	2,311	405	0.06	0.05	1.04	0.66
Epoxiconazole/fenpropimorph/metrafenone	1,795	726	0.05	0.04	1.05	0.60
Azoxystrobin/chlorothalonil	1,612	768	0.04	0.04	1.00	0.40

Figure 36 - Other crops for stock feeding - reasons for use of fungicides (where given)



Other crops for stockfeeding- growth regulators

- **Formulation area treated: 9,320 hectares**
- **Weight of active substances applied: 4.12 tonnes**
- **The five most common formulations by area treated were:**

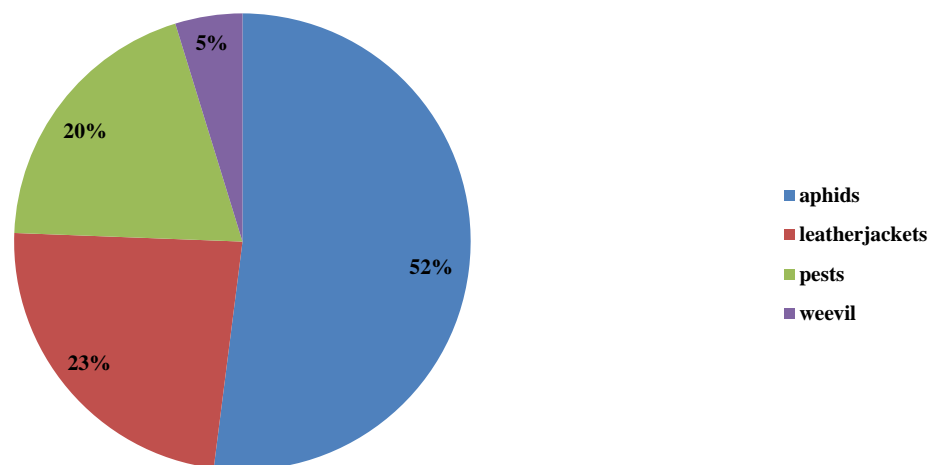
	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of insecticide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Chloromequat	4,982	3,292	0.53	0.09	1.22	0.49
Trinexapac-ethyl	2,361	111	0.25	0.05	1.12	0.47
Chloromequat/imazaquin	656	346	0.07	0.01	1.00	0.57
2-chloroethylphosphonic acid	535	71	0.06	0.01	1.00	0.32
2-chloroethylphosphonic acid/mepiquat	326	150	0.03	0.01	1.00	0.50

Other crops for stockfeeding- insecticides

- **Formulation area treated: 4,541 hectares**
- **Weight of active substances applied: 0.64 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of insecticide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Esfenvalerate	1,436	6	0.32	0.03	1.00	0.89
Chlorpyrifos	845	604	0.19	0.02	1.00	0.99
Zeta-cypermethrin	734	7	0.16	0.02	1.00	0.64
Cypermethrin	618	16	0.14	0.01	1.00	1.06
Lambda-cyhalothrin	450	2	0.10	0.01	1.00	1.00

Figure 37 - Other crops for stock feeding - reasons for use of insecticides (where given)



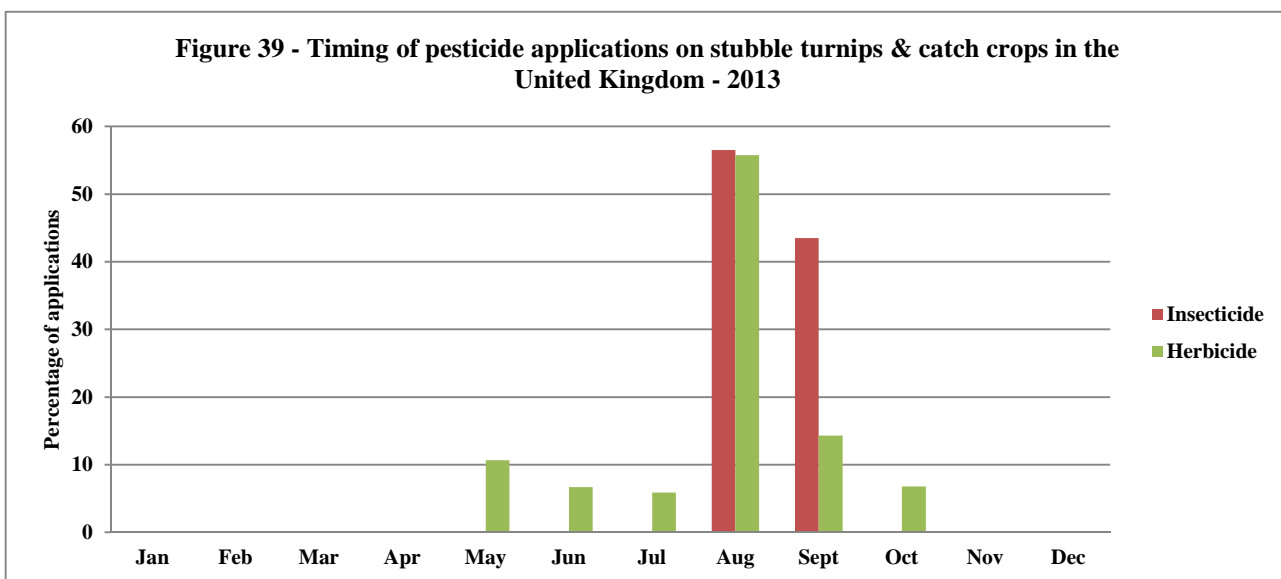
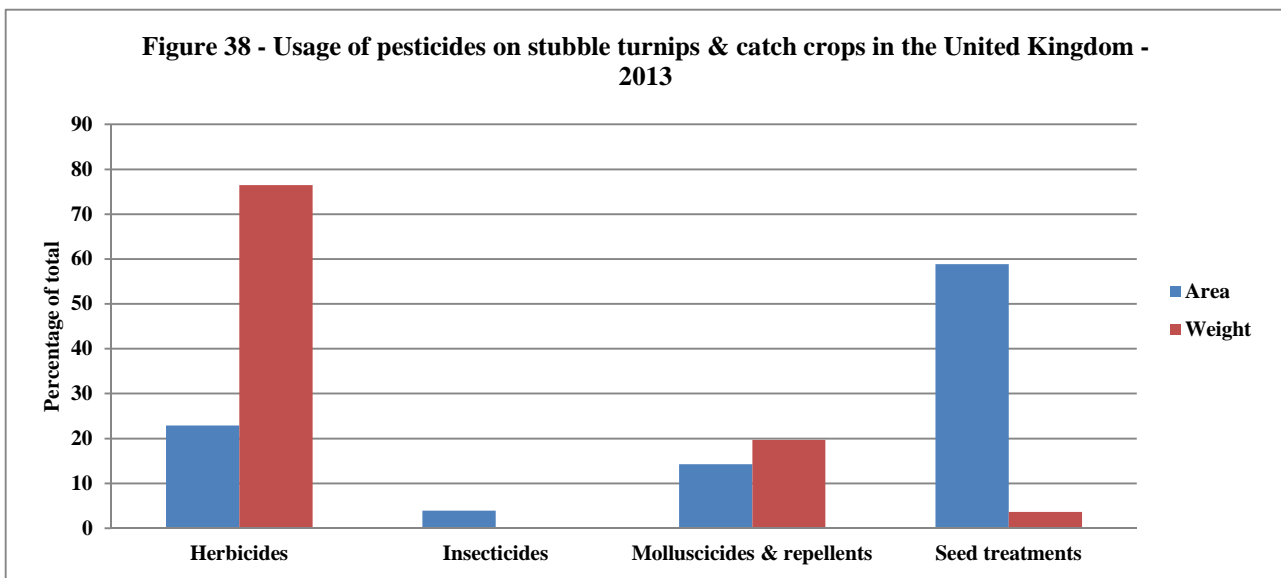
Other crops for stockfeeding- seed treatments

- **Formulation area treated: 24,892 hectares**
- **Weight of active substances applied: 1.42 tonnes**
- **46% of the seed remained untreated**
- **Where specified the most common formulations (excluding unspecified treatments) were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of seed treatment area	Proportion of census area treated
Prochloraz/triticonazole	6,683	190	0.35	0.15
Fluopyram/prothioconazole/tebuconazole	2,503	40	0.13	0.06
Fludioxonil	2,105	20	0.11	0.05
Clothianidin/prothioconazole	2,029	214	0.11	0.04
Carboxin/thiram	1,193	267	0.06	0.03

STUBBLE TURNIPS & CATCH CROPS

- 14,821 hectares of stubble turnips & catch crops grown in the United Kingdom
- 9,455 treated hectares
- 1.26 tonnes applied
- 78% of stubble turnips & catch crops remained untreated
- Stubble turnips & catch crops included combinations of kale, rape, swedes and turnips sown as catch crops in early July or later
- Where treated, stubble turnips & catch crops received an average of 1 spray with a single product and active substance
- No foliar applied fungicides were encountered

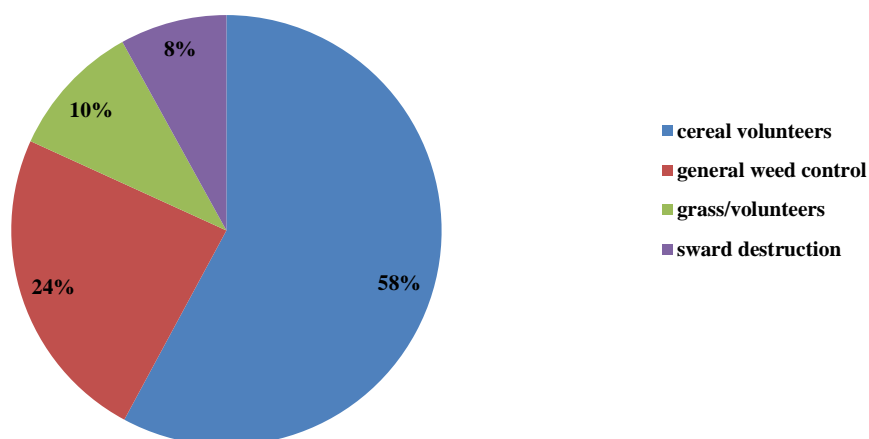


Stubble turnips & catch crops – Herbicides

- **Formulation area treated: 2,165 hectares**
- **Weight of active substances applied: 0.96 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of herbicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Propaquizafop	848	49	0.39	0.06	1.00	0.39
Fluazifop-P-butyl	579	20	0.27	0.04	1.00	0.09
Glyphosate	518	807	0.24	0.03	1.00	0.93
Metazachlor	109	81	0.05	0.01	1.00	1.00
Cycloxydim	9	3	<0.01	<0.01	1.00	0.67

Figure 40 - Stubble turnips & catch crops - reasons for use of herbicides (where given)



Stubble turnips & catch crops – Molluscicides

- **Formulation area treated: 1,351 hectares**
- **Weight of active substances applied: 0.25 tonnes**

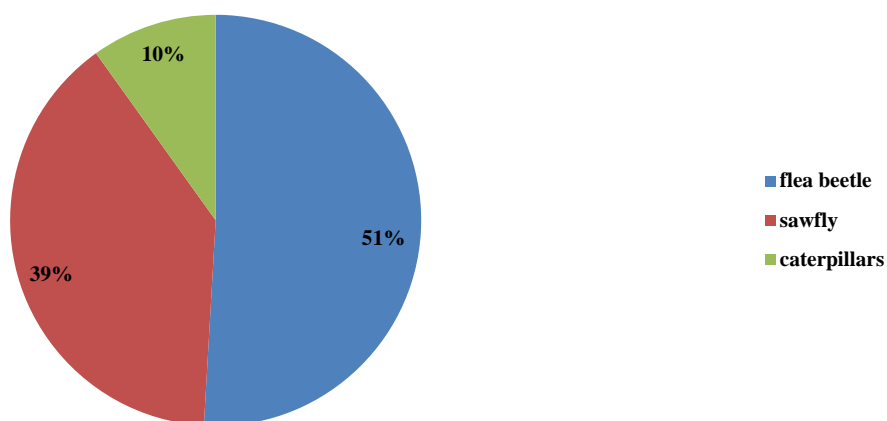
Metaldehyde was the only active substance encountered.

Stubble turnips & catch crops – Insecticides

- **Formulation area treated: 372 hectares**
- **Weight of active substances applied: <0.01 tonnes**
- **The only formulations encountered were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of insecticide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Deltamethrin	224	2	0.60	0.02	1.00	0.96
Alpha-cypermethrin	147	1	0.40	0.01	1.00	0.88

Figure 41 - Stubble turnips & catch crops - reasons for use of insecticides (where given)



Stubble turnips & catch crops – Seed Treatments

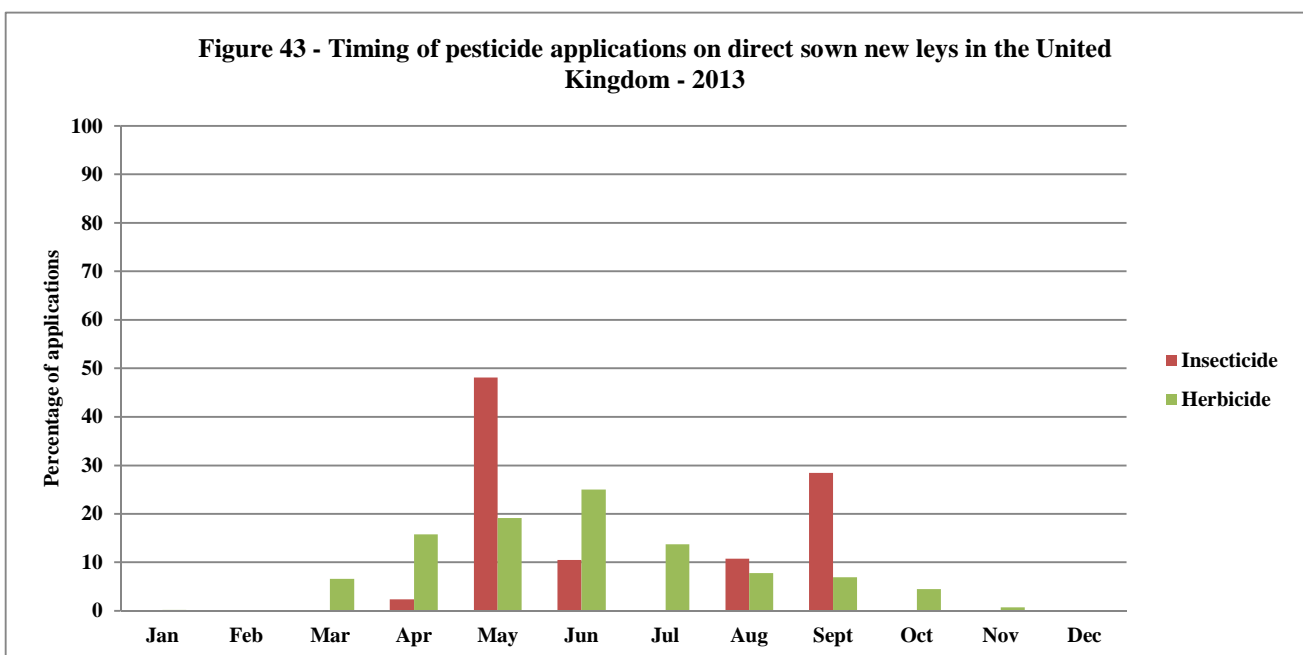
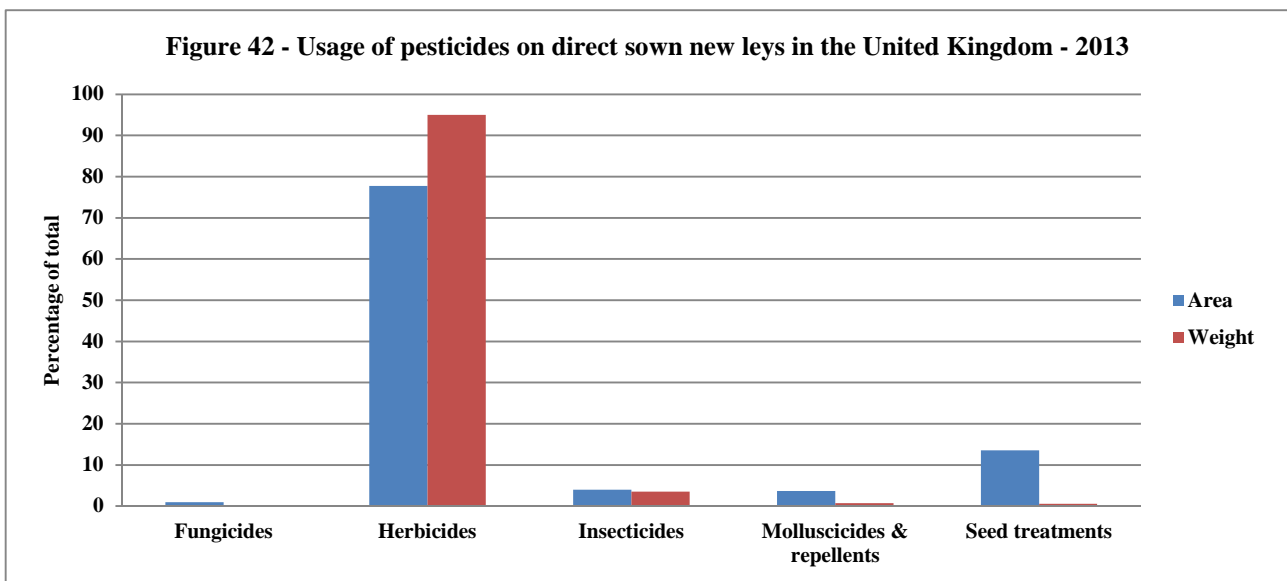
- **Formulation area treated: 5,567 hectares**
- **Weight of active substances applied: 0.05 tonnes**
- **64% of the seed remained untreated**
- **Where specified the most common formulations (excluding unspecified treatments) were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of seed treatment area	Proportion of census area treated
Thiamethoxam	1,019	25	0.62	0.07
Thiram	284	5	0.17	0.02
Beta-cyfluthrin/imidacloprid	182	3	0.11	0.01
Carbosulfan/thiram	147	12	0.09	0.01
Fludioxonil/metalaxyl-M/ thiamethoxam	1	<1	<0.01	<0.01

PESTICIDE USAGE ON GRASSLAND

NEW LEYS - DIRECT SOWN

- 221,875 hectares of new leys – direct sown grown in the United Kingdom
- 76,998 treated hectares
- 62.44 tonnes applied
- 71% of new leys - direct sown remained untreated
- Where treated, new leys – direct sown received an average of 1 spray with 2 products and 2 active substances
- There was minimal usage of fungicides

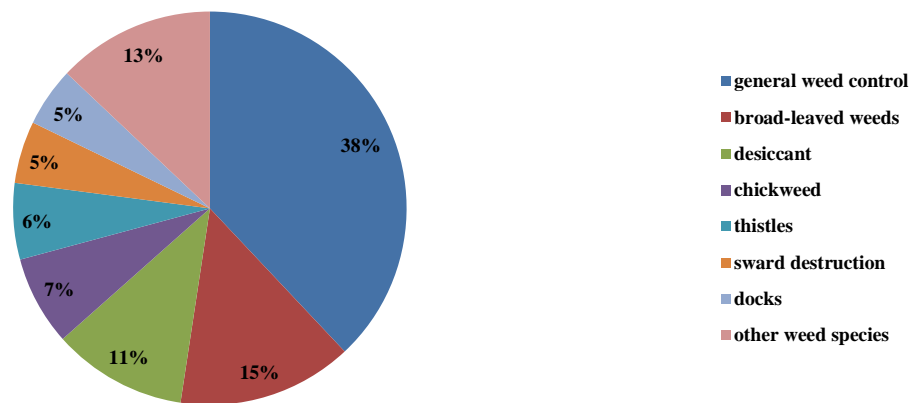


New leys - direct sown –Herbicides

- **Formulation area treated: 59,885 hectares**
- **Weight of active substances applied: 59.30 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of herbicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Glyphosate	23,693	29,916	0.40	0.11	1.01	0.67
Clopyralid/fluroxypyr/triclopyr	6,624	4,551	0.11	0.03	1.00	0.76
2,4-DB	5,739	7,416	0.10	0.03	1.00	0.72
Mecoprop-P	5,174	6,222	0.09	0.02	1.00	0.80
Tribenuron-methyl	5,092	24	0.09	0.02	1.00	0.96

Figure 44 - New leys - direct sown - reasons for use of herbicides (where given)



New leys - direct sown – Molluscicides

- **Formulation area treated: 2,823 hectares**
- **Weight of active substances applied: 0.48 tonnes**

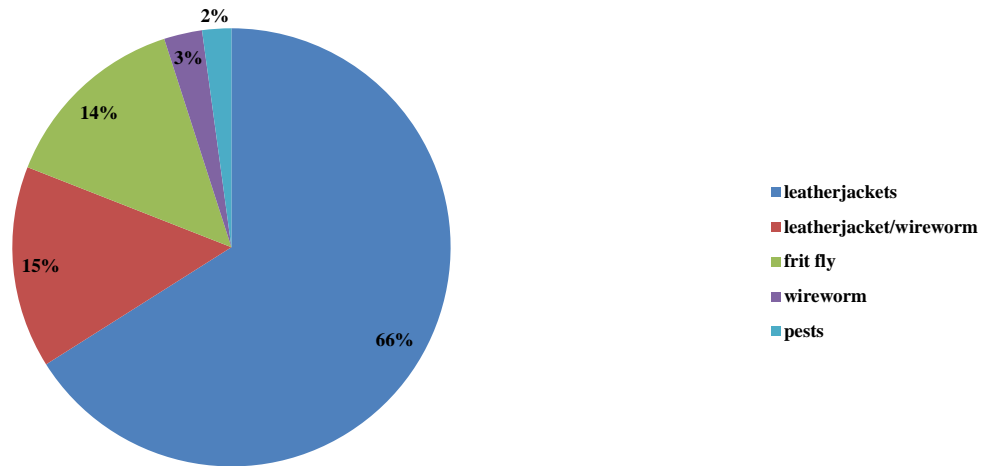
Metaldehyde accounted for 71% of the area treated, ferric phosphate 18% and methiocarb the remaining 10%.

New leys – direct sown – Insecticides

- **Formulation area treated: 3,072 hectares**
- **Weight of active substances applied: 2.19 tonnes**

Chlorpyrifos was the only insecticide recorded, being used mainly for the control of leatherjackets, wireworms and frit fly.

Figure 45 - New ley direct sown - reasons for use of insecticides (where given)



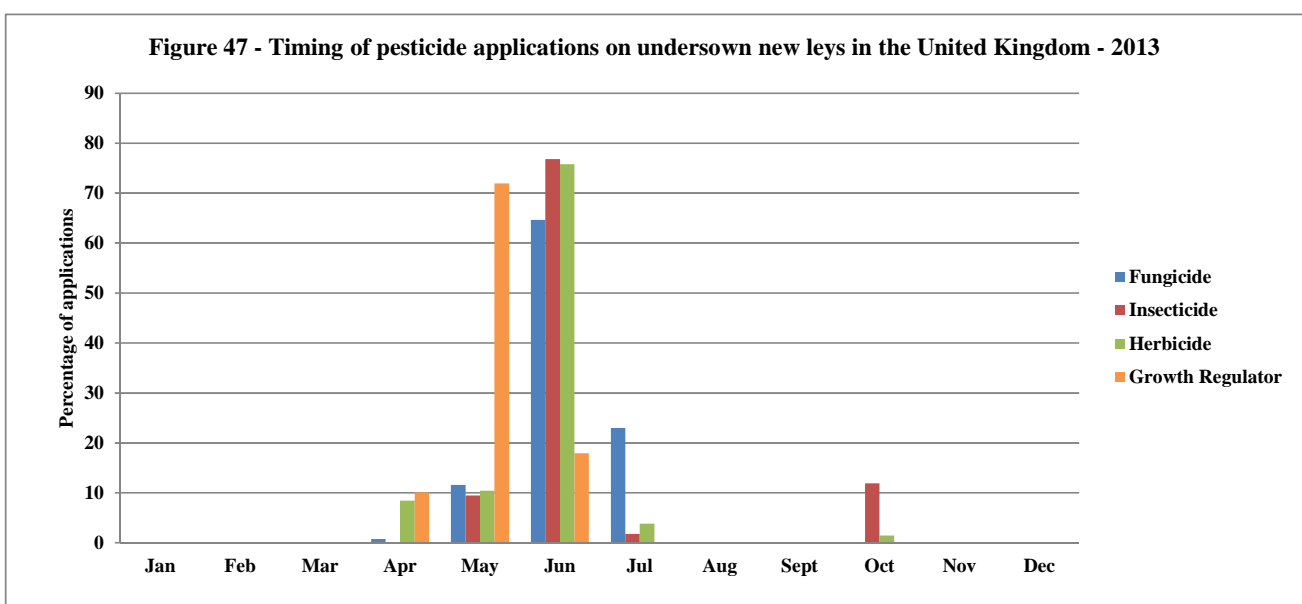
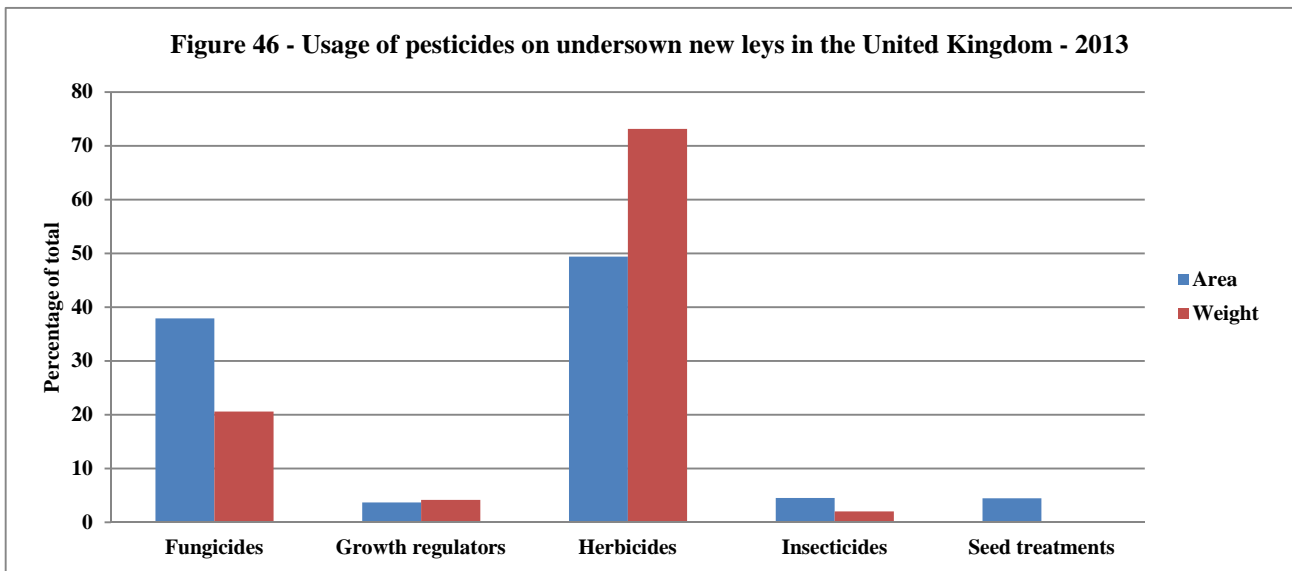
New leys – direct sown – Seed Treatments

- **Formulation area treated: 10,463 hectares**
- **Weight of active substances applied: 0.37 tonnes**
- **82% of the seed remained untreated**
- **Where specified, the most common formulations (excluding unspecified treatments) were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of seed treatment area	Proportion of census area treated
Growth promoters	3,049	<1	0.60	0.01
Thiram	1,404	152	0.28	0.01
<i>Bacillus subtilis</i>	625	222	0.12	0.00

NEW LEYS - UNDERSOWN

- 35,615 hectares of new leys – undersown grown in the United Kingdom
- 51,951 treated hectares
- 25.75 tonnes applied
- 54% of new leys - undersown remained untreated
- Where treated, new leys - undersown received an average of 2 sprays with 3 products and 4 active substances
- Fungicide usage would have been directed at the nurse cereal crop
- Usage on this crop is also reported in pesticide usage surveys on arable crops – beware of potential duplication
- Spring barley was the principal nurse crop used in combination with undersown leys

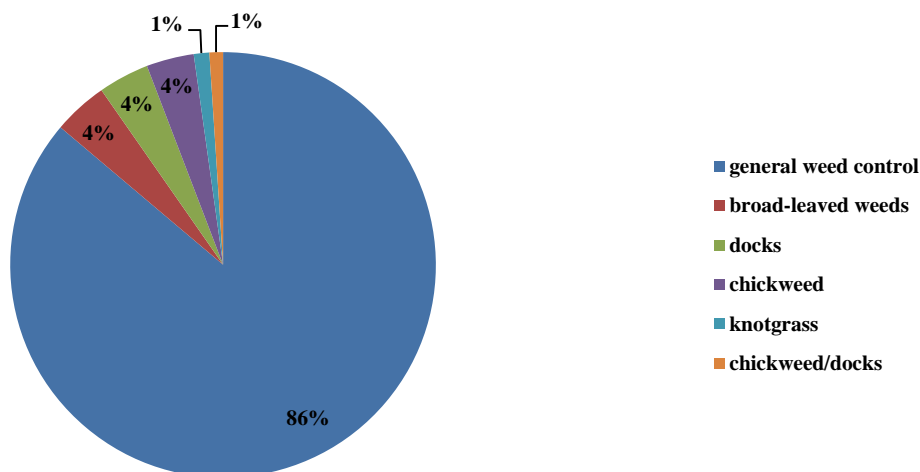


New leys – undersown – Herbicides

- **Formulation area treated: 25,655 hectares**
- **Weight of active substances applied: 18.84 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of herbicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Tribenuron-methyl	6,160	33	0.24	0.17	1.01	0.99
2,4-DB	5,809	6,643	0.23	0.16	1.00	0.64
Glyphosate	4,521	5,215	0.18	0.13	1.00	0.64
Dicamba/mecoprop-P	1,799	1,203	0.07	0.05	1.00	0.78
Dicamba/MCPA/mecoprop-P	1,111	1,670	0.04	0.03	1.00	0.87

Figure 48 - New leys - undersown - reasons for use of herbicides (where given)



New leys – undersown – Growth regulators

- **Formulation area treated: 1,916 hectares**
- **Weight of active substances applied: 1.08 tonnes**
- **The three formulations encountered were:**

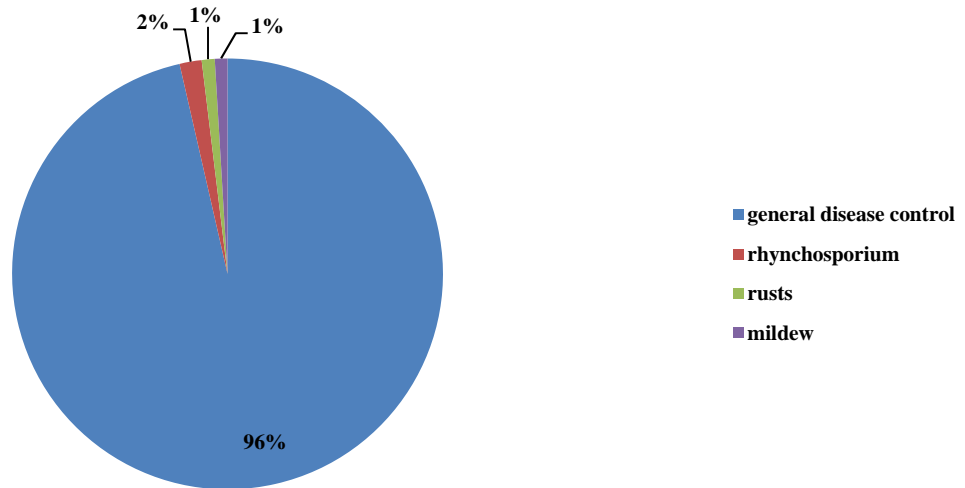
	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of growth regulator – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Chlormequat	1,091	970	0.57	0.03	1.20	0.66
Trinexapac-ethyl	732	9	0.38	0.02	1.00	0.13
Chlormequat/ 2-chloroethylphosphonic acid	93	100	0.05	<0.01	1.00	1.00

New leys – undersown – Fungicides

- **Formulation area treated: 19,691 hectares**
- **Weight of active substances applied: 5.31 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of fungicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Prothioconazole/tebuconazole	3,252	383	0.17	0.09	1.05	0.44
Chlorothalonil	2,347	1,569	0.12	0.06	1.12	0.67
Fluoxastrobin/prothioconazole/trifloxystrobin	1,152	174	0.06	0.03	1.00	0.50
Folpet	1,056	345	0.05	0.03	1.18	0.44
Prothioconazole/trifloxystrobin	1,049	86	0.05	0.02	1.80	0.41

Figure 49 - New leys - undersown - reasons for use of fungicides (where given)

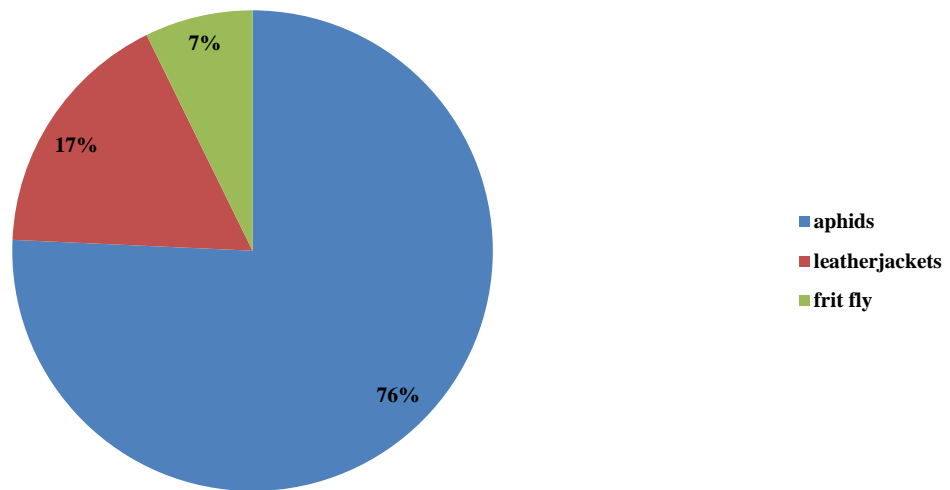


New leys – undersown – Insecticides

- **Formulation area treated: 2,348 hectares**
- **Weight of active substances applied: 0.52 tonnes**
- **The four most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of insecticide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Lambda-cyhalothrin	1,451	5	0.62	0.04	1.00	0.76
Chlorpyrifos	533	516	0.23	0.01	1.00	1.31
Deltamethrin	254	1	0.11	0.01	1.00	0.80
Esfenvalerate	110	0	0.05	0.00	1.00	1.03

Figure 50 - New ley undersown - reasons for use of insecticides (where given)



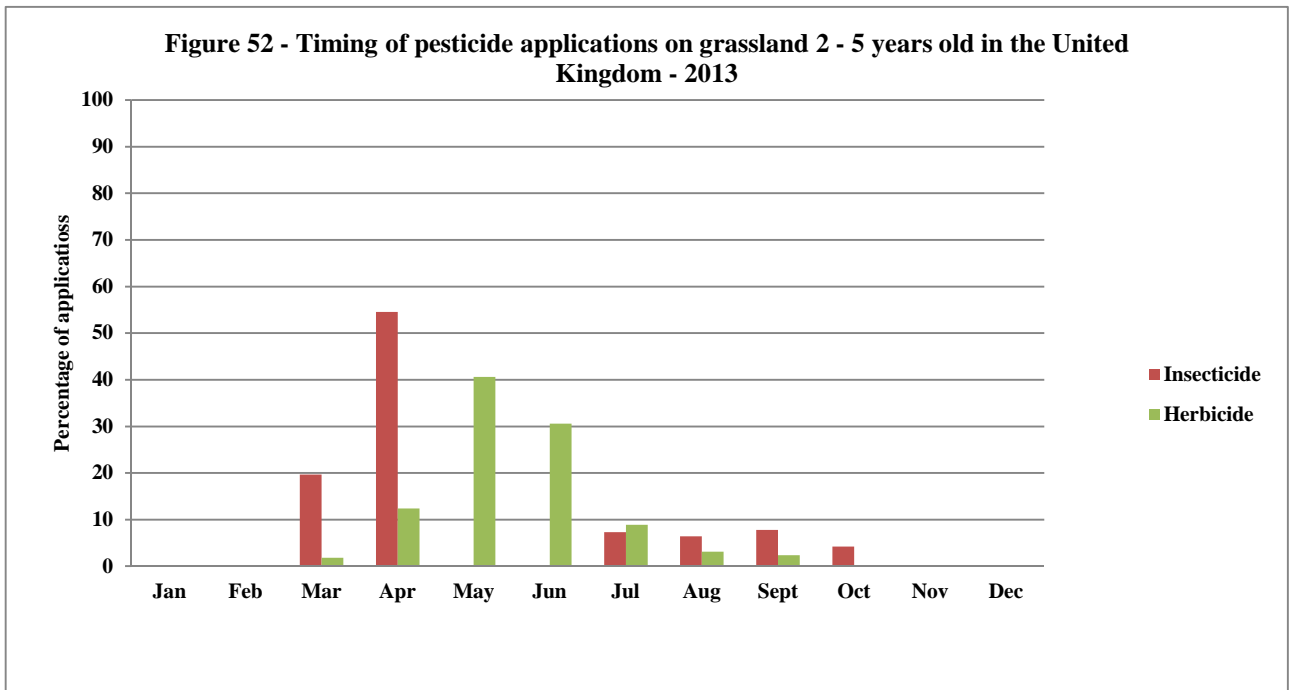
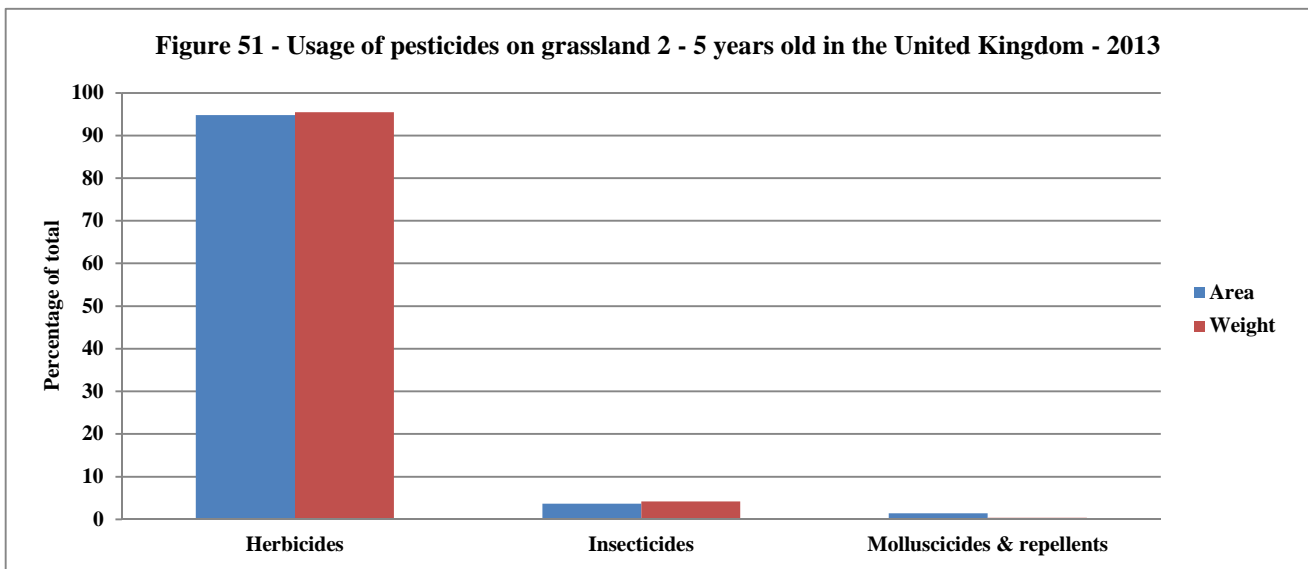
New leys – undersown – Grass Seed Treatments

- **Formulation area treated: 2,341 hectares**
- **Weight of active substances applied: <0.01 tonnes**
- **95% of the grass seed remained untreated**
- **Where specified, the most common formulation (excluding unspecified treatments) was:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of seed treatment area	Proportion of census area treated
Thiram	343	6	1.00	0.01

GRASSLAND TWO TO FIVE YEARS OLD

- 1,132,175 hectares of grassland 2 – 5 years old grown in the United Kingdom
- 69,390 treated hectares
- 54.67 tonnes applied
- 96% of grassland 2 – 5 years old remained untreated
- Where treated, grassland 2 – 5 years old received an average of 1 spray with 1 product and 3 active substances

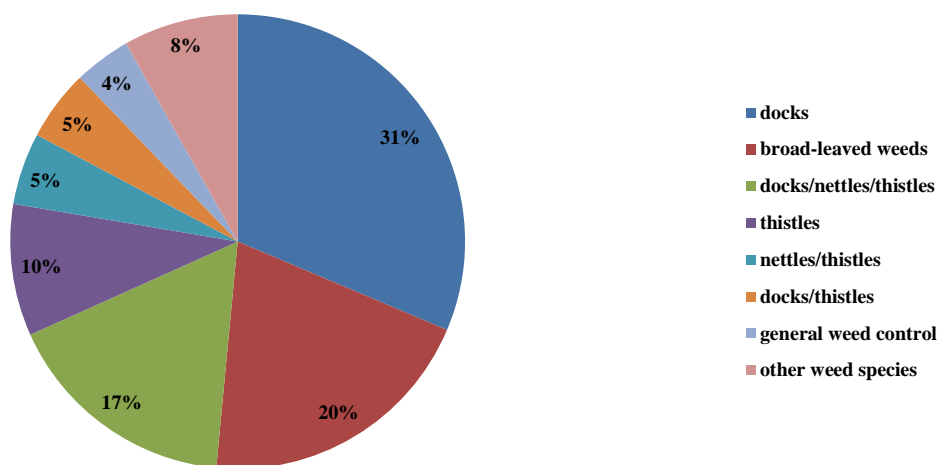


Grassland 2 -5 years old – Herbicides

- **Formulation area treated: 65,770 hectares**
- **Weight of active substances applied: 52.20 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of herbicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
MCPA	16,592	23,738	0.25	0.01	1.00	0.89
Clopyralid/triclopyr	12,680	5,421	0.19	0.01	1.00	0.37
Fluroxypyr/triclopyr	8,513	3,667	0.13	0.01	1.00	0.72
Amidosulfuron	4,753	207	0.07	0.00	1.02	0.97
Clopyralid/fluroxypyr/triclopyr	3,818	1,763	0.06	0.00	1.00	0.51

Figure 53 - Grassland 2 - 5 years old - reasons for use of herbicides (where given)



Grassland 2 -5 years old – Insecticides

- **Formulation area treated: 2,545 hectares**
- **Weight of active substances applied: 2.28 tonnes**

Chlorpyrifos was the only insecticide encountered, being used primarily for leatherjacket control.

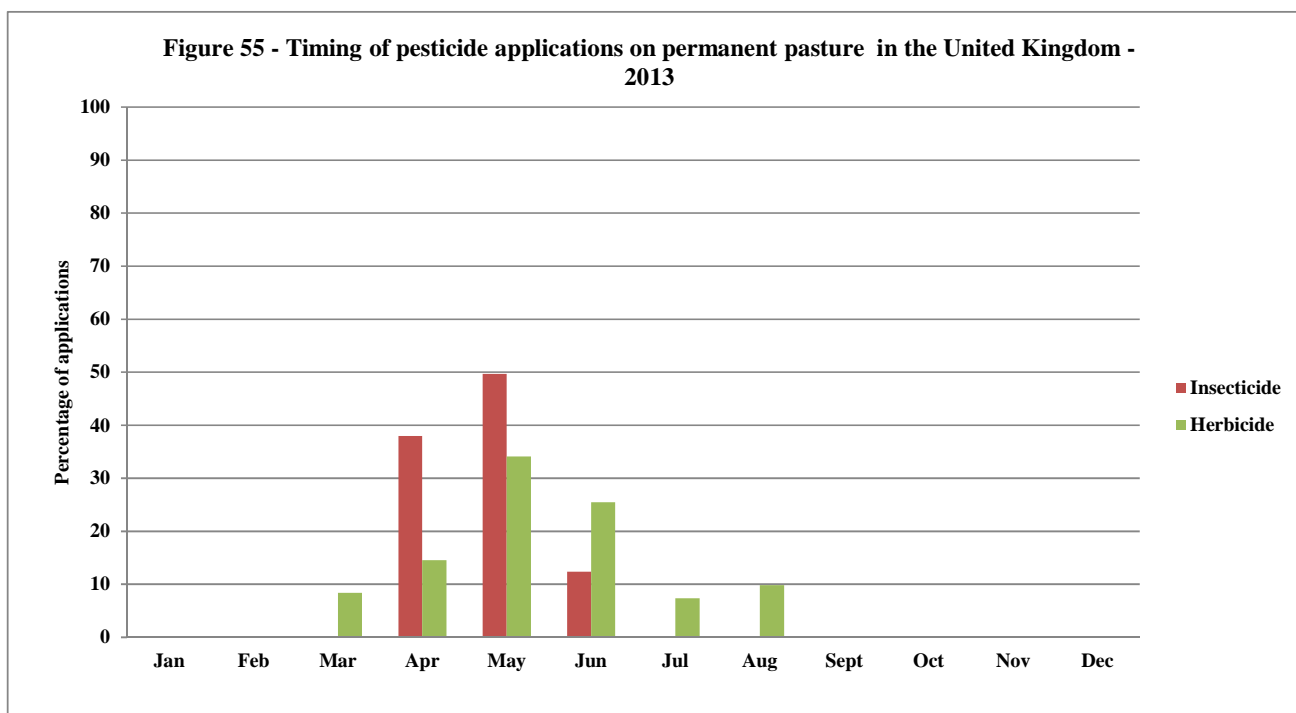
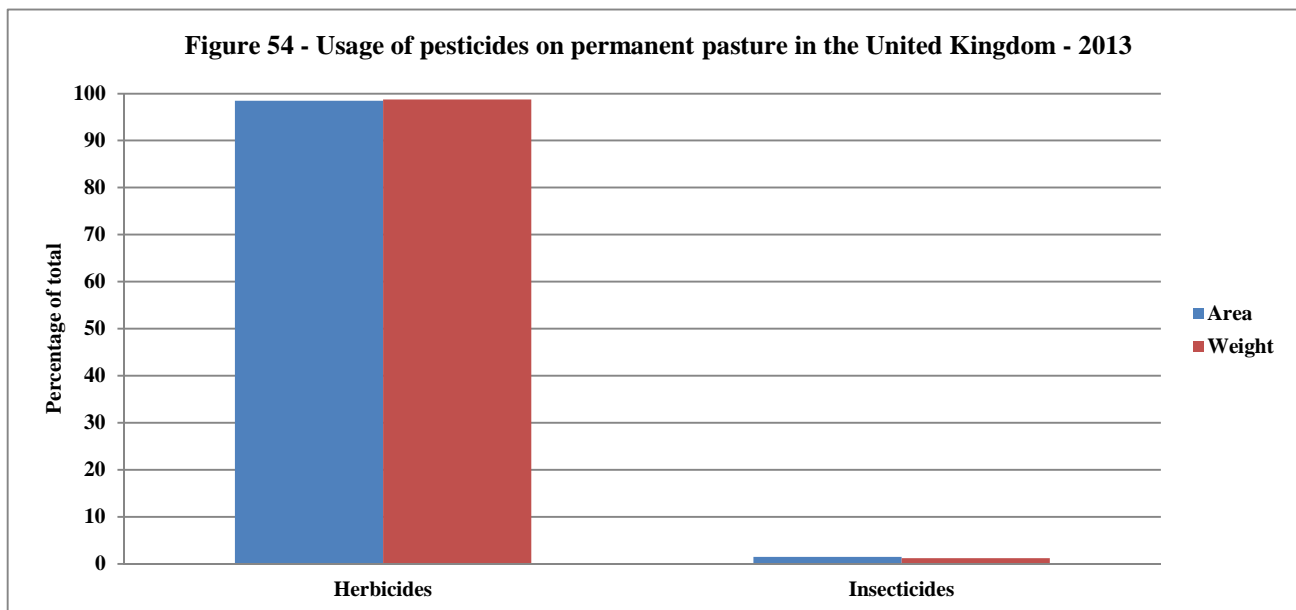
Grassland 2 -5 years old – Molluscicides

- **Formulation area treated: 993 hectares**
- **Weight of active substances applied: 0.18 tonnes**

Metaldehyde was the only molluscicide encountered.

PERMANENT PASTURE

- 5,801,747 hectares of permanent pasture grown in the United Kingdom
- 497,318 treated hectares
- 419.55 tonnes applied
- 93% of permanent pasture remained untreated
- Where treated, permanent pasture received an average of 1 spray with 1 product and 3 active substances

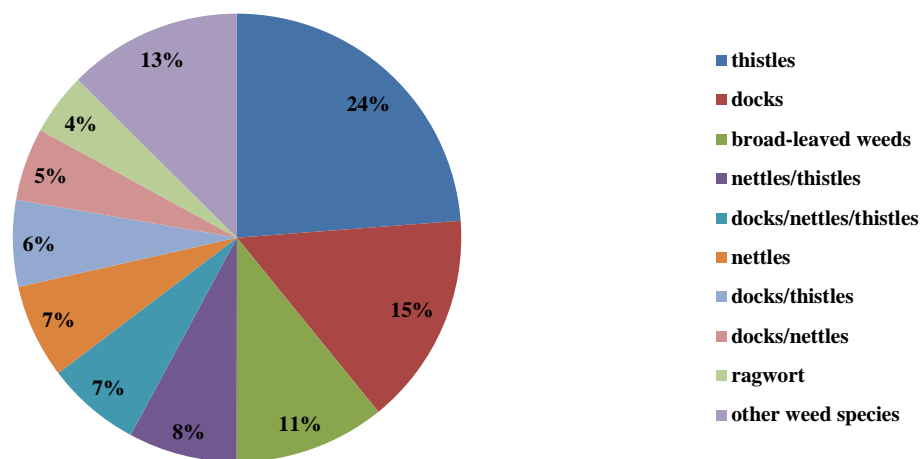


Permanent Pasture – Herbicides

- **Formulation area treated: 489,796 hectares**
- **Weight of active substances applied: 414.20 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of herbicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
MCPA	109,203	143,075	0.22	0.02	1.01	0.81
Clopyralid/triclopyr	95,032	50,434	0.19	0.01	1.13	0.61
Clopyralid/fluroxypyr/triclopyr	73,159	37,093	0.15	0.01	1.00	0.56
Fluroxypyr/triclopyr	55,504	26,934	0.11	0.01	1.00	0.81
2,4-D	27,935	35,437	0.06	<0.01	1.00	0.73

Figure 56 - Permanent pasture - reasons for use of herbicides (where given)



Permanent Pasture – Insecticides

- **Formulation area treated: 7,522 hectares**
- **Weight of active substances applied: 5.35 tonnes**

The only insecticide active substance recorded was chlorpyrifos. Leatherjacket control was the only reason specified for its use.

ROUGH GRAZING

- 3,939,855 hectares of rough grazing in the United Kingdom
- 8,044 treated hectares
- 18.60 tonnes applied
- Almost 100% of rough grazing remained untreated
- Where treated, rough grazing received an average of 1 spray with a single product and active substance

Figure 57 - Usage of pesticides on rough grazing in the United Kingdom - 2013

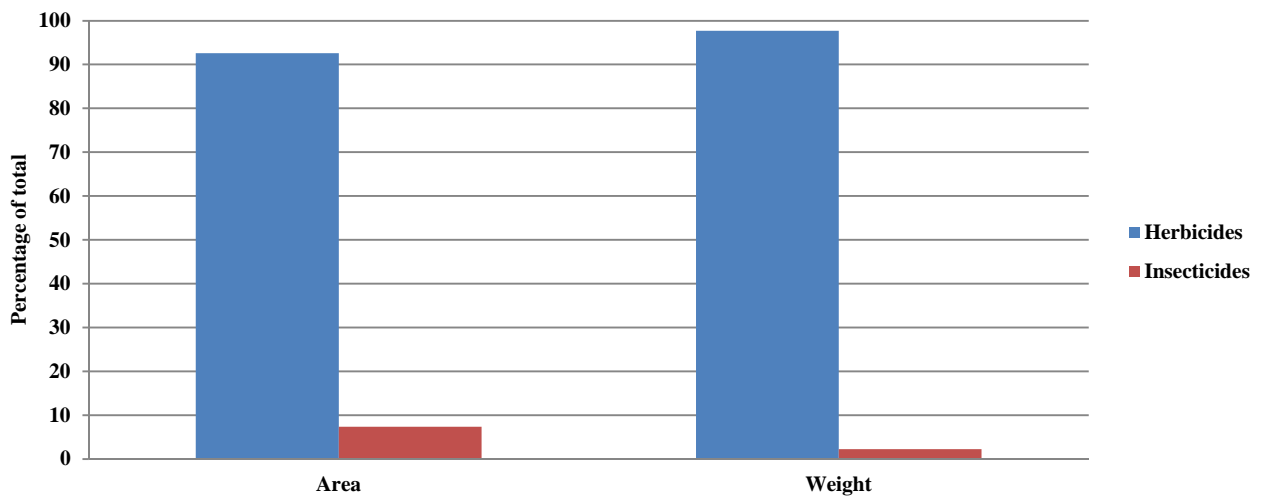
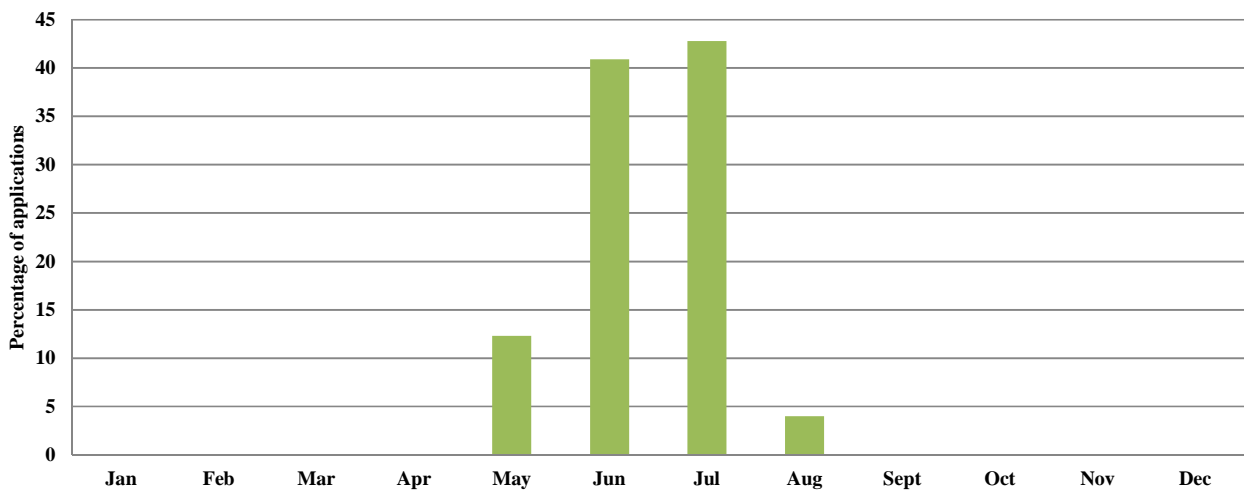


Figure 58 - Timing of herbicide applications on rough grazing in the United Kingdom - 2013

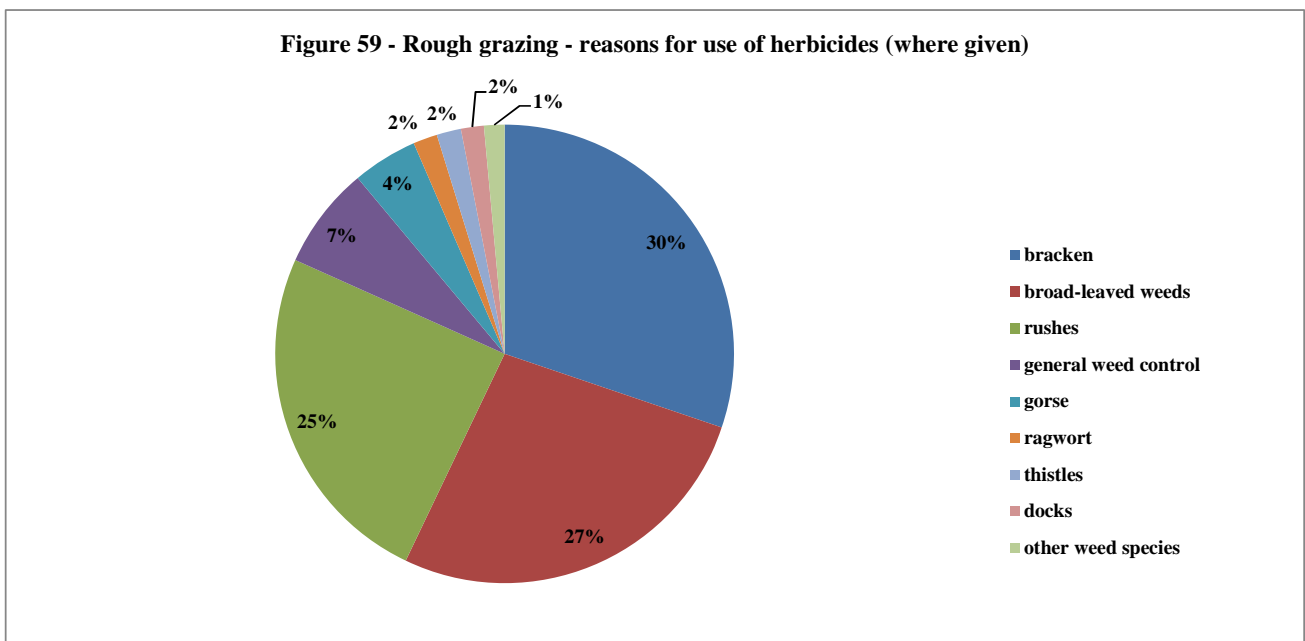


Rough Grazing – Herbicides

- **Formulation area treated: 7,450 hectares**
- **Weight of active substances applied: 18.17 tonnes**
- **The five most common formulations by area treated were:**

	Formulation area treated (ha)	Weight of a.s. applied (kg)	Proportion of herbicide – treated area	Proportion of census area treated	Average number of applications (where applied)	Average proportion of full label rate
Asulam	2,920	12,846	0.39	<0.01	1.00	1.00
MCPA	1,757	2,468	0.24	<0.01	1.00	0.85
Glyphosate	907	1,094	0.12	<0.01	1.00	0.56
Aminopyralid/fluroxypyr	457	75	0.06	<0.01	1.00	0.63
Dicamba/mecoprop-P	330	298	0.04	<0.01	1.00	1.00

The application of asulam, primarily for bracken control, is made at a relatively high rate compared to other herbicides, resulting in an overall high weight to area treated ratio.



Rough grazing – Insecticides

- **Formulation area treated: 594 hectares**
- **Weight of active substances applied: 0.43 tonnes**

The only insecticide active substance recorded was chlorpyrifos. Leatherjacket control was the only reason specified for its use.

APPENDIX 1 – APPLICATION TABLES

Table 1 Area of fodder crops & grassland grown by region in the United Kingdom - 2013 (hectares)

	East Midlands	Eastern	London & South East	North East	North West	South West	West Midlands	Yorkshire & the Humber	Wales	Scotland	Northern Ireland	United Kingdom
Maize	15,140	12,151	27,026	497	15,924	73,966	29,432	7,758	9,599	1,406	1,577	194,476
Turnips & swedes	.	.	1,109	611	1,608	993	193	73	3,772	4,106	.	12,465
Fodder beet & mangolds	2,024	411	835	303	1,795	3,986	4,377	4,028	2,066	465	410	20,700
Kale, cabbage & rape	.	.	481	306	322	908	829	1,089	939	3,904	.	8,778
Other crops for stockfeeding	1,463	1,469	2,372	298	3,387	8,176	1,048	1,074	12,619	9,106	4,368	45,380
Stubble turnips & catch crops	92	468	3,683	.	186	4,491	1,051	2,411	1,505	911	23	14,821
Grassland less than 5 years old ¹	57,488	37,065	78,552	32,691	86,510	226,922	90,627	57,859	143,720	439,061	139,170	1,389,665
Permanent pasture	284,560	178,497	384,359	258,987	539,897	891,482	396,746	338,650	997,620	882,165	648,784	5,801,747
Rough grazing	30,231	12,913	20,743	107,458	117,719	62,041	13,667	107,032	263,816	3,064,184	140,051	3,939,855
All fodder crops & grassland	390,998	242,974	519,160	401,151	767,348	1,272,965	537,970	519,974	1,435,656	4,405,308	934,383	11,427,887

¹ includes new leys – direct sown, new leys – undersown and grassland 2-5 years old

Table 2 Treated area of fodder crops & grassland in the United Kingdom 2013 by crop group (spray hectares)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough grazing	All crops
Fungicides	8,242	375	3,420	.	38,136	.	754	19,691	.	.	.	70,619
Growth regulators	.	.	.	.	9,320	.	.	1,916	82	.	.	11,318
Herbicides	452,250	9,767	108,377	4,618	46,479	2,165	59,885	25,655	65,770	489,796	7,450	1,272,212
Insecticides	4,154	829	5,244	1,733	4,541	372	3,072	2,348	2,545	7,522	594	32,955
Sulphur ¹	.	.	.	106	89	.	.	.	.	.	.	195
Molluscicides & repellents	951	130	.	92	2,226	1,351	2,823	.	993	.	.	8,567
All seed treatments	260,438	10,540	46,806	4,758	24,892	5,567	10,463	2,341	.	.	.	365,806
All pesticides	726,035	21,642	163,848	11,308	125,683	9,455	76,998	51,951	69,390	497,318	8,044	1,761,672

¹sulphur products may be applied as a fertiliser to overcome increasing problems with sulphur deficiency in crops, rather than for their fungicidal properties

Table 2a Usage of pesticides on fodder crops & grassland in the United Kingdom 2013 by crop group (kg of active substance applied)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough Grazing	All crops
Fungicides	1,593	60	1,119	.	9,788	.	94	5,306	.	.	.	17,960
Growth regulators	.	.	.	.	4,122	.	.	1,080	1	.	.	5,202
Herbicides	198,255	7,240	59,580	4,007	23,779	961	59,304	18,837	52,204	414,201	18,171	856,539
Insecticides	2,751	100	1,411	172	641	3	2,185	523	2,281	5,353	428	15,848
Sulphur	.	.	.	425	135	.	.	.	.	.	.	561
Molluscicides & repellents	156	26	.	14	390	247	482	.	181	.	.	1,496
All seed treatments	23,074	71	12,323	131	1,418	46	374	6	.	.	.	37,443
All pesticides	225,829	7,497	74,433	4,749	40,273	1,257	62,440	25,752	54,667	419,554	18,599	935,050

Table 3 Usage of pesticides on fodder crops & grassland in the United Kingdom 2013 - percentage area of crops treated with pesticides

	Insecticides	Fungicides	Herbicides	Sulphur	Growth regulators	Molluscicides & repellents	Seed treatments	Not treated¹
Maize	6.4	19.4	97.1	.	.	74.5	99.7	1.1
Turnips & Swedes	25.3	21.6	65.9	.	.	1.4	63.1	33.0
Fodder beet & mangolds	42.8	46.2	93.5	.	.	1.5	95.4	5.4
Kale, cabbage & rape	25.5	10.7	48.6	1.5	.	1.3	31.5	43.2
Other crops for stock feeding	10.2	46.9	56.3	.	17.1	4.7	53.8	41.2
Stubble turnips & catch crops	4.7	1.8	16.6	.	.	10.4	36	78.4
Grassland 2 - 5 years old	3	2	26.9	.	.	2.6	17.7	70.5
New leys - direct-sown	6.9	34.8	45.6	.	5.1	.	5.5	53.9
New leys - undersown	0.3	.	3.2	.	< 0.1	0.1	.	96.2
Permanent pasture	0.4	.	6.2	.	.	.	.	93.3
Rough grazing	< 0.1	.	0.2	.	.	.	.	99.8
All crops	0.6	1.1	6.0	< 0.1	0.1	1.9	60.2	92.9

¹ the area not treated with foliar or granular applications (including molluscicides) – seed treatments excluded

Table 4a Usage of pesticides on fodder and forage crops in the United Kingdom 2013 - number of applications made to crops when treated with individual pesticide groups (excluding seed treatments)¹

	Insecticides	Fungicides	Herbicides	Growth regulators	Molluscicides & repellents	Sulphur	All Pesticides
Maize	0.9	0.9	2	.	1	.	1.9
Turnips & Swedes	1.2	1	1	.	1	.	1.3
Fodder beet & mangolds	1	1	3	.	.	.	4
Kale, cabbage & rape	1	.	1	.	1	1	1
Other crops for stock feeding	1	2	1.3	1.3	1.2	.	2
Stubble turnips & catch crops	1	.	1	.	1	.	1
Grassland 2 - 5 years old	1	.	1.2	1	1.2	.	1.2
New leys - direct-sown	1	1	1.2	.	1.1	.	1.3
New leys - undersown	1	1.4	1.2	1.1	.	.	1.6
Permanent pasture	1	.	1	.	.	.	1.3
Rough grazing	1	.	1	.	.	.	1
All crops	1	1.3	1.4	1.2	1	1	1.5

¹ indicates number of passes of application machinery as some herbicides may be applied using weed wipers and some insecticides/molluscicides as granules or pellets. Parts of fields may be treated more than once or one field may have several different parts visited on different occasions. The number of applications relates only to those crops receiving a treatment with an individual pesticide group. In some cases only part of a field may have been treated resulting in a proportion in the table above.

Table 4b Usage of pesticides on fodder and forage crops in the United Kingdom 2013 - number of products applied to crops when treated with individual pesticide groups (excluding seed treatments)¹

	Insecticides	Fungicides	Herbicides	Growth regulators	Molluscicides & repellents	Sulphur	All pesticides
Maize	1	1	3	.	1	.	2.8
Turnips & swedes	1.4	1.5	1	.	1	.	1.5
Fodder beet & mangolds	1	1	6	.	.	.	7
Kale, cabbage & rape	1	.	1	.	1	1	1
Other crops for stock feeding	1	2	1.8	1.5	1.2	.	4
Stubble turnips & catch crops	1	.	1	.	1	.	1
Grassland 2 - 5 years old	1	.	1.4	1	1.2	.	1.4
New leys - direct-sown	1	1	1.4	.	1.2	.	1.6
New leys - undersown	1	2	1.6	1.1	.	.	2.8
Permanent pasture	1	.	1	.	.	.	1.3
Rough grazing	1	.	1	.	.	.	1
All crops	1	1.8	1.8	1.4	1.1	1	2

Table 4c Usage of pesticides on fodder and forage crops in the United Kingdom 2013 - number of active substances applied to crops when treated with individual pesticide groups (excluding seed treatments)¹

	Insecticides	Fungicides	Herbicides	Growth regulators	Molluscicides & repellents	Sulphur	All Pesticides
Maize	1	1	3	.	1	.	3.4
Turnips & swedes	1.4	1.5	1	.	1	.	1.5
Fodder beet & mangolds	1	2	11	.	.	.	12
Kale, cabbage & rape	1	.	1	.	1	1	1
Other crops for stock feeding	1	4	2.6	1.6	1.2	.	6
Stubble turnips & catch crops	1	.	1	.	1	.	1
Grassland 2 - 5 years old	1	.	1.2	1	1.2	.	1.2
New leys - direct-sown	1	1	1.2	.	1.1	.	1.3
New leys - undersown	1	1.4	1.2	1.1	.	.	1.6
Permanent pasture	1	.	3	.	.	.	2.5
Rough grazing	1	.	2	.	.	.	1
All crops	1	3	2.9	1.5	1.1	1	3.1

¹ indicates number of passes of application machinery as some herbicides may be applied using weed wipers and some insecticides/molluscicides as granules or pellets. Parts of fields may be treated more than once or one field may have several different parts visited on different occasions. The number of applications relates only to those crops receiving a treatment with an individual pesticide group. In some cases only part of a field may have been treated resulting in a proportion in the table above.

Table 5 Usage of pesticides on fodder crops & grassland grown in the United Kingdom, 2013 (spray hectares)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough grazing	All crops
Fungicides												
Azoxystrobin/chlorothalonil	.	.	.	.	1,612	.	.	696	.	.	.	2,308
Azoxystrobin/cyproconazole	.	.	1,262	.	534	.	.	.	.	.	.	1,796
Chlorothalonil	.	.	.	.	3,872	.	.	2,347	.	.	.	6,219
Epoxiconazole/fenpropimorph/metrafenone	.	.	.	.	1,795	.	.	889	.	.	.	2,684
Epoxiconazole/metconazole	.	.	.	.	1,338	.	.	893	.	.	.	2,231
Fluoxastrobin/prothioconazole/trifloxystrobin	.	.	.	.	1,256	.	.	1,152	.	.	.	2,408
Flusilazole	2,570	130	86	.	.	.	.	136	.	.	.	2,922
Folpet	.	.	.	.	971	.	.	1,056	.	.	.	2,028
Prothioconazole	.	.	.	.	2,827	.	.	743	.	.	.	3,570
Prothioconazole/spiroxamine	.	.	.	.	1,223	.	.	919	.	.	.	2,143
Prothioconazole/tebuconazole	.	.	.	.	2,311	.	.	3,252	.	.	.	5,563
Prothioconazole/trifloxystrobin	.	.	.	.	996	.	.	1,049	.	.	.	2,045
Pyraclostrobin	5,672	.	.	.	284	.	.	.	.	.	.	5,956
Unspecified fungicides	.	.	.	.	1,863	.	.	.	.	.	.	1,863
Other fungicides ¹	.	245	2,072	.	17,253	.	754	6,559	.	.	.	26,884
All Fungicides	8,242	375	3,420	.	38,136	.	754	19,691	.	.	.	70,619
Sulphur	.	.	.	106	89	.	.	.	.	.	.	195

¹ Other fungicides include azoxystrobin, azoxystrobin/fenpropimorph, bixafen/fluoxastrobin/prothioconazole, bixafen/prothioconazole, bixafen/prothioconazole/tebuconazole, boscalid/epoxiconazole, carbendazim/flusilazole, chlorothalonil/cyproconazole, chlorothalonil/cyproconazole/propiconazole, chlorothalonil/flusilazole, chlorothalonil/penthiopyrad, chlorothalonil/picoxystrobin, chlorothalonil/tebuconazole, cyflufenamid, cyproconazole, cyproconazole/trifloxystrobin, cyprodinil, cyprodinil/isopyrazam, cyprodinil/picoxystrobin, difenoconazole/fenpropidin, dimoxystrobin/epoxiconazole, epoxiconazole, epoxiconazole/fenpropimorph, epoxiconazole/fenpropimorph/kresoxim-methyl, epoxiconazole/fenpropimorph/pyraclostrobin, epoxiconazole/fluxapyroxad/pyraclostrobin, epoxiconazole/isopyrazam, epoxiconazole/kresoxim-methyl/pyraclostrobin, epoxiconazole/metrafenone, epoxiconazole/prochloraz, epoxiconazole/pyraclostrobin, famoxadone/flusilazole, fenpropidin, fenpropimorph, fenpropimorph/flusilazole, fenpropimorph/pyraclostrobin, fluoxastrobin/prothioconazole, fluxapyroxad, fluxapyroxad/metconazole, isopyrazam, mancozeb, metconazole, metconazole, metconazole, metrafenone, penthiopyrad, prochloraz, prochloraz/proquinazid/tebuconazole, propiconazole, proquinazid, prothioconazole/spiroxamine/tebuconazole, spiroxamine, spiroxamine/tebuconazole, tebuconazole, trifloxystrobin,

Table 5 (cont) Usage of pesticides on fodder crops & grassland grown in the United Kingdom, 2013 (spray hectares)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough grazing	All crops
Herbicides												
2,4-D	.	.	.	.	136	.	786	.	1,723	27,935	160	30,741
2,4-D/MCPA	.	.	.	.	97	.	.	199	1,173	11,833	165	13,467
2,4-D/dicamba	.	.	.	.	.	.	.	.	87	2,904	.	2,991
2,4-DB	.	.	.	.	1,931	.	5,739	5,809	1,007	59	.	14,545
Amidosulfuron	.	.	.	.	472	.	.	35	4,753	4,545	.	9,804
Aminopyralid/fluroxypyr	.	.	.	.	.	.	451	.	1,687	18,874	457	21,469
Asulam	.	.	.	.	.	.	.	.	597	1,477	2,920	4,994
Bromoxynil	11,041	.	.	.	.	.	.	.	.	.	.	11,041
Bromoxynil/prosulfuron	2,511	.	.	.	.	.	.	.	.	.	.	2,511
Bromoxynil/terbuthylazine	26,097	.	.	.	.	.	.	.	.	.	.	26,097
Chloridazon	.	.	3,105	.	.	.	.	.	.	.	.	3,105
Chloridazon/ethofumesate	.	.	3,415	.	.	.	.	.	.	.	.	3,415
Chloridazon/metamitron	.	.	2,729	.	.	.	.	.	.	.	.	2,729
Clopyralid	5,797	117	3,168	30	.	.	150	.	.	413	.	9,675
Clopyralid/fluroxypyr/triclopyr	.	.	.	.	.	.	6,624	317	3,818	73,159	12	83,931
Clopyralid/triclopyr	.	.	.	.	.	.	360	.	12,680	95,032	195	108,267
Desmedipham/ethofumesate/lenacil/phenmedipham	.	.	17,745	.	.	.	.	.	.	.	.	17,745
Desmedipham/ethofumesate/phenmedipham	.	.	4,921	.	.	.	.	.	.	.	.	4,921
Dicamba/MCPA/mecoprop-P	.	.	.	10	2,062	.	3,028	1,111	2,422	22,784	119	31,535
Dicamba/mecoprop-P	.	.	.	.	1,256	.	2,565	1,799	1,983	9,824	330	17,756
Dicamba/prosulfuron	3,955	.	.	.	.	.	.	.	.	.	.	3,955
Dimethenamid-P/pendimethalin	5,753	.	.	.	.	.	.	.	.	.	.	5,753
Diquat	385	.	242	.	1,204	.	.	148	.	.	.	1,979
Ethofumesate	.	.	4,717	.	.	.	.	.	.	.	.	4,717
Ethofumesate/metamitron	.	.	2,055	.	.	.	.	.	.	.	.	2,055
Flufenacet/isoxaflutole	4,385	.	.	.	.	.	.	.	.	.	.	4,385
Fluroxypyr	12,534	.	.	.	5,325	.	974	1,030	1,301	8,047	146	29,358
Fluroxypyr/triclopyr	.	.	.	.	.	.	1,773	.	8,513	55,504	156	65,945
Glyphosate	51,777	3,774	1,259	2,307	6,670	518	23,693	4,521	2,242	12,917	907	110,584
Lenacil	.	.	2,235	.	.	.	.	.	.	.	.	2,235

Table 5 (cont) Usage of pesticides on fodder crops & grassland grown in the United Kingdom, 2013 (spray hectares)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough grazing	All crops
Herbicides (cont)												
MCPA	158	.	.	.	853	.	2,399	1,061	16,592	109,203	1,757	132,021
Mecoprop-P	.	.	.	.	1,211	.	5,174	792	2,820	15,161	.	25,158
Mesotrione	79,644	.	.	.	.	.	.	.	.	.	.	79,644
Mesotrione/nicosulfuron	2,081	.	.	.	.	.	.	.	.	.	.	2,081
Mesotrione/terbuthylazine	65,463	.	.	.	.	.	.	.	.	.	.	65,463
Metamitron	.	.	30,856	.	.	.	.	.	.	.	.	30,856
Metazachlor	.	4,584	.	1,181	.	109	.	.	.	.	.	5,874
Metsulfuron-methyl	158	.	.	.	3,321	.	150	71	411	5,469	.	9,580
Metsulfuron-methyl/thifensulfuron-methyl	.	.	.	.	2,632	.	.	135	.	.	.	2,767
Metsulfuron-methyl/tribenuron-methyl	.	.	.	.	2,605	.	.	.	.	.	.	2,605
Nicosulfuron	113,663	.	.	.	44	.	.	.	.	.	.	113,707
Pendimethalin	49,084	.	.	.	1,557	.	.	135	38	.	.	50,813
Pendimethalin/terbuthylazine	7,391	.	.	.	.	.	.	.	.	.	.	7,391
Phenmedipham	.	.	12,622	.	.	.	.	.	.	.	.	12,622
Propaquizafop	.	47	1,623	.	.	848	.	.	.	.	.	2,519
Prosulfuron	4,022	.	.	.	.	.	.	.	.	.	.	4,022
S-metolachlor	3,102	.	.	.	.	.	.	.	.	.	.	3,102
Thifensulfuron-methyl	.	.	.	.	.	.	359	.	836	932	.	2,127
Tribenuron-methyl	.	.	.	.	1,741	.	5,092	6,160	537	886	.	14,416
Triflusaluron-methyl	.	.	13,761	.	.	.	.	.	.	.	.	13,761
Unspecified herbicides	1,588	.	370	410	119	103	267	.	117	10,834	.	13,808
Other herbicides ²	1,663	1,245	3,555	680	13,244	588	302	2,334	432	2,005	127	26,173
All Herbicides	452,250	9,767	108,377	4,618	46,479	2,165	59,885	25,655	65,770	489,796	7,450	1,272,212

² Other herbicides include 2,4-D/dicamba/dichlorprop-P, 2,4-D/dicamba/triclopyr, 2,4-DB/MCPA, 2,4-DB/linuron/MCPA, amidosulfuron/iodosulfuron-methyl-sodium, aminopyralid/triclopyr, bentazone, bromoxynil/ioxynil, carbetamide, carfentrazone-ethyl, chloridazon/quinmerac, chlorotoluron/diflufenican, clomazone, clomazone/linuron, clopyralid/florasulam/fluroxypyr, cycloxydim, desmedipham/phenmedipham, dicamba, dichlorprop-P, dichlorprop-P/MCPA/mecoprop-P, diflufenican, diflufenican/flufenacet, diflufenican/flupyr-sulfuron-methyl, diflufenican/flurtamone, diflufenican/iodosulfuron-methyl-sodium/mesosulfuron-methyl, diflufenican/mecoprop-P, diflufenican/pendimethalin, ethofumesate/phenmedipham, florasulam/fluroxypyr, florasulam/pyrox-sulam, fluazifop-P-butyl, flufenacet/pendimethalin, flupyr-sulfuron-methyl, flupyr-sulfuron-methyl/thifensulfuron-methyl, foramsulfuron/iodosulfuron-methyl-sodium, imazamox/pendimethalin, iodosulfuron-methyl-sodium, iodosulfuron-methyl-sodium/mesosulfuron-methyl, lenacil/triflusaluron-methyl, MCPB, metazachlor/quinmerac, pendimethalin/picolinafen, pendimethalin/pyrox-sulam, pinoxaden, propyzamide, pyridate, rimsulfuron, sulfosulfuron, tepraloxym, thifensulfuron-methyl/tribenuron-methyl,

Table 5 (cont) Usage of pesticides on fodder crops & grassland grown in the United Kingdom, 2013 (spray hectares)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough grazing	All crops
<i>Growth regulators</i>												
Chloromequat	.	.	.	.	4,982	.	.	1,091	.	.	.	6,073
Trinexapac-ethyl	.	.	.	.	2,361	.	.	732	.	.	.	3,093
Other growth regulators ³	.	.	.	.	1,977	.	.	93	82	.	.	2,152
All Growth regulators	.	.	.	.	9,320	.	.	1,916	82	.	.	11,318
<i>Insecticides</i>												
Chlorpyrifos	3,911	118	1,333	217	845	.	3,072	533	2,545	7,522	594	20,690
Cypermethrin	.	.	515	366	618	.	.	.	.	.	.	1,499
Deltamethrin	.	504	115	1,072	53	224	.	254	.	.	.	2,223
Lambda-cyhalothrin	121	92	1,788	.	450	.	.	1,451	.	.	.	3,903
Other insecticides & nematicides ⁴	121	115	1,493	78	2,575	147	.	110	.	.	.	4,639
All Insecticides & nematicides	4,154	829	5,244	1,733	4,541	372	3,072	2,348	2,545	7,522	594	32,955
<i>Molluscicides & repellents</i>												
Ferric phosphate	.	.	.	.	986	.	514	.	.	.	.	1,500
Metaldehyde	951	130	.	92	1,240	1,351	2,015	.	993	.	.	6,772
Methiocarb	.	.	.	.	.	.	295	.	.	.	.	295
All Molluscicides & repellents	951	130	.	92	2,226	1,351	2,823	.	993	.	.	8,567

³Other growth regulators include 2-chloroethylphosphonic acid, 2-chloroethylphosphonic acid/mepiquat, chlormequat chloride/2-chloroethylphosphonic acid, chlormequat chloride/2-chloroethylphosphonic acid/mepiquat chloride, chlormequat/2-chloroethylphosphonic acid, chlormequat/imazaquin, gibberellic acid, mepiquat chloride/prohexadione-calcium,

⁴Other insecticides and nematicides include alpha-cypermethrin, dimethoate, esfenvalerate, oxamyl, pirimicarb, zeta-cypermethrin,

Table 5 (cont) Usage of pesticides on fodder crops & grassland grown in the United Kingdom, 2013 (spray hectares)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough grazing	All crops
Fungicide seed treatments												
Fludioxonil	1,378	.	.	.	2,105	.	.	.	.	.	.	3,483
Fludioxonil/metalaxyl	2,560	.	.	.	.	.	.	.	.	.	.	2,560
Fludioxonil/metalaxyl-M	18,587	.	.	.	.	.	.	.	.	.	.	18,587
Fluopyram/prothioconazole/tebuconazole	.	.	.	.	2,503	.	.	.	.	.	.	2,503
Hymexazol	.	.	11,820	.	.	.	.	.	.	.	.	11,820
Iprodione	.	.	5,592	.	.	.	.	.	.	.	.	5,592
Prochloraz/triticonazole	.	.	.	.	6,683	.	.	.	.	.	.	6,683
Prothioconazole	.	.	.	.	330	.	.	.	.	.	.	330
Thiram	34,765	3,030	13,736	995	854	284	1,404	343	.	.	.	55,411
Other fungicides ⁵	1,378	248	.	50	3,957	.	625	.	.	.	.	6,257
All Fungicides	58,669	3,278	31,147	1,045	16,431	284	2,029	343	.	.	.	113,225
Fungicide/insecticide seed treatments												
Clothianidin/prothioconazole	.	.	.	.	2,029	.	.	.	.	.	.	2,029
Other fungicide/insecticide ⁶	.	316	.	363	36	149	.	.	.	.	.	864
All Fungicide/insecticide	.	316	.	363	2,065	149	.	.	.	.	.	2,893
Insecticide seed treatments												
Clothianidin	10,150	.	.	.	295	.	.	.	.	.	.	10,445
Imidacloprid	7,975	.	2,924	.	.	.	.	.	.	.	.	10,900
Methiocarb	147,614	.	263	.	.	.	.	.	.	.	.	147,877
Tefluthrin	.	.	6,762	410	.	.	.	.	.	.	.	7,172
Thiamethoxam	.	3,108	731	1,996	.	1,019	.	.	.	.	.	6,854
Other insecticides & nematocides ⁷	.	632	216	.	.	182	.	.	.	.	.	1,030
All Insecticides & nematocides	18,125	3,740	10,634	2,405	295	1,202	.	.	.	.	.	36,400

⁵Other fungicide seed treatments include *Bacillus subtilis*, carboxin/thiram, difenoconazole/fludioxonil, fludioxonil/flutriafol, fludioxonil/tefluthrin, fluquinconazole/prochloraz, fuberidazole/triadimenol, imazalil, imazalil/ipconazole, metalaxyl, metalaxyl-m, silthiofam, tebuconazole.

⁶Other fungicide/insecticide seed treatments were carbosulfan/thiram, clothianidin/prothioconazole/tebuconazole/triazoxide, fludioxonil/metalaxyl-M/thiamethoxam.

⁷Other insecticide seed treatments were beta-cyfluthrin/clothianidin, beta-cyfluthrin/imidacloprid, unspecified insecticides.

Table 5 (cont) Usage of pesticides on fodder crops & grassland grown in the United Kingdom, 2013 (spray hectares)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough grazing	All crops
Other seed treatments												
Growth promoters	.	.	.	.	95	.	3,049	.	.	.	.	3,144
Unspecified SPD seed treatments ⁸	.	.	.	.	900	.	3,729	.	.	.	.	4,629
Unspecified seed treatments	35,144	3,206	4,762	742	4,906	3,931	1,530	1,998	.	.	.	56,219
Other seed treatments ⁹	886	.	.	203	201	2	127	.	.	.	.	1,419
All other seed treatments	36,030	3,206	4,762	945	6,102	3,932	8,434	1,998	.	.	.	65,410
All seed treatments	260,438	10,540	46,806	4,758	24,893	5,567	10,463	2,341	.	.	.	365,805
Untreated	639	4,596	948	6,009	20,985	9,479	182,521	33,667	.	.	.	258,845

⁸Unspecified SPD seed treatments are fungicides

⁹Other seed treatments include rhizobial inoculum

Table 6 Usage of pesticides on fodder crops & grassland grown in the United Kingdom, 2013 (kg of active substances)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough grazing	All crops
Fungicides												
Azoxystrobin/chlorothalonil	.	.	.	.	768	.	.	453	.	.	.	1,221
Azoxystrobin/cyproconazole	.	.	290	.	88	.	.	.	.	.	.	377
Chlorothalonil	.	.	.	.	1,978	.	.	1,569	.	.	.	3,547
Epoxiconazole/fenpropimorph/metrafenone	.	.	.	.	726	.	.	331	.	.	.	1,057
Epoxiconazole/metconazole	.	.	.	.	154	.	.	69	.	.	.	223
Fluoxastrobin/prothioconazole/trifloxystrobin	.	.	.	.	227	.	.	174	.	.	.	401
Flusilazole	431	13	14	.	.	.	.	16	.	.	.	474
Folpet	.	.	.	.	503	.	.	345	.	.	.	848
Prothioconazole	.	.	.	.	330	.	.	75	.	.	.	405
Prothioconazole/spiroxamine	.	.	.	.	435	.	.	215	.	.	.	650
Prothioconazole/tebuconazole	.	.	.	.	405	.	.	383	.	.	.	788
Prothioconazole/trifloxystrobin	.	.	.	.	140	.	.	86	.	.	.	226
Pyraclostrobin	1,162	.	.	.	17	.	.	.	.	.	.	1,179
Unspecified fungicides	.	.	.	.	.	.	.	.	.	.	.	.
All fungicides	1,593	60	1,119	.	9,788	.	94	5,306	.	.	.	17,960
Sulphur	.	.	.	425	135	.	.	.	.	.	.	561

¹ Other fungicides include azoxystrobin, azoxystrobin/fenpropimorph, bixafen/fluoxastrobin/prothioconazole, bixafen/prothioconazole, bixafen/prothioconazole/tebuconazole, boscalid/epoxiconazole, carbendazim/flusilazole, chlorothalonil/cyproconazole, chlorothalonil/cyproconazole/propiconazole, chlorothalonil/flusilazole, chlorothalonil/penthiopyrad, chlorothalonil/picoxystrobin, chlorothalonil/tebuconazole, cyflufenamid, cyproconazole, cyproconazole/trifloxystrobin, cyprodinil, cyprodinil/isopyrazam, cyprodinil/picoxystrobin, difenoconazole/fenpropidin, dimoxystrobin/epoxiconazole, epoxiconazole, epoxiconazole/fenpropimorph, epoxiconazole/fenpropimorph/kresoxim-methyl, epoxiconazole/fenpropimorph/pyraclostrobin, epoxiconazole/fluxapyroxad/pyraclostrobin, epoxiconazole/isopyrazam, epoxiconazole/kresoxim-methyl/pyraclostrobin, epoxiconazole/metrafenone, epoxiconazole/prochloraz, epoxiconazole/pyraclostrobin, famoxadone/flusilazole, fenpropidin, fenpropimorph, fenpropimorph/flusilazole, fenpropimorph/pyraclostrobin, fluoxastrobin/prothioconazole, fluxapyroxad, fluxapyroxad/metconazole, isopyrazam, mancozeb, metconazole, metrafenone, penthiopyrad, prochloraz, prochloraz/proquinazid/tebuconazole, propiconazole, proquinazid, prothioconazole/spiroxamine/tebuconazole, spiroxamine, spiroxamine/tebuconazole, tebuconazole, trifloxystrobin,

Table 6 (cont) Usage of pesticides on fodder crops & grassland grown in the United Kingdom, 2013 (kg of active substances)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough grazing	All crops
Herbicides												
2,4-D	.	.	.	.	68	.	565	.	1,706	35,437	240	38,016
2,4-D/MCPA	.	.	.	.	131	.	.	269	2,074	21,116	312	23,902
2,4-D/dicamba	.	.	.	.	.	.	.	.	101	4,042	.	4,143
2,4-DB	.	.	.	.	2,320	.	7,416	6,643	863	48	.	17,288
Amidosulfuron	.	.	.	.	14	.	.	1	207	203	.	424
Aminopyralid/fluroxypyr	.	.	.	.	.	.	92	.	409	4,927	75	5,503
Asulam	.	.	.	.	.	.	.	.	1,218	1,702	12,846	15,767
Bromoxynil	3,338	.	.	.	.	.	.	.	.	.	.	3,338
Bromoxynil/prosulfuron	730	.	.	.	.	.	.	.	.	.	.	730
Bromoxynil/terbuthylazine	21,260	.	.	.	.	.	.	.	.	.	.	21,260
Chloridazon	.	.	2,748	.	.	.	.	.	.	.	.	2,748
Chloridazon/ethofumesate	.	.	5,057	.	.	.	.	.	.	.	.	5,057
Chloridazon/metamitron	.	.	3,562	.	.	.	.	.	.	.	.	3,562
Clopyralid	557	23	198	.	.	.	2	.	.	37	.	824
Clopyralid/fluroxypyr/triclopyr	.	.	.	.	.	.	4,551	143	1,763	37,093	11	43,560
Clopyralid/triclopyr	.	.	.	.	.	.	144	.	5,421	50,434	164	56,163
Desmedipham/ethofumesate/lenacil/phenmedipham	.	.	3,960	.	.	.	.	.	.	.	.	3,960
Desmedipham/ethofumesate/phenmedipham	.	.	1,691	.	.	.	.	.	.	.	.	1,691
Dicamba/MCPA/mecoprop-P	.	.	.	17	3,181	.	4,646	1,670	2,976	33,997	354	46,839
Dicamba/mecoprop-P	.	.	.	.	595	.	1,958	1,203	1,684	8,101	298	13,839
Dicamba/prosulfuron	626	.	.	.	.	.	.	.	.	.	.	626
Dimethenamid-P/pendimethalin	8,700	.	.	.	.	.	.	.	.	.	.	8,700
Diquat	115	.	73	.	470	.	.	157	.	.	.	814
Ethofumesate	.	.	1,874	.	.	.	.	.	.	.	.	1,874
Ethofumesate/metamitron	.	.	1,252	.	.	.	.	.	.	.	.	1,252
Flufenacet/isoxaflutole	1,192	.	.	.	.	.	.	.	.	.	.	1,192
Fluroxypyr	1,963	.	.	.	611	.	159	183	317	2,243	22	5,499
Fluroxypyr/triclopyr	.	.	.	.	.	.	779	.	3,667	26,934	87	31,466
Glyphosate	51,265	3,888	1,172	2,817	7,574	807	29,916	5,215	2,574	24,321	1,094	130,642
Lenacil	.	.	382	.	.	.	.	.	.	.	.	382

Table 6 (cont) Usage of pesticides on fodder crops & grassland grown in the United Kingdom, 2013 (kg of active substances)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough grazing	All crops
Herbicides (cont)												
MCPA	261	.	.	.	705	.	2,471	717	23,738	143,075	2,468	173,435
Mecoprop-P	.	.	.	.	1,069	.	6,222	554	3,078	18,806	.	29,728
Mesotrione	6,654	.	.	.	.	.	.	.	.	.	.	6,654
Mesotrione/nicosulfuron	252	.	.	.	.	.	.	.	.	.	.	252
Mesotrione/terbuthylazine	26,713	.	.	.	.	.	.	.	.	.	.	26,713
Metamitron	.	.	32,900	.	.	.	.	.	.	.	.	32,900
Metazachlor	.	3,147	.	690	.	81	.	.	.	.	.	3,918
Metsulfuron-methyl	1	.	.	.	16	.	<1	<1	1	9	.	28
Metsulfuron-methyl/thifensulfuron-methyl	.	.	.	.	105	.	.	3	.	.	.	107
Metsulfuron-methyl/tribenuron-methyl	.	.	.	.	31	.	.	.	.	.	.	31
Nicosulfuron	3,775	.	.	.	2	.	.	.	.	.	.	3,777
Pendimethalin	61,364	.	.	.	1,837	.	.	133	36	.	.	63,370
Pendimethalin/terbuthylazine	5,455	.	.	.	.	.	.	.	.	.	.	5,455
Phenmedipham	.	.	3,355	.	.	.	.	.	.	.	.	3,355
Propaquizafop	.	4	192	.	.	49	.	.	.	.	.	245
Prosulfuron	55	.	.	.	.	.	.	.	.	.	.	55
S-metolachlor	3,734	.	.	.	.	.	.	.	.	.	.	3,734
Thifensulfuron-methyl	.	.	.	.	.	.	4	.	9	10	.	23
Tribenuron-methyl	.	.	.	.	11	.	24	33	3	4	.	76
Triflusaluron-methyl	.	.	182	.	.	.	.	.	.	.	.	182
Other herbicides ²	246	179	981	478	5,040	23	355	1,915	359	1,661	202	11,439
All herbicides	198,255	7,240	59,580	4,007	23,779	961	59,304	18,837	52,204	414,201	18,171	856,539

² Other herbicides include 2,4-D/dicamba/dichlorprop-P, 2,4-D/dicamba/triclopyr, 2,4-DB/MCPA, 2,4-DB/linuron/MCPA, amidosulfuron/iodosulfuron-methyl-sodium, aminopyralid/triclopyr, bentazone, bromoxynil/ioxynil, carbetamide, carfentrazone-ethyl, chloridazon/quinmerac, chlorotoluron/diflufenican, clomazone, clomazone/linuron, clopyralid/florasulam/fluroxypyr, cycloxydim, desmedipham/phenmedipham, dicamba, dichlorprop-P, dichlorprop-P/MCPA/mecoprop-P, diflufenican, diflufenican/flufenacet, diflufenican/flupyralsulfuron-methyl, diflufenican/flurtamone, diflufenican/iodosulfuron-methyl-sodium/mesosulfuron-methyl, diflufenican/mecoprop-P, diflufenican/pendimethalin, ethofumesate/phenmedipham, florasulam/fluroxypyr, florasulam/pyroxsulam, fluazifop-P-butyl, flufenacet/pendimethalin, flupyralsulfuron-methyl, flupyralsulfuron-methyl/thifensulfuron-methyl, foramsulfuron/iodosulfuron-methyl-sodium, imazamox/pendimethalin, iodosulfuron-methyl-sodium, iodosulfuron-methyl-sodium/mesosulfuron-methyl, lenacil/triflusaluron-methyl, MCPB, metazachlor/quinmerac, pendimethalin/picolinafen, pendimethalin/pyroxsulam, pinoxaden, propyzamide, pyridate, rimsulfuron, sulfosulfuron, tepraloxymid, thifensulfuron-methyl/tribenuron-methyl,

Table 6 (cont) Usage of pesticides on fodder crops & grassland grown in the United Kingdom, 2013 (kg of active substances)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough grazing	All crops
<i>Growth regulators</i>												
Chloromequat	.	.	.	.	3,292	.	.	970	.	.	.	4,262
Trinexapac-ethyl	.	.	.	.	111	.	.	9	.	.	.	120
Other growth regulators ³	.	.	.	.	720	.	.	100	1	.	.	820
All Growth regulators	.	.	.	.	4,122	.	.	1,080	1	.	.	5,202
<i>Insecticides</i>												
Chlorpyrifos	2,733	85	961	154	604	.	2,185	516	2,281	5,353	428	15,300
Cypermethrin	.	.	13	9	16	.	.	.	.	.	.	38
Deltamethrin	.	3	1	7	<1	2	.	1	.	.	.	15
Lambda-cyhalothrin	1	<1	12	.	2	.	.	5	.	.	.	20
Other insecticides & nematicides ⁴	17	11	424	1	19	1	.	<1	.	.	.	474
All Insecticides & nematicides	2,751	100	1,411	172	641	3	2,185	523	2,281	5,353	428	15,848
<i>Molluscicides & repellents</i>												
Ferric phosphate	.	.	.	.	155	.	55	.	.	.	.	210
Metaldehyde	156	26	.	14	235	247	395	.	181	.	.	1,254
Methiocarb	.	.	.	.	.	.	32	.	.	.	.	32
All Molluscicides & repellents	156	26	.	14	390	247	482	.	181	.	.	1,496

³Other growth regulators include 2-chloroethylphosphonic acid, 2-chloroethylphosphonic acid/mepiquat, chloromequat chloride/2-chloroethylphosphonic acid, chloromequat chloride/2-chloroethylphosphonic acid/mepiquat chloride, chloromequat/2-chloroethylphosphonic acid, chloromequat/imazaquin, gibberellic acid, mepiquat chloride/prohexadione-calcium.

⁴Other insecticides and nematicides include alpha-cypermethrin, dimethoate, esfenvalerate, oxamyl, pirimicarb, zeta-cypermethrin,

Table 6 (cont) Usage of pesticides on fodder crops & grassland grown in the United Kingdom, 2013 (kg of active substances)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough grazing	All crops
Fungicide seed treatments												
Fludioxonil	3	.	.	.	20	.	.	.	.	.	.	23
Fludioxonil/metalaxyl	5	.	.	.	.	.	.	.	.	.	.	5
Fludioxonil/metalaxyl-M	22	.	.	.	.	.	.	.	.	.	.	22
Fluopyram/prothioconazole/tebuconazole	.	.	.	.	40	.	.	.	.	.	.	40
Hymexazol	.	.	132	.	.	.	.	.	.	.	.	132
Iprodione	.	.	14	.	.	.	.	.	.	.	.	14
Prochloraz/triticonazole	.	.	.	.	190	.	.	.	.	.	.	190
Prothioconazole	.	.	.	.	4	.	.	.	.	.	.	4
Thiram	1,055	5	11,877	14	95	5	152	6	.	.	.	13,209
Other fungicides ⁵	25	2	.	2	826	.	222	.	.	.	.	1,075
All Fungicides	1,110	6	12,023	15	1,174	5	374	6	.	.	.	14,714
Fungicide/insecticide seed treatments												
Clothianidin/prothioconazole	.	.	.	.	214	.	.	.	.	.	.	214
Other fungicide/insecticide ⁶	.	7	.	8	4	12	.	.	.	.	.	31
All Fungicide/insecticide	.	7	.	8	218	12	.	.	.	.	.	245
Insecticide seed treatments												
Clothianidin	526	.	.	.	26	.	.	.	.	.	.	552
Imidacloprid	5,191	.	173	.	.	.	.	.	.	.	.	5,363
Methiocarb	16,247	.	1	.	.	.	.	.	.	.	.	16,247
Tefluthrin	.	.	75	59	.	.	.	.	.	.	.	134
Thiamethoxam	.	58	37	49	.	25	.	.	.	.	.	170
Other Insecticides & nematicides ⁷	.	<1	15	.	.	3	.	.	.	.	.	18
All Insecticides & nematicides	5,716	58	300	108	26	29	.	.	.	.	.	6,236

⁵Other fungicide seed treatments include *Bacillus subtilis*, carboxin/thiram, difenoconazole/fludioxonil, fludioxonil/flutriafol, fludioxonil/tefluthrin, fluquinconazole/prochloraz, fuberidazole/triadimenol, imazalil, imazalil/ipconazole, metalaxyl, metalaxyl-M, silthiofam, tebuconazole.

⁶Other fungicide/insecticide seed treatments were carbosulfan/thiram, clothianidin/prothioconazole/tebuconazole/triazoxide, fludioxonil/metalaxyl-M/thiamethoxam

⁷Other insecticide seed treatments were beta-cyfluthrin/clothianidin, beta-cyfluthrin/imidacloprid, unspecified insecticides.

Table 6 (cont) Usage of pesticides on fodder crops & grassland grown in the United Kingdom, 2013 (kg of active substances)

	Maize	Turnips & swedes	Fodder beet & mangolds	Kale, cabbage, rape etc.	Other crops for stock feeding	Stubble turnips & catch crops	New ley direct sown	New ley undersown	Grassland 2-5 years old	Permanent pasture	Rough grazing	All crops
Other seed treatments												
Growth promoters	.	.	.	.	<1	.	<1	.	.	.	.	3,144
Other seed treatments ⁸	<1	.	.	<1	<1	<1	<1	.	.	.	.	<1
All other seed treatments	<1			<1	<1	<1	<1	<1	.	.	.	65,410
All seed treatments	23,073	71	12,324	131	1,418	46	374	6	.	.	.	37,442

⁸Other seed treatments include rhizobial inoculum

Table 7 Estimated area (ha) of application of the fifty most extensively used active substances on all grassland & fodder crops surveyed in 2013 in Great Britain (individual active substance data was not available from the 2009 Northern Ireland survey)

	Active substance	Area treated 2013 (ha)	Area treated 2009 (ha)	% change on 2009	Movement	
1	Triclopyr	227,489	186,810	22	↑	
2	Clopyralid	199,195	163,378	22	↑	
3	MCPA	160,697	244,023	-34		↓
4	Fluroxypyr	154,186	104,129	48	↑	
5	Mesotrione	146,719	97,708	50	↑	
6	Nicosulfuron	115,571	60,153	92	↑	
7	Terbuthylazine	98,047	47,756	105	↑	
8	Glyphosate	97,891	105,562	-7		↓
9	Pendimethalin	64,059	47,152	36	↑	
10	Mecoprop-P	61,312	88,430	-31		↓
11	2,4-D	47,879	76,966	-38		↓
12	Dicamba	47,392	45,390	4	↑	
13	Bromoxynil	39,393	37,258	6	↑	
14	Phenmedipham	37,386	37,156	1	↑	
15	Metamitron	35,315	20,981	68	↑	
16	Ethofumesate	34,055	31,199	9	↑	
17	Desmedipham	23,239	19,372	20	↑	
18	Lenacil	20,428	13,271	54	↑	
19	Prothioconazole	19,127	14,694	30	↑	
20	2,4-DB	14,763	25,164	-41		↓
21	Tribenuron-methyl	14,255	4,568	212	↑	
22	Triflusaluron-methyl	14,210	19,622	-28		↓
23	Aminopyralid	13,757	4,842	184	↑	
24	Chlorpyrifos	13,618	25,626	-47		↓
25	Metsulfuron-methyl	13,382	8,649	55	↑	
26	Prosulfuron	10,487	14,691	-29		↓
27	Chloridazon	9,274	6,920	34	↑	
28	Tebuconazole	8,598	8,700	-1		↓
29	Amidosulfuron	7,957	17,185	-54		↓
30	Pyraclostrobin	7,692	4,524	70	↑	
31	Chlorothalonil	7,607	17,865	-57		↓
32	Epoxiconazole	7,527	11,141	-32		↓
33	Metaldehyde	6,772	6,206	9	↑	
34	Flufenacet	6,006	25,766	-77		↓
35	Metazachlor	5,874	6,745	-13		↓
36	Thifensulfuron-methyl	5,317	11,949	-55		↓
37	Trifloxystrobin	5,202	9,236	-44		↓
38	Chlormequat	4,831	5,793	-17		↓
39	Isoxaflutole	4,385	25,130	-83		↓
40	Azoxystrobin	4,379	3,435	27	↑	
41	Fenpropimorph	4,086	13,321	-69		↓
42	Spiroxamine	3,804	6,671	-43		↓
43	Flusilazole	3,723	3,521	6	↑	
44	Asulam	3,532	13,583	-74		↓
45	Diflufenican	3,513	1,364	158	↑	
46	Fluoxastrobin	3,320	3,616	-8		↓
47	Lambda-cyhalothrin	3,246	3,150	3	↑	
48	S-metolachlor	3,102	262	1,084	↑	
49	Cyproconazole	2,914	6,913	-58		↓
50	Fenpropidin	2,745	1,949	41	↑	

Table 8 Estimated amount (kg) of the fifty most extensively used active substances on all grassland & fodder crops surveyed in 2013 in Great Britain (individual active substance data was not available from the 2009 Northern Ireland survey)

	Active substance	Amount used 2013 (kg)	Amount used 2009 (kg)	% change on 2009	Movement	
1	MCPA	192,645	218,115	-12		↓
2	Glyphosate	116,695	123,886	-6		↓
3	Pendimethalin	68,762	59,098	16	↑	
4	Triclopyr	66,829	70,085	-5		↓
5	2,4-D	54,251	77,712	-30		↓
6	Mecoprop-P	40,862	69,292	-41		↓
7	Terbuthylazine	38,674	18,623	108	↑	
8	Metamitron	34,363	19,142	80	↑	
9	Fluroxypyr	28,345	19,763	43	↑	
10	Clopyralid	25,787	27,294	-6		↓
11	2,4-DB	17,273	18,539	-7		↓
12	Asulam	14,130	16,861	-16		↓
13	Bromoxynil	12,314	10,805	14	↑	
14	Mesotrione	11,471	7,850	46	↑	
15	Chlorpyrifos	10,201	18,930	-46		↓
16	Chloridazon	7,754	7,421	4	↑	
17	Ethofumesate	6,735	5,941	13	↑	
18	Phenmedipham	5,394	6,120	-12		↓
19	Dicamba	5,123	5,322	-4		↓
20	Metazachlor	3,918	4,868	-20		↓
21	Nicosulfuron	3,840	1,993	93	↑	
22	S-metolachlor	3,734	352	961	↑	
23	Chlormequat	3,158	4,436	-29		↓
24	Chlorothalonil	3,116	7,280	-57		↓
25	Prothioconazole	1,682	1,164	44	↑	
26	Pyraclostrobin	1,333	312	328	↑	
27	Metaldehyde	1,254	2,190	-43		↓
28	Flufenacet	1,238	7,935	-84		↓
29	Desmedipham	1,078	550	96	↑	
30	Chlorotoluron	995	781	27	↑	
31	Lenacil	959	2,336	-59		↓
32	Fenpropidin	893	673	33	↑	
33	Aminopyralid	783	281	178	↑	
34	Fenpropimorph	722	2,438	-70		↓
35	Spiroxamine	684	1,075	-36		↓
36	Bentazone	678	3,637	-81		↓
37	Dichlorprop-P	632	5	11,553	↑	
38	Tebuconazole	602	1,414	-57		↓
39	Diquat	585	162	261	↑	
40	Sulphur	561	1,393	-60		↓
41	Flusilazole	538	363	48	↑	
42	Azoxystrobin	512	452	13	↑	
43	Epoxiconazole	462	635	-27		↓
44	MCPB	421	18,931	-98		↓
45	Amidosulfuron	342	721	-53		↓
46	Mancozeb	310	240	29	↑	
47	Oxamyl	305	599	-49		↓
48	Trifloxystrobin	287	597	-52		↓
49	Prochloraz	258	409	-37		↓
50	Pyridate	257	492	-48		↓

Table 9 New or newly encountered compounds encountered on all grassland & fodder crops in Great Britain between 2009 & 2013

	Active substance	Area treated 2013 (ha)	Amount used 2013 (kg)
1	Dimethenamid-P	5,159	3,502
2	Folpet	2,028	848
3	Bixafen	1,737	64
4	Ferric phosphate	1,500	210
5	Propyzamide	1,248	857
6	Isopyrazam	898	95
7	Penthiopyrad	854	106
8	Pyroxsulam	571	11
9	Fluxapyroxad	410	23
10	Mepiquat	326	99

Table 10 Major increases in the use of individual active substances on all grassland & fodder crops in Great Britain since 2009 (area treated)

	Active substance	Area treated 2013 (ha)	Area treated 2009 (ha)	% change on 2009
1	Clomazone	1,619	17	9,384
2	Dichlorprop-P	760	18	4,102
3	Unspecified herbicides	13,808	347	3,882
4	Cyflufenamid	641	25	2,511
5	S-metolachlor	3,102	262	1,084
6	Flurtamone	297	29	921
7	Esfenvalerate	1,038	164	531
8	Unspecified fungicides	1,863	353	427
9	Pirimicarb	1,221	259	372
10	Pinoxaden	1,637	396	314
11	Diquat	1,589	405	292
12	Flupyrsulfuron-methyl	446	122	265
13	Tribenuron-methyl	14,255	4,568	212
14	Aminopyralid	13,757	4,842	184
15	Boscalid	1,181	435	171
16	Rimsulfuron	885	343	158
17	Diflufenican	3,513	1,364	158
18	Carbetamide	63	29	113
19	Terbuthylazine	98,047	47,756	105
20	Nicosulfuron	115,571	60,153	92

Table 11 Major decreases in the use of individual active substances on all grassland & fodder crops in Great Britain since 2009 (area treated)

	Active substance	Area treated 2013 (ha)	Area treated 2009 (ha)	% change on 2009
1	Linuron	368	25,045	-99
2	MCPB	435	15,031	-97
3	Ioxynil	322	10,397	-97
4	Florasulam	1,486	24,108	-94
5	Picoxystrobin	635	4,561	-86
6	Carbendazim	40	283	-86
7	Bentazone	759	4,952	-85
8	Dimoxystrobin	29	165	-83
9	Isoxaflutole	4,385	25,130	-83
10	Flufenacet	6,006	25,766	-77
11	Cypermethrin	1,327	5,689	-77
12	Asulam	3,532	13,583	-74
13	Kresoxim-methyl	417	1,598	-74
14	Propiconazole	1,054	3,784	-72
15	Quinmerac	26	88	-71
16	Fenpropimorph	4,086	13,321	-69
17	Chlormequat chloride	291	916	-68
18	Pyridate	286	843	-66
19	Trinexapac-ethyl	2,198	6,193	-65
20	Methiocarb	295	782	-62

Table 12 Comparison of pesticide usage on fodder crops other than grass, in the United Kingdom, 2005 - 2013, area treated (ha) and amount used (t)

Chemical group	2005		2009		2013	
	ha	t	ha	t	ha	t
<i>Insecticides</i>	19,788	4.30	17,723	3.68	16,873	5.08
<i>Fungicides</i>	44,820	10.95	36,121	9.25	50,173	12.56
<i>Sulphur</i>	466	2.99	429	1.03	195	0.56
<i>Growth regulators</i>	14,512	12.00	8,968	5.11	9,320	4.12
<i>Herbicides</i>	382,155	314.58	478,354	246.17	623,656	293.82
<i>Molluscicides</i>	6,900	1.63	3,840	1.07	4,750	0.83
<i>Seed treatments</i>	315,787	39.51	395,815	35.48	353,001	37.06
Total – all registered pesticides	784,428	385.96	941,250	301.78	1,057,968	354.03
Area grown	220,171		269,306		296,620	

Table 13 Comparison of pesticide usage on grassland, in the United Kingdom, 2005 - 2013, area treated (ha) and amount used (t)

Chemical group	2005		2009		2013	
	ha	t	ha	t	ha	t
<i>Insecticides</i>	9,699	3.05	28,648	16.60	16,081	10.77
<i>Fungicides</i>	62,895	11.89	54,171	12.70	20,445	5.40
<i>Sulphur</i>	174	0.42	51	0.36	0	0.00
<i>Growth regulators</i>	17,542	5.94	6,173	1.26	1,998	1.08
<i>Herbicides</i>	783,381	738.17	730,579	664.01	648,556	562.72
<i>Molluscicides</i>	2,887	0.76	3,347	1.21	3,816	0.66
<i>Seed treatments</i>	34,753	0.66	33,745	0.31	12,804	0.38
Total – all registered pesticides	911,331	760.88	856,714	696.44	703,700	581.01
Area grown	11,278,008		11,587,679		11,131,267	

APPENDIX 2 – DEFINITIONS

- a) 'Pesticide' is used throughout this report to include commercial formulations containing active substances of insecticides, acaricides, molluscicides, fungicides, herbicides, desiccants, soil sterilants, nematocides, and growth regulators.
- b) 'Treated area' is the gross area treated with a pesticide, including all repeat applications, some of which may have been applied to the land in preparation for planting and thus may appear as an inappropriate use on that crop.
- c) 'Reason for application' indicated in the text is the grower's stated reason for use of that particular pesticide on that crop and may not always seem entirely appropriate.
- d) Where individual pesticides are mentioned in the text, they are listed in descending order of use by hectares treated.
- e) The term "formulation(s)" used within the text is used here to describe either single active substances or mixtures of active substances contained within an individual **product**. It does not refer to any of the solvents, pH modifiers or adjuvants also contained within a product that contribute to its efficacy.
- f) For the purposes of this survey the total area of fodder crops was taken as the sum of the areas of the following crops: maize; turnips & swedes; fodder beet & mangolds; kale, cabbage & rape; other crops for stockfeeding including whole-cropped cereals, peas and beans; lucerne and sainfoin. Samples were selected on the basis of these crops. Stubble turnips & catch crops were not included in the sampling process as these crops are unlikely to have been recorded on the June Survey form.
- g) For the purposes of this survey the total area of grassland was taken as the sum of the areas of the following crops: permanent pasture; grassland less than five years old, including established leys 2 to 5 years old, and both direct sown new leys and those undersown cereals crops. Samples were selected on the basis of these crops. Rough grazing was not included in the sampling process as pesticide usage on this crop is minimal and could be considered atypical of normal grassland pesticide usage.
- h) Pesticide applications included those applied prior to planting, or in some cases to crops that failed and were subsequently re-planted, and as these are associated with that crop they may appear as inappropriate uses.
- i) Where highlighted in the text the amount of active substance is calculated from the weight of product applied per hectare multiplied by the proportion of each individual active substance within a product.
- j) Within the seed treatment tables at the end of each crop section, unspecified or unknown seed treatments have been excluded from the last column in order to express the known seed treatment areas as a proportion of the total area of each crop grown.
- k) Untreated crops are those that have received no foliar applications of insecticides, fungicides, herbicides, growth regulators, molluscicides and sulphur. They may have been grown from treated seed.
- l) Undersown grass leys are those that are drilled at the same time, or after the drilling of a cereal crop, primarily spring barley, leaving an established grass ley after the cereal crop has been harvested. Most of the pesticide applications applied to undersown new leys are targeted at the nurse crop rather than the grass. It is likely that this usage is duplicated in pesticide usage survey reports on arable crops.
- m) Unspecified fungicides and herbicides have been recorded where the farmer was unsure of the product used. Within Table 5 the area treated is reported but as they are not associated with a weight or rate of application they are therefore not included in Table 6.
- n) Throughout all tables, "Other" refers to chemicals grouped together because they were applied to less than 0.001% of the total area treated with pesticides.

APPENDIX 3 - METHODOLOGY

METHODS

The samples of holdings to be surveyed were selected using data from the Agricultural Census Returns, June 2012 for England & Wales (Anon., 2013a and 2013b).

The samples were drawn from the June Survey returns so as to represent the area of all grassland and fodder crops grown throughout England, Scotland, Northern Ireland and Wales. For England the sample was selected within each of the eight Government Office Regions (GOR's). The Welsh Government provided a further sample, which represented the area grown in Wales. For Scotland and Northern Ireland the sample represented the regions in each country.

Two separate samples were taken, one for fodder crops and one for grassland crops. The grassland sample was intended to supplement grassland data collected as part of the fodder survey. The samples were stratified according to the total area of all grassland or fodder crops grown in each region and by size group based on the total area of grassland or fodder crops grown on each holding. The area of grassland or fodder crops sampled in each size group and each region was proportional to the total area of grassland or fodder crops grown on holdings of each size group in each region. All three survey teams followed the same methodology for data collection and used the same forms and instructions for their completion. Supplementary data collected as part of the British Survey of Fertiliser Practice (BSFP) for England & Wales also followed the same format.

The use of the British Survey of Fertiliser Practice (BSFP) was intended to reduce the overall burden on farmers, collecting data for a supplementary survey (in this case the Pesticide Usage Survey in England & Wales) at the same time as collecting data for the primary survey. In part this was successful, with the number of holdings needed for the supplementary grassland sample being met. However, the amount of data collected as part of the fodder survey was less than half that expected and an alternative approach needs to be considered for future surveys. The shortfall in numbers for the fodder survey was met by members of the England & Wales survey team.

For the fodder sample, the size groups, based on the total fodder area are as follows: <12.5ha; >12.5-<=20 ha; >20-<=30 ha; >30-<=50 ha; and >50 ha; for the grassland sample the size groups, based on the total grassland area are as follows: <30ha; >30-<=60 ha; >60-<=90 ha; >90-<=150 ha; and >150 ha.

For the purposes of this survey the total area of fodder crops was taken as the sum of the areas of the following crops: maize; turnips & swedes; fodder beet & mangolds; kale, cabbage & rape; other crops for stockfeeding including whole-cropped cereals, peas and beans; lucerne and sainfoin. Stubble turnips & catch crops were not included in the sampling process as these crops are unlikely to have been recorded on the June Survey form. Whilst the majority of data were collected by personal visit by members of the three survey teams, additional data (88 holdings) were obtained as part of the BSFP.

For the grassland sample the total area was taken as the sum of the areas of the following crops: permanent pasture; grassland less than five years old, including established leys 2 to 5 years old, and both direct sown new leys and those undersown cereals crops. Rough grazing was not included in the sampling process as pesticide usage on this crop is minimal and could be considered atypical of normal grassland pesticide usage. In Scotland the supplementary grassland data were collected as part of a postal survey. In Northern Ireland grassland data were collected by interview or by telephone. In England & Wales all supplementary grassland data were collected as part of the BSFP.

An introductory letter was sent to the occupiers of the selected holdings explaining the purpose of the survey. A total of 688 holdings were visited during the winter of 2013/14 and data collected during a personal interview with the farmer conducted by an experienced pesticide usage surveyor. Where a holding listed in the original sample was not able to provide data it was replaced with another from the same size group and region, held on a reserve list. Again, and in order to reduce the burden on participating farmers, data were collected by phone, post and in some cases using emailed farm records.

Using data from the three main surveyors in England and Wales a total of 533 premises were contacted, of which 67 (13%) were not growing fodder crops during 2013. Of the 466 premises growing fodder crops, 36 (8%), were unwilling to help with the survey, a further 31 (7%) either provided data after the deadline or were willing to help at a later date.

Detailed crop assurance information was collected from 504 farms in Great Britain and of these 30 (6%) were registered organic on all or part of their holding.

Commercial farm management software and in-house electronic record keeping systems are now used extensively within many areas of agriculture and horticulture. Electronic record keeping was used by 22% of the holdings contacted in England & Wales, with these records accounting for 27% of the total area of grassland & fodder crops grown. Of those using electronic record keeping 94% used commercial farm management software systems with the remaining 6% using in-house computer systems developed by the growers themselves.

Where possible, and in order to minimise the burden on individual growers, pesticide usage data were emailed or posted by the growers back to the survey teams. In a few cases, and normally on smaller holdings, information was collected over the telephone. In total, data from 60% of the number of holdings in England & Wales were collected using non-visit methodologies, which together accounted for 58% of the area grown.

One of the requirements placed on growers by their customers is the membership of farm assurance schemes. These schemes require detailed pesticide records (computer based or hand written) which ensure traceability and can be examined by crop assurance auditors at any time, but normally at least once each year. These records are used extensively by members of the survey team. Of the 504 holdings in Great Britain from which information was available, 93% were members of one or more crop assurance schemes. However, in terms of area grown, membership of a crop assurance scheme accounted for 97% of the total area surveyed.

The Questionnaire

The questionnaire for the main part of the survey consisted of two forms, which were completed during an interview with the grower.

Form 1 summarised the areas of grassland & fodder crops grown on the designated holding during the 2012/2013 season.

Form 2 dealt with all aspects of pesticide usage on the individual crops grown on the holding and harvested in 2013, a separate form being used for each field/crop combination. These included pesticides applied prior to planting, or in some cases to crops that failed and were subsequently re-planted, as these are associated with that crop they may appear as inappropriate uses. Certain agronomic details that may have influenced pesticide usage (including drilling and harvest times, seed rates, intended use, use of adjuvants and the volume of spray applied) were also recorded on form 2.

Raising factors

The pesticide usage data collected from each holding were raised by a ratio of two factors to give an estimate of regional usage using a standard ratio raising statistical technique; the first factor being dependent on farm size group and region (see Appendix 5) and the second dependent on crop area and region. The data were further adjusted by a third factor to compensate for regions in which specific crops were not sampled and to make estimates of total pesticide usage related to the national cropping areas in the United Kingdom (Thomas, 2000).

The raising factors were based on the areas of grassland & fodder crops grown and harvested in 2013 as recorded in the June Survey of Agriculture and Horticulture for England & Wales (Anon., 2014a, b).

The first raising factors from the principal survey, fodder crops, are presented in Table 14. It is the first raising factor which does most of the work and gives an indication of the robustness of the sample with smaller numbers indicating a larger area sampled within each size group and region. The first raising factor is often largest in the smaller size groups where there is generally a much larger population. The first raising factors are not presented for the grassland sample as this was a supplementary sample to the main fodder sample.

Whilst we have confidence in the methodologies used for the pesticide usage surveys and the data collected from individual farmers and growers (see Appendix 4), the raised estimates for individual crops will be subject to higher standard errors simply because available data on National and Regional areas for individual crops are much more limited. Where possible the survey team have used data collected as part of the June Survey to make estimates of national & regional pesticide usage as this survey is subject to the same strict methodologies as our own. However, where these estimates are not available then other sources of data such as combinations of June Survey data and our own observations will be used and these data may therefore be associated with a higher standard error.

Rounding

Due to rounding of figures, the sum of constituent items in the tables may not agree exactly with the totals shown.

Error checking

Extensive checks are made on the data before, at the time of and following data entry. Data checking routines are used to verify the authenticity of the data collected including: the authorisation status of all crop/pesticide combinations; high and low rates of application; the methods of application used to apply pesticides; crop growth stages at the time of application; the timing of pesticide applications and consistency within a tank mix.

Further checks are made on the integrity of the relational database used to store the raw data collected ensuring that links to product databases are in place prior to the production of the report. The product databases used for the pesticide usage surveys are maintained alongside the commercial product database, *LIAISON*, which is used extensively by agronomists and the major farm management software companies.

Where inconsistencies are found, for example where there are high rates of application or non-authorised product usage, these are checked first against the farm records and secondly with the grower and amended if necessary.

Reports are written and checked within the team after which they are sent to reviewers within the Working Party on Pesticide Usage Surveys for their comments and checking.

The final report is pre-announced and published via the ONS Publication Hub and the FERA website in line with the Code of Practice for Official Statistics.

Data limitations and use of data

Our experience has shown that the proposed face to face interview and ‘main contact plus reserves approach’ delivers the highest quality data and minimises non response bias; no other approach is likely to yield fit for purpose data to meet the quality requirements of the UKSA Code of Practice for Official Statistics. Drawing a fresh stratified random sample each year is clearly an appropriate survey methodology. Despite this the population of horticultural growers sampled as part of the whole PUS survey programme is much smaller than the number of arable or grassland & fodder holdings in England, so that, especially in the strata of larger enterprises, the same growers come around fairly often so this sample is already closer to a panel than a sample from a larger population might be.

As part of this survey FERA has implemented the UK Statistics Authority Code of Practice for Official Statistics, published in 2009. Whilst all eight principles apply, we acknowledge in particular, the following:

- Integrity – in particular, that statistical reports must be issued separately from other statements or comments about the figures, that the public interest prevails.
- Confidentiality – the identity of individuals or their information is not revealed, information is kept secure and respondents are informed how their confidentiality will be protected.
- Proportionate burden - seeking participation through informed consent.
- Accessibility – to all users, providing information on the quality and reliability of the statistics, adopting formats that enhance clarity and consistency, disseminate in formats that encourage analysis and re-use.

In accordance with UKSA Code of Practice for Official Statistics, we work with Defra statisticians and CRD to build on our existing extensive and effective relationships with users of the surveys to further enhance user engagement. There is a broad spectrum of users and stakeholders across policy, research, agricultural supply industry (including consultancies), farming and horticultural businesses, NGOs and members of the public. Over the years we have an excellent record of listening to our users and incorporating their feedback into the way we collect and report our statistics. We continue to work in partnership with both CRD and Defra to strengthen this engagement in line with recent recommendations from UKSA.

APPENDIX 4 – ESTIMATES OF STANDARD ERRORS FROM PESTICIDE USAGE DATA (2013 DATA)

Stéphane Pietravalle, Statistician, FERA

Introduction, Data and Method

The results presented in this report come from the Pesticide Usage Survey (PUS) data for fodder, maize and grassland in the UK (England, Wales, Scotland and Northern Ireland) in 2013. The total areas of fodder, maize and grassland as well as the total numbers of holdings with fodder, maize and grassland by region were obtained from the June 2013 Survey.

In the PUS survey, data were collected from 688 holdings in the UK for fodder, 363 for maize and 1,472 for grassland. The numbers of holdings sampled as part of the PUS and the total numbers in the June Survey are presented by region in table A.1 below.

The way the national estimates and their standard errors are derived in this report is through “ratio raising”. This approach has already been used in previous reports (e.g. “Soft fruit - 2012”) and looks at, for each holding sampled as part of the PUS, the ratio of its pesticide treated area (or weight of active ingredients) per unit area of the crop grown. This “ratio” is then tabulated for each region category (each *stratum*) separately (separate ratio analysis, i.e. the area treated with pesticide (or the weight of active ingredients used) per unit area of crop grown is allowed to vary between *strata*). It is then “raised” to each *stratum*, using the total area grown from the June Survey, to estimate the total area treated with pesticide (or weight of active ingredients) in each of those *strata*.

The standard error of each of these estimates is then calculated using the standard error observed, for each *stratum* in the PUS and the fraction of the total number of holdings in that *stratum* in the June Survey that were sampled in the PUS. In other words, the standard error of the total area treated (or total amount applied) represents the uncertainty associated to this total and is a function of the variability of the observed data (sample to sample variability in the PUS data), the number of samples collected in the PUS data and the total number of holdings in the June Survey data. The calculation can be done in one of two ways:

- i. Using approximations (Taylor series expansion) to calculate the standard error of a combination of variables.
- ii. Using bootstrapping of the “ratios” observed in the holdings sampled in the PUS, where each holding in a given *stratum* is replicated n times, where n is the nearest integer to the raising factor for that *stratum*.

In this report, all the standard errors (and corresponding 95% confidence intervals) presented have been estimated using the bootstrapping method (Note: 1,000 bootstrap runs were used for each estimate).

As explained above, i. the calculation of the estimates (at the regional and national levels) requires the total area of the crop grown and ii. the calculation of the standard error of the estimates requires the total numbers of holdings with the crop in order to scale up the standard error.

Because of the low number of holdings with either maize or fodder in the PUS data for some of the regions, it was decided to group the holding size *strata* as it was felt that there was not sufficient information for each region/holding category to appropriately estimate variability at that level from the PUS data. As a result, the *strata* at which the ratios were “raised” were simply the regions. As a result, it was assumed that the “ratio” (i.e. the pesticide treated area (or weight of active ingredients) per unit area of the crop grown) was constant across all holding sizes within a region.

Further, because of the very low numbers of holdings growing fodder or maize in some regions (see Tab. A.1), it was also decided to group adjacent regions (“North East” and “North West” for fodder and “North East”, “North West” and “Yorkshire & the Humber” for maize), therefore assuming that this “ratio” was also constant between those adjacent regions.¹

All analyses are done using GenStat 16.2.

¹ These groupings were used for the Standard Error calculations only; not to calculate the raising factors used to make national estimates. For national estimates separate raising factors were calculated for each region/size-group (Appendix 5) or region/crop combination as appropriate.

Table A.1: Summary of the number of holdings with fodder, maize and grassland sampled in the UK as part of the Pesticide Usage Survey and in the June Survey.

Region	Fodder		Maize		Grassland	
	PUS	June Survey	PUS	June Survey	PUS	June Survey
<i>East Midlands</i>	54	1,023	46	743	58	9,409
<i>Eastern</i>	53	959	44	680	46	8,434
<i>London & South East</i>	57	1,188	50	1,064	67	11,303
<i>North East</i>	6	193	0	44	34	3,789
<i>North West</i>	28	1,083	20	857	67	11,082
<i>Northern Ireland</i>	33	829			235	24,503
<i>Scotland</i>	183	2,682	16	91	517	40,086
<i>South West</i>	167	3,972	141	3,379	236	22,734
<i>Wales</i>	40	2,384			96	34,215
<i>West Midlands</i>	39	1,830	33	1,480	47	12,001
<i>Yorkshire & the Humber</i>	28	1,064	13	470	69	10,366
Overall	688	17,207	363	8,808	1,472	187,922

Results and conclusions

Tables A.2 and A.3 below show the calculated relative standard errors (RSE) of the estimates (in percentage) for fodder. As always, because the confidence intervals are derived from the percentiles of the bootstrapped distribution, they are not necessarily symmetrical around the estimated total area and total amount of active ingredient. Table A.2 shows those estimates for the treated areas and table A.3 presents them for the weight of active ingredients for fodder.

Tables A.2 and A.3 show that the relative standard error of the estimates are below or at the target of 5% for both the area treated and the amount of active substance (4.1% and 4.5% respectively).

Tables A.4 and A.5 show the equivalent results for maize (Tab. A.4 presents the results for the treated areas whilst Tab. A.5 presents the results for the weight of active substance). Although the relative standard error of the estimate is well below the target of 5% for the area treated (2.8%), it is slightly above for the amount of active ingredient (5.2%).

Finally, tables A.6 and A.7 show the equivalent results for grassland (Tab. A.6 shows the results for the treated areas and Tab. A.7 shows the results for the weight of active ingredient). Similarly to what can be observed for maize, the relative standard error of the estimate is below the target of 5% for the area treated (4.2%); however, it is well above it for the amount of active ingredient (8.1%).

Note that tables A.2 to A.7 also present in the bottom row the same estimates (and their relative standard error) when using groups of size categories as well as regions as the *strata*. Note that this report does not present the details of which group size categories were combined together to run these analyses but simply the overall estimates (at the national level) to investigate and discuss the effects of such changes in the analyses. There are clearly two consequences in using group size categories as well as regions as *strata*. First it allows for the ratio used to estimate the total areas and amount applied to be estimated separately for more categories, hence improving the accuracy of the estimate (especially if these ratios are very variable between group size categories). On the other hand, it reduces the number of holdings sampled within each group and potentially causes the means to be estimated less accurately (i.e. larger standard error of the means). The combined effect of these two points will obviously depend on their relative importance, i.e. whether the increase in variability caused by grouping all size categories together (and therefore using a single ratio across size categories) is “compensated” by the increase in accuracy around the mean caused by the increase in observations. As can be seen in tables A.2 to A.7, allowing for different ratios between size categories (i.e. different pesticide treated area (or weight of active ingredients) per unit area of the crop grown) allows for more accurate estimates for all crops, except for weight of active ingredients for fodder. This therefore justifies the need for stratification for holding size.

Table A.2: Relative standard error and 95% confidence interval for the area treated (ha) with pesticide on fodder.

Region	Total	RSE (%)	Bootstrap 95% confidence interval for the total
<i>East Midlands</i>	83,635	23.6	[50,402 ; 124,621]
<i>Eastern</i>	60,041	15.0	[42,158 ; 74,465]
<i>London & South East</i>	76,308	10.0	[62,505 ; 92,182]
<i>North¹</i>	62,087	16.7	[41,130 ; 78,659]
<i>Northern Ireland</i>	25,041	9.6	[20,111 ; 29,508]
<i>Scotland</i>	32,176	8.5	[26,993 ; 37,633]
<i>South West</i>	243,947	6.9	[214,143 ; 280,363]
<i>Wales</i>	55,331	15.4	[35,222 ; 68,734]
<i>West Midlands</i>	95,157	6.5	[84,895 ; 109,092]
<i>Yorkshire & the Humber</i>	37,235	14.2	[28,258 ; 48,713]
Overall	770,958	4.1	[703,418 ; 828,147]
Overall (using size categories)	739,314	3.6	[684,187 ; 787,472]

¹ Regions “North East” and “North West” were combined to produce the estimate for the “North” in this table.

Table A.3: Relative standard error and 95% confidence interval for weight of active ingredients (kg) applied on fodder.

Region	Total	RSE (%)	Bootstrap 95% confidence interval for the total
<i>East Midlands</i>	34,442	15.8	[24,148 ; 45,326]
<i>Eastern</i>	23,976	11.6	[17,802 ; 28,627]
<i>London & South East</i>	32,902	11.0	[25,715 ; 39,544]
<i>North²</i>	34,569	20.1	[18,974 ; 45,380]
<i>Northern Ireland</i>	12,307	9.7	[10,006 ; 14,604]
<i>Scotland</i>	16,929	9.6	[13,820 ; 20,212]
<i>South West</i>	86,253	7.0	[75,098 ; 98,632]
<i>Wales</i>	28,462	26.0	[15,877 ; 43,633]
<i>West Midlands</i>	40,310	10.7	[30,843 ; 47,706]
<i>Yorkshire & the Humber</i>	13,160	17.8	[8,492 ; 17,906]
Overall	323,310	4.5	[291,766 ; 349,141]
Overall (using size categories)	312,795	4.6	[282,605 ; 339,499]

Table A.4: Relative standard error and 95% confidence interval for the area treated (ha) with pesticide on maize.

Region	Total	RSE (%)	Bootstrap 95% confidence interval for the total
<i>East Midlands</i>	37,860	11.4	[27,401; 44,353]
<i>Eastern</i>	43,802	14.6	[31,190 ; 52,653]
<i>London & South East</i>	62,964	7.2	[53,370 ; 71,465]
<i>North³</i>	53,182	10.1	[41,439 ; 62,381]
<i>Scotland</i>	2,795	7.3	[2,414 ; 3,198]
<i>South West</i>	192,952	3.6	[179,299 ; 206,163]
<i>West Midlands</i>	70,807	4.4	[64,415 ; 77,156]
Overall	464,362	2.8	[433,596 ; 485,776]
Overall (using size categories)	452,636	2.5	[428,207 ; 472,179]

² Regions “North East” and “North West” were combined to produce the estimate for the “North” in this table.

³ Regions “North East”, “North West” and “Yorkshire & the Humber” were combined to produce the estimate for the “North” in this table.

Table A.5: Relative standard error and 95% confidence interval for weight of active ingredients (kg) applied on maize.

Region	Total	RSE (%)	Bootstrap 95% confidence interval for the total
<i>East Midlands</i>	19,721	16.5	[13,680; 26,259]
<i>Eastern</i>	17,279	11.1	[12,730 ; 20,389]
<i>London & South East</i>	27,978	12.2	[22,014 ; 35,316]
<i>North⁴</i>	29,467	20.1	[18,067 ; 40,466]
<i>Scotland</i>	2,465	16.1	[1,741 ; 3,267]
<i>South West</i>	69,501	8.4	[57,981 ; 80,675]
<i>West Midlands</i>	31,013	11.7	[22,462 ; 37,348]
Overall	197,424	5.2	[176,532 ; 216,755]
Overall (using size categories)	195,376	5.0	[175,942 ; 212,848]

Table A.6: Relative standard error and 95% confidence interval for the area treated (ha) with pesticide on grassland.

Region	Total	RSE (%)	Bootstrap 95% confidence interval for the total
<i>East Midlands</i>	201,990	20.1	[120,647 ; 282,725]
<i>Eastern</i>	124,597	21.8	[74,852 ; 180,396]
<i>London & South East</i>	269,584	17.0	[180,773 ; 360,083]
<i>North East</i>	147,917	24.6	[74,173 ; 218,954]
<i>North West</i>	355,277	15.2	[252,687 ; 461,864]
<i>Northern Ireland</i>	582,012	4.8	[523,084 ; 633,225]
<i>Scotland</i>	559,195	7.1	[486,484 ; 637,626]
<i>South West</i>	468,334	12.2	[362,079 ; 587,310]
<i>Wales</i>	656,368	14.4	[469,889 ; 852,736]
<i>West Midlands</i>	372,075	15.1	[260,291 ; 482,088]
<i>Yorkshire & the Humber</i>	242,069	13.7	[174,818 ; 307,855]
Overall	3,979,418	4.2	[3,652,776 ; 4,315,159]
Overall (using size categories)	3,799,481	3.8	[3,512,745 ; 4,074,311]

⁴ Regions “North East”, “North West” and “Yorkshire & the Humber” were combined to produce the estimate for the “North” in this table.

Table A.7: Relative standard error and 95% confidence interval for weight of active ingredients (kg) applied on grassland.

Region	Total	RSE (%)	Bootstrap 95% confidence interval for the total
<i>East Midlands</i>	82,175	35.5	[33,351 ; 153,026]
<i>Eastern</i>	30,885	32.6	[14,168 ; 54,083]
<i>London & South East</i>	47,951	22.8	[28,902 ; 70,621]
<i>North East</i>	19,205	48.2	[5,313 ; 41,186]
<i>North West</i>	53,264	33.2	[27,303 ; 95,477]
<i>Northern Ireland</i>	92,402	10.9	[72,945 ; 110,440]
<i>Scotland</i>	58,724	10.9	[46,851 ; 72,588]
<i>South West</i>	108,004	18.3	[74,153 ; 150,332]
<i>Wales</i>	63,648	23.7	[37,544 ; 94,522]
<i>West Midlands</i>	64,511	38.5	[26,796 ; 119,470]
<i>Yorkshire & the Humber</i>	38,940	19.3	[24,353 ; 54,750]
Overall	659,709	8.1	[563,105 ; 774,741]
Overall (using size categories)	686,789	7.4	[593,302 ; 787,106]

APPENDIX 5 – FIRST RAISING FACTORS USED FOR THE FODDER SAMPLE – 2013

Table 14 – First Raising factors for the Fodder survey in the United Kingdom - 2013

Region	Size Group	RF1	Area grown (ha)	Area surveyed (ha)	Number of farms
East Midlands	A	41.15	2,749	67	11
	B	13.38	2,361	176	11
	C	18.20	3,143	173	7
	D	9.91	3,838	387	10
	E	4.39	9,585	2,185	15
Eastern	A	33.07	2,390	72	10
	B	12.32	1,893	154	9
	C	18.89	2,430	129	*
	D	6.79	3,600	530	14
	E	3.31	7,533	2,273	15
London & South East	A	71.50	2,979	42	*
	B	21.64	2,090	97	6
	C	29.88	4,060	136	6
	D	9.95	7,055	709	18
	E	7.64	15,678	2,052	22
North East	A	33.67	771	23	*
	B	14.76	459	31	*
	C	11.53	234	20	*
North West	A	30.72	3,182	104	14
	B	33.45	2,757	82	*
	C	66.67	3,379	51	*
	D	25.54	4,333	170	*
	E	17.20	5,502	320	*
Northern Ireland	A	27.86	3,210	115	18
	B	11.02	1,294	117	7
	C	8.26	966	117	*
	D	8.48	577	68	*
	E	6.58	493	75	*
Scotland	A	15.28	9,440	618	96
	B	6.74	3,570	529	33
	C	3.33	2,893	870	35
	D	3.22	2,043	635	17
	E	8.40	1,040	124	*
South West	A	41.26	10,959	266	35
	B	27.43	10,214	372	23
	C	14.85	12,700	855	34
	D	13.11	18,572	1,417	36
	E	8.92	33,659	3,776	39
Wales	A	71.98	8,841	123	19
	B	49.62	6,220	125	8
	C	37.90	5,680	150	6
	D	27.93	3,701	132	*
	E	9.54	4,554	477	*
West Midlands	A	73.83	5,379	73	10
	B	152.49	5,026	33	*
	C	32.43	6,303	194	8
	D	28.03	8,168	291	7
	E	8.68	10,505	1,210	12
Yorkshire & the Humber	A	55.75	3,591	64	14
	B	49.80	2,404	48	*
	C	20.51	2,125	104	*
	D	11.01	1,841	167	*
	E	21.27	3,301	155	*

For confidentiality reasons a * has been used where 5 or less holdings have been sampled

The first raising factor (rf1) is the largest of the three raising factors and gives an indication of the robustness of the sample with smaller numbers indicating a larger area sampled within each size group and region.

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