

PESTICIDE USAGE SURVEY REPORT 302

AMENITY PESTICIDE USAGE IN THE UNITED KINGDOM 2020

David Garthwaite, Gillian Parrish & Lewis Ridley

Land Use and Sustainability Team

Fera

Sand Hutton

York

YO41 1LZ

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INTRODUCTION

The Expert Committee on Pesticides (ECP) 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.

As part of the on-going process for obtaining data, the Pesticide Usage Survey Team of Fera Science Ltd., a joint venture between Capita PLC and the Department for Environment, Food and Rural Affairs (Defra), conducted a survey of pesticide usage in amenity situations in 2020 by using online methodologies throughout the United Kingdom during 2021.

This was the third survey of usage in amenity situations in the whole of the United Kingdom managed by Fera Science Ltd. The previous report for the United Kingdom and conducted by Fera Science Ltd. was published in 2018, and covered pesticide usage in amenity situations in 2016 (Garthwaite, 2018). A further report considered amenity usage in 2012 (Gould, 2015). The 2012 survey was conducted by GfK Kynetec as part of the agreement that Fera Science Ltd. had with GfK Kynetec and as part of a Memorandum of Understanding (MOU) with the Health and Safety Executive (HSE) in place at that time.

An Integrated Weed Control report has recently been published for Scotland (Reay, 2022) looking at usage by local authorities in 2019.

Previous reports of pesticide usage in amenity situations were conducted by Risk and Policy Analysts (RPA) in 2007 and 2011 and by Produce Studies in 1995.

For further information please contact:

The survey team – e-mail: PUS@fera.co.uk Telephone: 01904 465 712

Or visit the website: <https://pusstats.fera.co.uk/home>

Alternatively, please contact: Fera at: science@fera.co.uk

Further data relating specifically to Scotland may be obtained from SASA. Also available at:

<https://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:

<https://www.afbini.gov.uk/articles/pesticide-usage-monitoring-reports>

OVERVIEW OF MAIN FINDINGS

This report contains data on a survey conducted within the amenity sector for 2020. The survey used two methods of data collection: an online survey developed to increase participation rates and emailed responses. The sectors covered included: local authorities; highway; railway and other contractors; golf courses; lawn care; other sectors including invasive weeds; amenity turf and water companies.

The questionnaire collected data in two areas: background information for each company and product use by each company in 2020. Please see page four for details of the types of data collected.

The responses to this survey represent only part of the total population of amenity pesticide users.

A total of 304 organisations responded to the survey, with 197 respondents providing their pesticide usage data for 2020. Four of the 197, three golf courses and one local authority, indicated that they did not use pesticides in 2020.

Of the 295 respondents completing the assurance question, 35% were members of the Amenity Assured scheme, 8% lawn assured and 3% members of the Property Care Association Scheme. Some respondents were members of more than one scheme. Of the 295, 43% were not members of an assurance scheme.

A total of 21,322 staff were employed by the 275 responding to this question. Of these, there were 3,711 spray operators involved in spraying, with 4,091, staff having spray certificates indicating the use of trained supervisory staff.

The number of sprayers used by 264 of the companies responding was 4,470. Of these, 62% were knapsacks, 13% controlled droplet applicators, 8% stem-injection sprayers (for invasive weed and tree stump control), 7% hand lance, 5% hydraulic boom sprayers, 4% manually folding boom sprayers, and train sprayers made up the remainder.

Data relating to a total of 357 tonnes of product and 133 tonnes of active substance was obtained from those providing pesticide data.

Submissions by railway contractors accounted for 40% of the weight of active substances applied, highway contractors 38%, local authorities 17%, lawn care 2%, other contractors 2%, and all other sectors including golf courses, 'other', invasive weed specialists, water companies and amenity grass (including turf growers and sports turf) less than 1%.

Herbicides comprised 98% of the total weight of active substances, disinfectants 1% and adjuvants, fungicides, growth regulators, physical control agents, algicides, insecticides, sulphur and fungicides/insecticides the remaining 1%.

Glyphosate, alone or in mixtures, accounted for 90% of the weight of active substances applied excluding adjuvants. Other important herbicides (alone or in mixtures) by weight applied were MCPA, 2,4-D, diflufenican, triclopyr, mecoprop-P and fluroxypyr.

Tebuconazole, trifloxystrobin, azoxystrobin and fludioxonil were the principal fungicide active substances used by weight applied. Most fungicide usage was applied within the lawn care sector.

Trinexapac-ethyl was the principal growth regulator recorded, being used mainly for grass suppression by highway contractors on central reservations and verges alongside roads.

Didecylidimethylammonium chloride was the only disinfectant recorded, being used to control moss, liverworts and algae on hard surfaces.

There was minimal usage of insecticides with chlorantraniliprole, used on golf courses, being the main active substance recorded.

The use of the biological control agents *Steinernema feltiae* and *Heterorhabditis bacteriophora*, for leatherjacket and chafer grub control respectively, was encountered mainly in the lawn care sector and by a general contractor.

A comparison is made between the 2016 and 2020 amenity pesticide usage surveys. Between 2016 and 2020 the overall response rate increased by 45% and the number of respondents providing pesticide data more than doubled.

DATA USES

The data are used for a number of purposes including:

- Quantifying pesticide usage and changes in the use of active substances over time;
- 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 United Kingdom to honour international agreements); evaluating changes in growing methods and Integrated Pest Management where this has an impact on pesticide usage;
- Informing the pesticide risk assessment (authorisation) process;
- 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;
- 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 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

This report presents a comprehensive summary of data for amenity pesticide usage in 2020. 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:

<https://pusstats.fera.co.uk/home>

RESULTS OF THE BACKGROUND QUESTIONNAIRE

THE QUESTIONNAIRE

In contrast to the 2016 survey, where a postal survey was the main approach, the 2020 survey was based on an online Survey Monkey questionnaire. With experience gained from the 2016 survey, the online approach was chosen because of both accessibility to respondents and the ease with which the questionnaire could be completed.

The number of questions in the questionnaire were reduced from 28 in 2016 to 10 questions in 2020 (see Appendix 4). The level of detail required within each of the questions in 2020 was also reduced compared to the 2016 questionnaire (Garthwaite et. al. 2018). These changes were made in response to feedback from individuals within the amenity sector who felt the questionnaire was overly-detailed and contributed to the low response rate in 2016.

The 2020 questionnaire was agreed between Amenity Forum members who were involved in the practical application of pesticides, HSE and Fera Science Ltd. in order to try to improve the overall response rate to the survey.

The main sectors targeted for 2020, Local Authorities, Transport Infrastructure, and Golf Courses are three of the largest areas of pesticide use within the amenity sector. Using a more targeted approach it was hoped to increase the response rates within each of these sectors.

However, because of the promotion of the survey by the Amenity Forum we received responses from a wide range of sectors. Other amenity sectors include contractors, invasive weed specialists, lawn care, sports turf, turf growers, water companies and others. The Amenity Forum is responsible for the United Kingdom's industry led voluntary initiative, it is involved in promoting best practice and the safe and sustainable management of weeds, pest and diseases within the amenity sector <https://amenityforum.co.uk/> (last accessed 24/04/2022).

The 2020 questionnaire was split into two parts, background information and product use.

The background information collected included:

- contact details;
- the organisation name and category (local authority, contractor, golf course etc.);
- the respondent's membership of assurance schemes;
- their total number of staff, the numbers involved in pesticide applications and their certification;
- the types and numbers of sprayers used.

The product use section of the questionnaire asked for:

- product name;
- the surface treated;
- method of application;
- reasons for use;
- the total quantity of each product used in 2020.

There was also an option to either add the individual product usage to the online questionnaire or to email the data to Fera Science Ltd.

One issue that did cause problems with the online survey was the submission of multiple responses from the same organisation. This happened quite regularly and at different times during the period the survey was open. In one case there were four submissions from the same local authority as different departments and a contractor submitted data. Duplicated information was combined into a single response in each case; this was particularly important in ensuring there was no duplication of pesticide data.

The average time taken to complete the survey was 20 minutes, which is half the average time taken for the 2016 survey.

TARGET SECTORS

LOCAL AUTHORITIES

There is a total of 398 local authorities in the UK, some of which have multiple contacts. In order to increase the number of local authorities participating in the survey, 392 local authorities (district councils, county councils and metropolitan boroughs) were emailed between the 22nd of January and the 30th of March 2021. Fifteen local authorities that were members of the Amenity Forum completed the online questionnaire before the 22nd of January 2021. In total, and including those within the Amenity Forum, 407 local authority contacts were made. Responses to the email requests for data can be seen in Table 1.

Whilst several local authorities were able to complete the Survey Monkey questionnaire online, a number dealt with the survey as a Freedom of Information (FOI) request and required the questions to be sent in writing. A copy of the questions outlined in Appendix 5 was sent to those dealing with the survey as an FOI request and replies were emailed back to Fera Science Ltd.

One question that should have been included in the questionnaire, particularly for local authorities, was the use of contractors. Many respondents indicated the use of contractors and some very limited information on the percentage of contractor use was collected as emailed data were returned.

One difficulty that affected a small number of local authorities was where contractors refused to provide the pesticide data to the local authorities as part of the survey.

A greater concern is that the responses from individual local authorities cannot be guaranteed to be 100% of pesticide usage for that local authority. There could be other departments within a local authority contracting or using pesticides over and above those sent by the responding departments.

TRANSPORT INFRASTRUCTURE

Many of the Amenity Forum members are contractors within the Transport and Infrastructure sector; these businesses were aware of the survey and willingly helped. Additional information on Transport and Information was obtained from the list of contractors providing services to the National Highway Sector Schemes (NHSS).

This list provided 85 additional contact details, although several of the contractors replied to say that they had made minimal applications recently or that they were not applying pesticides to road or rail. As can be seen from Table 1, the response rate from the NHSS address list, excluding members of the Amenity Forum, was low (7%).

Whilst we had excellent responses from the railway contractor members of the Amenity Forum, it was also necessary to contact several Network Rail staff to collect information on railway yards.

GOLF

Members of the Amenity Forum, primarily The British and International Golf Greenkeepers Association (BIGGA) and a large distributor within the Golf and Sports Turf sector, were instrumental in encouraging golf courses to participate in the survey.

Golf course contacts from the previous amenity survey were also contacted for their participation. The Covid pandemic is very likely to have reduced participation of golf courses, many of which would have been closed during 2020 and some staff would also have been on furlough at the time of the survey.

Without knowing the total number of golf courses contacted by BIGGA or the distributor, it is difficult to know the percentage response.

Using an address list of golf course respondents to the 2016 online questionnaire we were able to send emails to 85 golf courses at the end of April.

RESPONSES TO THE 2020 AMENITY SURVEY

RESPONSE RATES FROM INDIVIDUAL SECTORS WHERE AN EMAIL HAD BEEN SENT TO ENCOURAGE PARTICIPATION

Table 1 - Target sectors – response to emails – UK Amenity – 2020¹

Sector	Number of emails sent	Responses	Percentage response
Local Authorities	392	94	24
Highway Contractors	95	7	7
Golf Courses	85	8	9
Total	572	109	19

¹These are responses to emails sent by Fera Science to each of the target sectors.

The data in Table 1 show a better response rate than in 2016, where the overall response rate was 9%. The response in the local authority sector showed a significant increase on the 9% observed in 2016. In addition, it is likely that without the Covid pandemic the response within the golf course sector would have been higher.

OVERALL RESPONSE TO THE 2020 AMENITY SURVEY

Whilst the three sectors in Table 1 were contacted to increase their sample size, most data came from organisations that were members of the Amenity Forum. Table 2 shows all responses to the survey, including the responses from Table 1.

Table 2 – Overall responses to the UK amenity survey - 2020

Sector	All responses	All responses with pesticide data	Online survey responses	Online survey responses with pesticide data
Contractor	12	7	12	7
Golf	75	35	74	34
Highways	42	36	17	12
Invasive weeds	2	2	2	2
Local authorities	109	82	83	58
Lawn care	25	16	25	16
Other ¹	20	7	20	7
Railway	7	5	7	5
Sports Turf	8	4	8	4
Turf grass	1	1	1	1
Water companies	3	2	3	2
Total	304	197	252	148

¹The 'Other' category included distributors, advisors, arboriculture, garden and grounds maintenance, private estates and civil society organisations. Two responses from civil society organisations have been included within the 'Other' sector as the volume of data provided does not warrant the creation of a separate sector and could lead to issues of confidentiality.

The online survey accounted for 83% of all responses made and for 75% of the number of respondents providing pesticide usage data.

The actual population is unknown for many sectors and in some, for example railways, the bulk of the work is conducted by a small number of contractors.

Contractor usage includes a huge number of different situations and here includes the work of grounds maintenance and facilities management companies. In the design of the survey we have classified those contractors with a significant proportion of their work within transport infrastructure as Highways contractors.

Where contractors have responded on behalf of sampled organisations, they have normally provided information on their whole business, not just the staff and equipment used with the customer sampled in the survey.

In some cases, qualitative and quantitative information has been received not only from an organisation using a contractor(s), but also from the contractor(s) as well. In these cases, the qualitative responses have been separated but all pesticide usage has been attributed to the organisation employing the contractor; this is particularly important for local authority usage.

Lawn care has shown a positive response in terms of the numbers received and one of the major lawn care companies not only submitted a response for their whole company (over 100 franchises), but also actively encouraged their franchisees to participate as well. Another smaller company provided information for each of their locations.

Based on previous experience with postal surveys an overall response rate of 20% would have been expected and higher response rates have already been achieved in the local authority sector. We have no information available for the number of members in each sector of Amenity Forum and therefore it is difficult to calculate an overall percentage response.

However, the response rate in terms of those providing pesticide data is significantly better than in 2016. In 2016 we received pesticide usage data from 75 respondents, in 2020 this figure had increased to 197.

BACKGROUND QUESTIONNAIRE

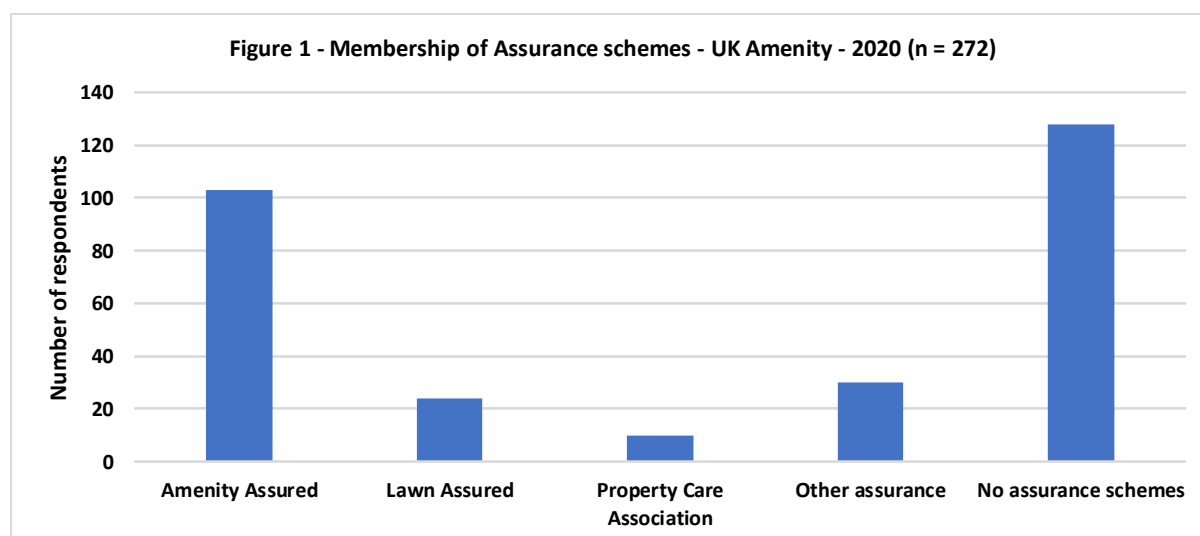
The background questionnaire requested information on: contact details; the organisation name and category (local authority, contractor, golf course etc.); the respondent's membership of assurance schemes; their total number of staff, the numbers involved in pesticide applications and their certification; and the types and numbers of sprayers used.

This part of the questionnaire was not always completed, and the following tables and charts indicate the number of positive responses to each section.

Whilst the contact details, organisation name and category were always completed, questions on amenity assurance, on staff numbers and the types and number of sprayers used were not always completed.

Respondents who have not completed a response to any of the questions in these three categories (30 out of 304) have been excluded from the analysis that follows.

ORGANISATION ASSURANCE STATUS



Assurance schemes are used to show that individual organisations and companies have reached a set of predetermined standards set by organisations such as the Amenity Forum, BASIS Lawn Assured scheme and the Property Care Association scheme. These standards are maintained and checked on a regular basis.

Approximately 44% of respondents (121) were part of one or more of the three main assurance schemes. Of the main assurance schemes no respondent was a member of all three, but eleven respondents were Amenity Assured and Lawn Assured, and five respondents were Amenity Assured and part of the Property Care Association scheme. Some were also part of 'Other' assurance schemes.

Table 3 – Membership of Assurance Schemes – UK Amenity – 2020 (n = 143)

Sector	Amenity Assured	Lawn Assured	Property Care Association scheme	Other assurance
Contractor	4	0	0	4
Golf	33	1	0	2
Highways	32	0	4	5
Invasive weeds	1	0	2	1
Local authorities	19	3	3	8
Lawn care	7	20	0	3
Other	0	0	0	3
Railway	4	0	0	3
Sports Turf	3	0	0	1
Turf grass	0	0	0	0
Water companies	0	0	1	0
Total	103	24	10	30

Of those that were not part of an assurance scheme one mentioned that they were Independent, and another indicated that 'fees to join organisation rather high for areas of challenged regional economies'.

There were 128 respondents, 47% of the total, that were either not part of the three main assurance schemes or had no recorded response in the 'Other assurance'.

Details of the other assurance schemes, 30 respondents in total, can be found in Table 4.

AMENITY ASSURANCE (cont.)

Table 4 – Membership of Other Assurance Schemes – UK Amenity – 2020 (n = 30)

Sector	Assurance Provider	Number of responses
Contractor	BALI (British Association of Landscape Industries)	1
Contractor	Grounds Maintenance Association	1
Contractor	Landscape Juice Network	1
Contractor	Alcumus (https://www.alcumus.com/en-gb/)	1
Golf	BIGGA	1
Golf	England Gold	1
Highways	NHSS 18	1
Highways	Arboriculture Association Scheme	1
Highways	ISO 9001 14001 95001	1
Highways	Highway Authority	1
Highways	BASIS	1
Invasive weeds	INNSA (Invasive Non-Native Specialists Association) Contractor Member	1
Local authorities	Street Cleaning Contract	1
Local authorities	ISO9000, ISO14001 and ISO45001 accreditations	1
Local authorities	Local Government	1
Local authorities	Grounds Maintenance Association	1
Local authorities	ISO 14001 Environmental Management Standard	1
Local authorities	Long term member of The Amenity Forum	1
Local authorities	BASIS	2
Lawn care	PA3 & PA6 licences	1
Lawn care	UKLCA (United Kingdom Lawn Care Association)	2
Other	Lantra Instructor	1
Other	BASIS	2
Railway	Network rail infrastructure	1
Railway	RISQS (The Railway Industry Supplier Qualification Scheme)	2
Sports Turf	City & Guilds PA1 & PA6A	1

Whilst some of these might not be considered assurance schemes, they all include a level of training and experience.

NUMBER OF STAFF AND SPRAYING CERTIFICATION

This was a detailed question which looked at the total number of staff employed, those involved in spraying and the number with spraying qualifications. The main issue with this question was that some respondents did not always complete all sections of the question and that contractors may have completed some sections on behalf of a customer. Where possible, updates have been made in line with the information available.

Contractor usage includes a huge number of different situations and here includes the work of grounds maintenance and facilities management companies. In the design of the survey we have classified those contractors with a significant proportion of their work within transport infrastructure as Highways contractors.

Where contractors have responded on behalf of sampled organisations, they have normally provided information on their whole business, not just the staff and equipment used with the customer sampled in the survey.

As can be seen from Table 5 the respondents represented companies with 21,322 staff and 3,711 applying pesticides. It can also be seen that the number of staff with spraying qualifications (4,091) is greater than the number spraying, reflecting perhaps the number of trained supervisory staff that are not directly involved in spraying.

Table 5 – Number of staff involved in the business, the number spraying and the number with spraying qualifications - UK Amenity – 2020 (n = 275)

Sector¹	Number of staff employed in the business	Number of operators involved in spraying	Number of operators with spray certificates
Contractor (11)	2,089	702	715
Golf (73)	564	255	300
Highways (41)	842	280	283
Invasive weeds (2)	52	10	14
Local authorities (90)	14,315	1,859	2,135
Lawn care (25)	369	295	311
Other (16)	234	115	135
Railway (7)	383	129	128
Sports Turf (7)	59	33	35
Turf grass (1)	15	8	8
Water companies (2)	2,400	25	27
Total	21,322	3,711	4,091

¹ Figures in parentheses indicate the number of individual responses within each sector

EQUIPMENT: NUMBER AND TYPES OF SPRAYERS

The background information question on sprayers - total number of sprayers used by your organisation (excluding sprayers that are no longer in use) - was completed by 264 respondents.

One respondent, replying on behalf of a lawn care company, was excluded from this question as the number of sprayers represented the total number of sprayers used for all franchises.

There was some confusion on the numbers of knapsacks and hand lances, where the number of sprayers recorded in each category was the same. It is likely that the hand lance on the knapsack sprayer caused confusion and resulted in double recording on 24 responses. Whilst this is not significant when a small number of each is recorded, it becomes more of an issue when the number of potentially duplicated sprayers exceeds 100. It was decided to keep the knapsack number unchanged for the 24 responses and set the hand lance value to 0. For any future survey the questionnaire needs to make it clear that the lance category excludes knapsacks.

Table 6 – Number and distribution of the main sprayers encountered in this survey - UK Amenity – 2020 (n = 264)¹

Sector ²	Total number of sprayers	Average number of sprayers per respondent	Minimum number of sprayers per respondent	Maximum number of sprayers per respondent
Contractor (11)	772	70	2	460
Golf (72)	252	4	1	25
Highways (40)	661	17	3	103
Invasive weeds (2)	18	9	3	15
Local authorities (86)	1,956	23	1	118
Lawn care (24)	270	11	1	43
Other (13)	350	27	1	168
Railway (6)	128	21	1	60
Sports Turf (7)	29	4	1	11
Turf grass (1)	9	9	9	9
Water companies (2)	25	13	5	20
Total	4,470	17		

¹This does not include 'Other types of sprayer' - see text on page 11

²Figures in parentheses indicate the number of individual responses within each sector

The responses shown in Table 6 clearly show the large number of sprayers included in this survey. Compared to the number of operators spraying (Table 5), there is an average of 1.20 sprayers per person – or between one and two sprayers per person.

As would be expected contractors have a higher average number of sprayers per company than other sectors.

The 'Other' sector, containing the two civil society organisations, has the next highest average per organisation and this is high because of the numerous locations in which these organisations are present.

Local authorities, highway contractors and railway contractors have the next highest numbers. The average numbers of sprayers within the local authority sector is high and this is likely to be due to their use of contractors who have also added their total number of sprayers to the questionnaire for some local authorities.

Whilst the average number of sprayers for water companies is high there are only a small number of responses (2), and at least one of these responses includes contractor information.

TYPES OF SPRAYERS ENCOUNTERED

Table 7 – Number and types of the main sprayers encountered in this survey - UK Amenity – 2020 (n = 264)¹

Sector ²	Knapsack	Hydraulic Boom	Lance	Stem Injection/ Plugs	Controlled Droplet Applicator	Manually Folding Boom	Train Sprayer	Motorised Knapsack	Total
Contractor (11)	611	25	7	61	55	4	0	9	772
Golf (72)	142	59	10	1	2	33	0	5	252
Highways (40)	348	70	60	81	42	50	3	7	661
Invasive weeds (2)	10	0	0	6	0	0	0	2	18
Local authorities (86)	1,090	50	225	61	481	32	0	17	1956
Lawn care (24)	234	2	1	0	1	25	0	7	270
Other (13)	199	1	10	116	1	18	0	5	350
Railway (6)	70	10	0	25	4	0	19	0	128
Sports Turf (7)	17	5	2	0	0	5	0	0	29
Turf grass (1)	6	1	1	1	0	0	0	0	9
Water companies (2)	15	0	9	1	0	0	0	0	25
Total	2,742	223	325	353	586	167	22	52	4,470

¹This does not include 'Other types of sprayer' - see description below

²Figures in parentheses indicate the number of individual responses within each sector

Table 7 shows the importance of the knapsack sprayer, which accounted for 61% of all sprayers encountered. The other sprayers included controlled droplet applicators 13%, stem injection/use of herbicide plugs 8%, hand lance 7%, hydraulic boom 5%, manually folding boom 4% and all other types 1% or less. Other sprayer types included motorised knapsacks and train sprayers.

Table 7 also shows the importance of handheld sprayers in the amenity sector which accounted for 91% of all sprayers encountered. However, the figure may be higher than this if hand-held pedestrian sprayers have been included in the manually folding boom section.

Other sprayers were recorded, but no additional information was collected as part of this survey. In total there were 120 'other' sprayers. Information is known from 71 or 59% of the number of 'other' sprayers; these included Weed-IT precision sprayers, sprayers used on quad bikes and hand sprayers.

For future surveys it would be useful to collect the information on 'other' sprayers and possibly separate herbicide plugs from stem injection sprayers. There is a concern that in some cases the number of plugs used could have been recorded as individual 'sprayers', and any high numbers were checked and corrected where it was obvious that this was the case.

RESULTS OF THE PESTICIDE QUESTIONNAIRE

DATA QUALITY

The type and quality of data provided by respondents varied. The data required when using the online questionnaire included the product used, the surface type, the method of application, the total quantity of product used in 2020 and the reasons for use.

Some more detailed responses, normally derived from the respondent's own spray records, included the date of each application, the surface treated, the product used, the quantity of product used at each application, the method of application and reasons for use.

All data supplied, apart from fertilisers and foliar feed, have been incorporated into the database.

In total, 1,710 rows of pesticide data have been collected, despite the increased number of responses. This is slightly lower than in 2016 where initially the aim was to obtain data, with dates of application, which resulted in an increased number of rows. The provision of daily usage totals, which accounted for 49% of the rows of data, suggested that it may have been possible to look at the timing of application for some sectors. However, as a percentage of the total weight of active substances, the rows of data with date of application accounted for only 3% of the total and information on the timing of application has not been considered as part of this report.

In contrast to the 2016 survey an estimate of the area treated has not been made for the 2020 survey. Estimating the area treated could potentially be calculated by dividing the total amount used by the maximum recommended rate for each product and type of surface treated. It was felt that this was not entirely accurate and may underestimate the total area treated because of reduced rates of application. Conversely there may be an overestimate of the treated area where stem injection methods for invasive weeds are likely to be applied at rates higher than more conventional rates of application.

The method of application for Ecoplug Max (glyphosate) has, for now, been recorded as stem injection, but could be changed to another method of application if necessary. Data on the use of Ecoplug Max was normally provided in terms of plugs; these values have been converted to the weight of glyphosate product used and then to the quantity of active substance for the tables in this report.

Data have been standardised to ensure that surface types and methods of application are consistent with the responses to the online questionnaire.

Data collected as part of the online questionnaire resulted in a single row of data per product. Whilst the surface treated and the type of sprayers used were recorded within this single row there was no distinction made between the percentage in each category. Where a combination of handheld and boom sprayer usage has been recorded for a single product, these have been combined into a single category. Similarly, where both soft and hard surfaces have been treated with a single product these have been combined into a single category. The use of combined sprayer or surface types has been clearly identified in the text of this report.

Low response rates within certain sectors have meant that some data have been amalgamated to ensure confidentiality.

ESTIMATED NATIONAL USAGE

As with the 2016 survey we have not made national estimates based on the information collected in the 2020 survey. This decision was taken because of the large and unquantified uncertainties associated with two critical pieces of information needed to make an estimate: a) the size of the populations within each sector; b) the extent to which the small proportion of those who were surveyed that decided to respond are representative of the population as a whole.

OVERALL RESPONSE RATES AND USE OF PESTICIDES

Table 8 – Number of respondents providing pesticide data and the weight of active substances applied - UK Amenity – 2020 (n = 197)

Sector	Number providing pesticide data	Active substances applied (kg) ¹
Contractor	7	2,344
Golf	35	592
Highways	36	51,113
Invasive weeds	2	360
Local authorities	82	22,211
Lawn care	16	3,075
Other ²	7	461
Railway	5	52,798
Other amenity grass ³	5	26
Water companies	2	103
Total	197	133,082

¹Excludes unspecified adjuvants & wetters

²The 'Other' category included distributors, advisors, arboriculture, garden and grounds maintenance, private estates and civil society organisations

³Includes sports turf and turf growers

Other amenity grass includes sports turf and turf growers which have been combined because of the limited number of respondents; four sports turf and one turf grower in total.

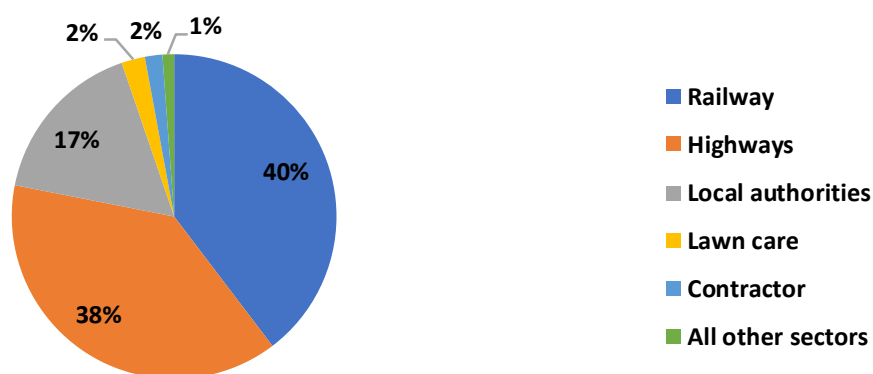
Local authorities had the largest number of respondents providing pesticide data, accounting for 42% of all responses, other major sectors responding included transport infrastructure (highways and rail combined) 21%, golf 18% and lawn care 8%.

Of the 16 lawn care sector responses one response was from a single major company with over 100 franchisees. Whilst this may duplicate a small number of other lawn care responses, no account has been taken of this in this report. It was felt that overall it was unlikely to overestimate usage in the lawn care sector as there are other franchisee companies and many independent lawn care operatives.

Excluding biological control usage, respondents submitted data relating to 357 tonnes of product and 133 tonnes of active substance.

Three sectors comprised over 90% of the weight of active substances applied; railways 40%, highway contractors 38% and local authorities 17%. Lawn care accounted for 2%, other contractors 2% and all other sectors 1% or less.

Figure 2 - Weight of pesticide active substances applied within each of the sectors sampled - UK amenity - 2020 (n = 197)



OVERALL RESPONSE RATES AND PESTICIDE USAGE (cont.)

The data presented in Table 9 clearly show that herbicides were the single largest group accounting for 97% of the weight of products and 98% of the weight of active substances applied.

Disinfectants, used for clearing moss, algae and liverworts on hard surfaces, accounted for 2% of the weight of products and 1% of the weight of active substances. All other pesticide groups including adjuvants, fungicides, growth regulators, physical controls, algicides, insecticides, sulphur and fungicides/insecticides accounted for less than 1% of the total weight of active substances applied.

Biological control agents, mainly for the control of chafer grubs and leatherjackets in golf, turf and domestic gardens have not been included in table 9 because they are sold in units, rather than in kilogram or litre packs. These packs contain many thousands of live nematodes and as such cannot be compared to units of weight.

Table 9 – Summary of the data provided as part of the survey - UK Amenity – 2020 (n = 197)

Pesticide group	Weight of products (kg)¹	Weight of active substances (kg)¹
Adjuvant	901	782
Algicide	59	6
Disinfectant	8,212	1,603
Fungicide	1,629	363
Fungicide/insecticide	<1	<1
Growth regulator	1,582	188
Herbicide	344,264	130,129
Insecticide	28	4
Physical control	6	6
Sulphur	1	<1
Total	356,683	133,082

¹Excludes unspecified adjuvants & wetters

For each of the following sector descriptions, on pages 16 – 23 we have considered the major pesticides used; herbicides, fungicides, insecticides, disinfectants, growth regulators and adjuvants. However, we have excluded unspecified adjuvants and wetters (where the active substance is unknown) from the totals.

A detailed list and the weights associated with all active substances can be found in Tables 18 - 21.

USAGE OF PESTICIDES WITHIN EACH SECTOR

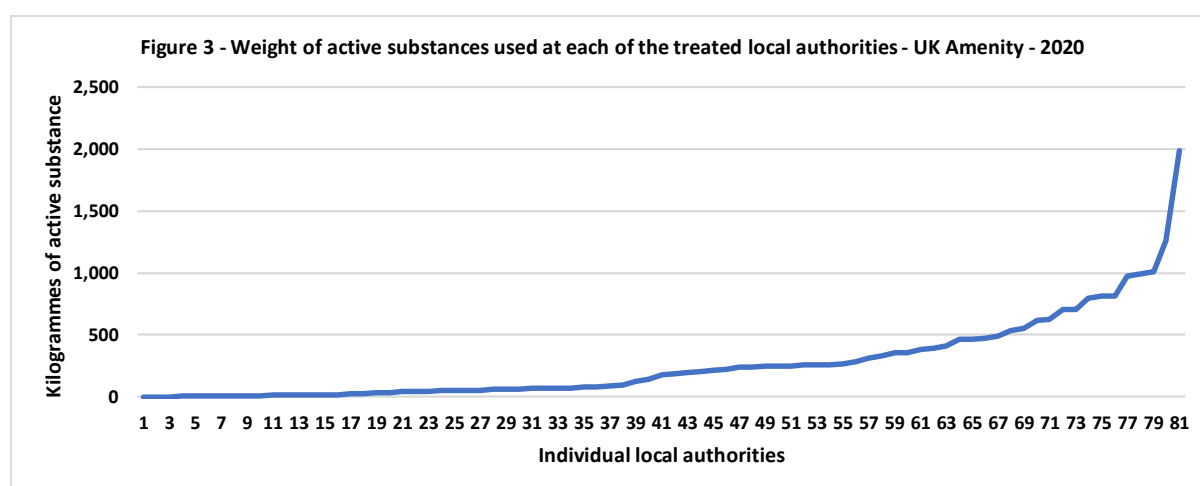
PESTICIDE USAGE BY LOCAL AUTHORITIES IN 2020

There are 398 local authorities in the UK. Of the 82 local authorities providing information on pesticide usage, one local authority didn't use pesticides in 2020. Of the 81 using pesticides a total of 62 tonnes of products were used and 22 tonnes of active substance. There are several areas of usage, including highways, that have been recorded with the local authority totals, rather than with highways. Where known, highway treatments comprised 5% of the weight of pesticides applied.

The local authorities encountered in the survey accounted for 17% of the weight of all active substances applied in this survey.

An average of 274 kg of active substance was used at each local authority, although the minimum amount used was less than 1kg and the maximum 1,987 kg. The median value was 175 kg.

Figure 3 shows the differences in weight of active substances (herbicides, fungicides, insecticides, disinfectants, growth regulators and adjuvants) applied by each local authority, emphasising the difficulties in making national estimates of pesticides used by local authorities. A further concern is that weed control may be the responsibility of more than one local authority department. It is very likely that only partial information from each local authority has been received from those responding.



Usage of herbicides accounted for 99% of the weight of all pesticides applied, adjuvants less than 1%. There was minimal use of fungicides and disinfectants. Where specified, 55% of use was on a combination of hard and soft surfaces, 39% on hard surfaces, 5% for other soft surfaces including tree stumps and 1% on amenity grass.

Handheld sprayers accounted for 62% of all application methods by weight applied, mixed hand-held and other sprayers, 37% and 1% hydraulic boom sprayers.

Table 10 – The principal 5 active substances, by weight, used by local authorities submitting data for the 2020 amenity survey

Active substance	Active substance weight (kg)
Glyphosate	21,075
Glyphosate/sulfosulfuron	483
Diflufenican/glyphosate	127
Polyoxyalkylene glycol	100
Ferrous sulphate	80

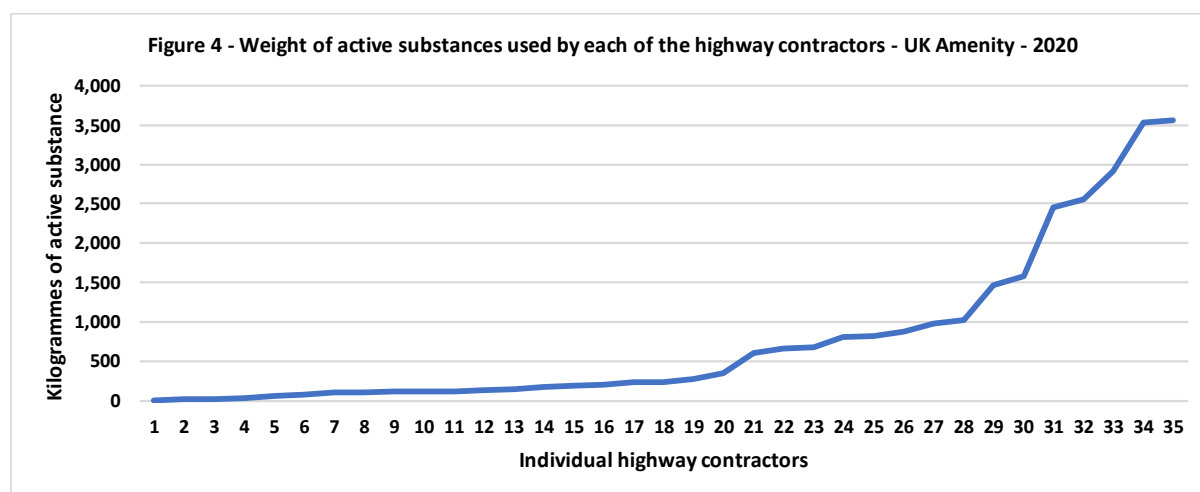
General weed control was the main reason given for weed control, accounting for 83% of the weight applied where a reason was given. Invasive weed species including Japanese knotweed and giant hogweed comprised 14% of the total. Other weed species specified included bracken and brambles.

PESTICIDE USAGE BY HIGHWAY CONTRACTORS IN 2020

The highway contractors encountered in the survey accounted for 38% of the weight of all active substances applied. In total, 36 contractors provided pesticide information which accounted for 133 tonnes of product and 51 tonnes of active substances. Whilst highways were the main area of usage, there was also use in other areas such as local authorities and maintenance contracts. Whilst some usage has been moved to local authorities, where the local authority agreed for us to do this, other local authority data have remained within this section as usage was mainly on footpaths and roads.

An average of 777 kg of active substance was used by each contractor, although the minimum amount used was less than 1kg and the maximum 3,564 kg (excluding the largest contractor for confidentiality reasons). The median value was 232 kg.

Figure 4 shows the differences in weight of active substances (herbicides, fungicides, insecticides, disinfectants, growth regulators and adjuvants) provided by each contractor, emphasising the difficulties in making national estimates of pesticides used by highway contractors.



Usage of herbicides accounted for 97% of the pesticides applied by highway contractors, disinfectants 3% and growth regulators, fungicides and insecticides all less than 1%. Most usage by weight, 68%, was applied to highways including motorways, roads and footpaths alongside roads. Soft surfaces such as verges and central reservations comprised 14%, hard surfaces 7% and a combination of hard and soft surfaces 10%; other areas including tree stumps and sports turf made up the remainder. A combination of handheld and other types of sprayers made up 91% of all applications and handheld sprayers accounted for the remaining 9%.

Table 11 – The principal 5 active substances, by weight, used by highway contractors submitting data for the 2020 amenity survey

Active substance	Active substance weight (kg)
Glyphosate	44,100
Dicamba/MCPA/mecoprop-P	4,330
Didecyldimethylammonium chloride	1,468
2,4-D	479
Trinexapac-ethyl	172

By weight applied, general weed control accounted for 97% of the usage of herbicides where a reason was specified. The main areas of usage were footpaths alongside roads, highways, industrial sites, cable wayleave and motorways although an additional 2% of the weight applied was as a grass retarder alongside motorways. There was minimal usage of herbicides for ragwort and Japanese knotweed. The use of growth regulators was entirely for grass suppression and disinfectants for moss control. The only pest specified for insecticide use was the brown-tail moth.

PESTICIDE USAGE BY RAILWAY CONTRACTORS IN 2020

The railway contractors encountered in the survey accounted for 40% of the weight of all active substances applied. In total, 5 contractors provided pesticide information which accounted for 143 tonnes of product and 53 tonnes of active substances. Whilst railways were the main area of usage, there was also minimal use in other areas such as railway yards.

With such a small number of respondents, breaking them down by individual quantities of use has not been done for confidentiality reasons.

Usage of herbicides accounted for almost 100% of the pesticides applied by railway contractors, with less than 1% of adjuvants being recorded. Most usage by weight, 86%, was applied to the ballast alongside the railway tracks. A combination of hard and soft surfaces comprised 12% of the total, hard surfaces alone for 2% and soft surfaces and tree stumps less than 1%.

Train sprayers (MPV weed spraying trains) accounted for 64% of the weight of herbicides applied, a mixture of handheld sprayers and other types of sprayers for 29%, and handheld sprayers and stump treatments for the remaining 7%.

Table 12 – The principal 5 active substances, by weight, used by railway contractors submitting data for the 2020 amenity survey

Active substance	Active substance weight (kg)
Glyphosate	41,928
Diflufenican/glyphosate	7,838
2,4-D/glyphosate	1,620
Aminopyralid/triclopyr	993
Acetic acid	169

By weight applied, general weed control accounted for 99% of the usage of herbicides where a reason was specified. The only other reasons given were for moss control, invasive weeds and tree stumps.

PESTICIDE USAGE BY OTHER CONTRACTORS IN 2020

The other contractors encountered in the survey accounted for 2% of the weight of all active substances applied. In total, seven contractors provided pesticide information which accounted for 6 tonnes of product and 2 tonnes of active substances. A range of sectors were treated including one that was primarily local authority usage, three general contractor work, two garden maintenance and one providing services to a civil society organisation.

With such a small number of respondents breaking them down by individual quantities of use has not been done for confidentiality reasons. However, minimum usage was less than 1 kg of active substances, the maximum was 1,800 kg, with an average of 335 kg. The median value was 25 kg.

Usage of herbicides accounted for all pesticides applied by other contractors. Most usage by weight, 77%, was applied to a combination of hard and soft surfaces, hard surfaces alone for 21%, soft surfaces 2% and gravel areas less than 1%.

Handheld sprayers, including knapsacks accounted for 80% of the weight of herbicides applied, and a mixture of handheld sprayers and other types of sprayers for 20%.

Table 13 – The four active substances, by weight, used by other contractors submitting data for the 2020 amenity survey

Active substance	Active substance weight (kg)
Glyphosate	2,343
Clopyralid/triclopyr	1
Flazasulfuron	<1
Clopyralid/florasulam/fluroxypyr	<1

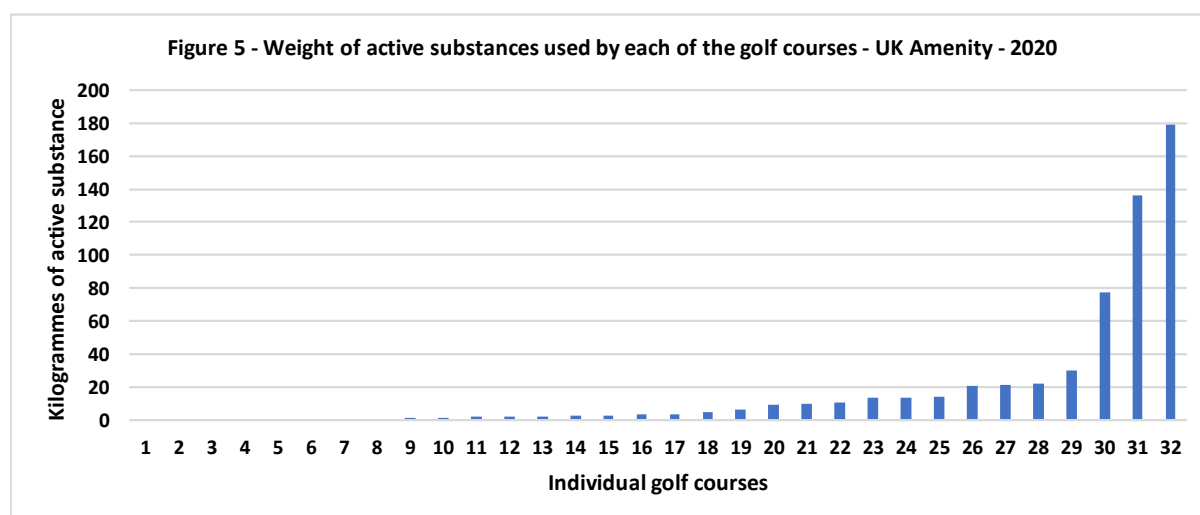
By weight applied, general weed control accounted for 99% of the usage of herbicides where a reason was specified. The only other reasons given for use were Japanese knotweed and woody weeds.

One contractor used the biological control agent *Heterorhabditis bacteriophora* for chafer grub control.

PESTICIDE USAGE ON GOLF COURSES IN 2020

According to Statista, <https://www.statista.com/topics/3199/golf-in-the-united-kingdom-uk/> there were almost 3,000 golf courses in the UK in 2018. The 35 golf courses encountered in the survey and providing pesticide information accounted for less than 1% of the weight of all active substances applied.

Three courses remained untreated, and in total 32 golf courses provided pesticide information which accounted for 2 tonnes of product and 0.59 tonnes of active substances. The average weight applied to each of the 32 treated golf courses was 18 kg, the range varied from less than 1 kg to 179 kg per course. The median value was 3 kg. When all 35 courses are considered the average falls to 16 kg per course.



Usage of herbicides accounted for 50% of the weight of pesticides applied, adjuvants, 41%, with many adjuvants used for dry patch, water penetration and dew control on the golf course, fungicides 6%, growth regulators 2% and insecticides 1%.

Almost all pesticides, 95%, were applied to the golf course, with the remaining 5% being applied to a combination of hard and soft surfaces including car parks and rough areas with pernicious weeds such as bramble and gorse. Hydraulic boom sprayers accounted for 86% of all application methods by weight applied; hand-held sprayers including knapsacks and CDA applicators comprised a further 10% and a mixture of sprayer types the remaining 4%.

There was no use of biological control reported in 2020.

Table 14 – The principal 5 active substances, by weight, used by golf courses submitting data for the 2020 amenity survey

Active substance	Active substance weight (kg)
2,4-D/dicamba/fluroxypyr	78
2,4-D/florasulam	53
2,4-D	46
Glyphosate	26
Mecoprop-P	25

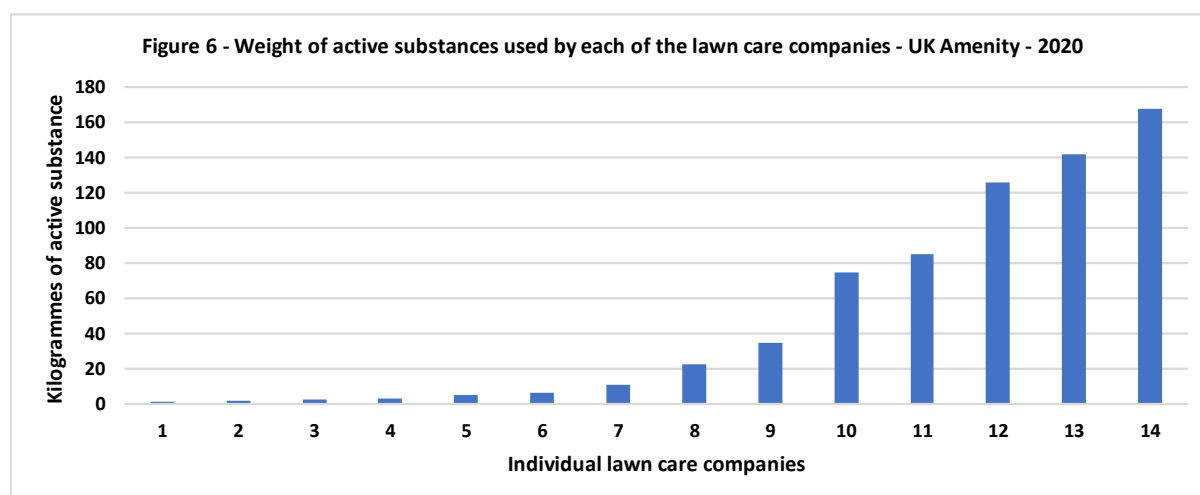
Use of the adjuvant, dihydrooxirane, epihydrin, for dry patch on the golf course, accounted for 170 kg or 33% of all active substances applied.

By weight applied, general weed control accounted for 93% of the herbicide treated area where the reason was known, broad-leaved weed control 4%, grassweed control 2% and moss, brambles and gorse comprised the remaining 1%. General disease control accounted for 52% of fungicide use, *Microdochium/Fusarium* patch 42%, earthworms 4% and other diseases 2%. The only pests mentioned were chafer and leatherjackets.

PESTICIDE USAGE BY LAWN CARE OPERATIVES IN 2020

The 16 lawn care companies encountered in the survey and providing pesticide information accounted for 2% of the weight of all active substances applied.

The 16 lawn companies provided pesticide information which accounted for 8 tonnes of product and 3 tonnes of active substances. The average weight applied by 14 of the lawn care companies was 49 kg; the range varied from 1 kg to 168 kg per company. The median value was 17 kg. Two lawn care companies were excluded from the calculations because they were responsible for several separate companies.



Usage of herbicides accounted for 78% of the weight of pesticides applied, adjuvants 10%, fungicides 9%, disinfectants 3% and growth regulators for less than 1%.

Almost all pesticides, 75%, were applied to domestic garden lawns, 21% to hard surfaces including garden drives and paths, 4% to a combination of hard and soft surfaces and less than 1% to soft surfaces. Knapsack sprayers accounted for 80% of all application methods by weight applied, 10% hydraulic boom sprayers, a mixture of sprayer types 8% and the remaining 2% handheld sprayers.

Two lawn care companies, one responsible for over 100 individual franchisees, another with several offices around the country, both used biological control agents. These included *Heterorhabditis bacteriophora* for chafer grub control and *Steinernema feltiae* for leatherjacket control.

Table 15 – The principal 5 active substances, by weight, used by lawn care companies submitting data for the 2020 amenity survey

Active substance	Active substance weight (kg)
2,4-D/dicamba/fluroxypyr	1,272
Glyphosate	374
Tebuconazole/trifloxystrobin	288
Acetic acid	254
2,4-D/florasulam	210

By weight applied, general weed control on driveways, other hard surfaces and other areas accounted for 94% of the total where the reason was known, and broad-leaved weeds 5%. The remaining 1% of applications included grass destruction, *Anthracoise/Fusarium*, fairy ring and plant growth regulator.

PESTICIDE USAGE BY OTHER SAMPLED SECTORS IN 2020

Other sampled sectors together accounted for just over 1% of the total weight of all pesticides applied and a summary of their usage is set out below.

Other

The 'Other' category included distributors, advisors, arboriculture, garden and grounds maintenance, private estates and civil society organisations. Not all respondents used pesticides. Two responses from civil society organisations have been included within the 'Other' sector as the volume of data provided does not warrant the creation of a separate sector and could lead to issues of confidentiality.

There were seven respondents using pesticides in this category and together they applied 1,169 kg of product and 461 kg of active substance. The median value was 10 kg.

The average weight applied by the seven respondents was 66 kg; the range varied from 1 kg to 284 kg per company.

Usage of herbicides accounted for 99.6% of the weight of pesticides applied, and insecticides, for box leaf caterpillar control, less than 1%.

Almost all pesticides, 83%, were applied to soft surfaces, 10% to a combination of hard and soft surfaces, 7% to hard surfaces and less than 1% to tree stumps. Hydraulic booms accounted for 54% of all application methods by weight applied, 34% knapsacks and the remaining 12% handheld applicators.

2,4-D, glyphosate and asulam accounted for 87% of the weight of pesticides applied.

General weed control 69%, broad-leaved weed control 14% and bracken control 13% were the reasons given for 96% of all usage by weight applied. The remaining 4% for a mixture of weeds including grass weeds, nettles, Japanese knotweed and alexanders.

Invasive weed specialists

Two invasive weed specialist companies provided pesticide data. Together they applied 773 kg of product and 360 kg of active substance.

Usage of herbicides accounted for 98% of the weight of pesticides applied, adjuvants 2%.

All pesticides were applied to a combination of hard and soft surfaces, and all applications were made using handheld applicators.

Glyphosate, aminopyralid/triclopyr and flazasulfuron were the only herbicides recorded and comprised 98% of the weight of pesticides applied, unspecified adjuvants 2%.

Whilst general weed control was the reason given for 75% of all usage where a reason was given, invasive weeds comprised the remaining 25%.

PESTICIDE USAGE BY OTHER SAMPLED SECTORS IN 2020 (cont.)

Water companies

Two water companies provided pesticide data. Together they applied 223 kg of product and 103 kg of active substance.

Herbicides were the only pesticides applied.

Most pesticides were applied to either a hard surface (62%) or a combination of hard and soft surfaces (34%). The remaining surfaces treated included highways, soft surfaces, riparian areas and gravel. A mixture of sprayer types accounted for 53% of applications, and knapsacks the remaining 47%.

Glyphosate was the only herbicide recorded.

Whilst general weed control was the reason given for 98% of all usage where a reason was given, invasive weeds, including Japanese knotweed and giant hogweed, comprised the remaining 2%.

Amenity turf

Four sports turf and one turf grass respondent provided pesticide data. Together they applied 93 kg of product and 26 kg of active substance.

Herbicides accounted for 87% of the weight of active substances applied, growth regulators 9% and fungicides 4%.

Most pesticides were applied to sports turf (51%), with hard surfaces 28%, a combination of hard and soft surfaces (14%), soft surfaces 7%, derelict land and domestic gardens less than 1%. Hydraulic booms, 48%, knapsacks 30% and other handheld sprayers 22% were the only sprayer types recorded.

Table 16 – The principal 5 active substances, by weight, used by amenity turf companies submitting data for the 2020 amenity survey

Active substance	Active substance weight (kg)
Glyphosate	11
2,4-D	5
Dicamba/MCPA/mecoprop-P	5
Trinexapac-ethyl	2
Clopyralid/florasulam/fluroxypyr	2

Whilst general weed control was the reason given for 59% of all usage where a reason was given, general weed control and pitch destruction comprised a further 28%, plant growth regulator 9%, disease control 3%, *Microdochium/Fusarium* patch 1% and red thread less than 1%.

APPENDIX 1 – PESTICIDE DATA – DETAILED TABLES

Tables 18 - 21 detail pesticide usage by sector, surface type and method of application. Whilst the individual sectors have already been identified, the following table (Table 17) shows how surface types have been defined. Please also see Appendix 6 for the database codes used for the survey.

Adjuvant usage has been included in Tables 18 - 20, as they are particularly important for sectors such as golf courses where they are used to combat dry patch on turf. Adjuvants have been excluded from Table 21.

Table 17 – Categories of surface types encountered in the 2020 amenity survey

Description	Hard/soft	Grouping for published report
Golf course	soft	golf course
Hard & soft surfaces	combination of hard & soft	hard & soft surfaces
Lawns	soft	lawn care
Car parks	hard	other hard surfaces
Garage areas	hard	other hard surfaces
Gravel	hard	other hard surfaces
Hard surfaces	hard	other hard surfaces
Paths	hard	other hard surfaces
Pavements/kerbs	hard	other hard surfaces
Playgrounds	hard	other hard surfaces
Amenity grass	soft	other soft surfaces
Derelict land/brown field site	hard	other soft surfaces
Domestic gardens	soft	other soft surfaces
Ecologically sensitive area	soft	other soft surfaces
Forestry/woodland	soft	other soft surfaces
Invasive weeds	soft	other soft surfaces
Pitches	soft	other soft surfaces
Riparian	soft	other soft surfaces
Tree stumps	soft	other soft surfaces
Soft surfaces	soft	other soft surfaces
Sports turf/bowling green	soft	other soft surfaces
Trees/shrubs	soft	other soft surfaces
Railway ballast	hard	railways
Railway grass	soft	railways
Railway tracks	hard	railways
Roads	hard	roads
Roadside verges	soft	roads

Table 18 – Pesticide usage collected as part of the 2020 amenity survey – by sector – weight applied (kilogrammes)

	Local authorities	Highways	Railways	Contractors ²	Golf courses	Lawn care ²	Other sectors ¹	Total
Adjuvants								
Alcohol alkoxylate/trisiloxane organosilicone copolymers	.	.	49	.	.	.	.	49
Alkoxylated alcohol	74	.	.	.	.	.	.	74
Dihydrooxirane, epihydrin	.	.	.	.	170	298	.	468
Non-ionic surfactant	.	.	.	.	<1	.	.	<1
Polyoxyalkylene glycol	100	.	.	.	.	.	.	100
Polyoxyethylene (3 EO) C12-C15 primary alcohol/ polyoxyethylene (7 EO) C12-C15 primary alcohol	.	.	.	.	.	.	7	7
Unspecified adjuvants	.	.	.	.	.	287	.	287
Unspecified wetter	8	.	.	.	75	.	.	83
All adjuvants	183	.	49	.	245	585	7	1,069
Algicides								
Alkyl (C12-14) dimethyl benzyl ammonium chloride	6	.	.	.	.	.	.	6
All algicides	6	.	.	.	.	.	.	6
Disinfectants								
Citric acid/didecyldimethylammonium chloride	.	.	.	.	.	90	.	90
Didecyldimethylammonium chloride	35	1,468	.	.	.	10	.	1,513
All disinfectants	35	1,468	.	.	.	100	.	1,603
Physical control								
Natural plant extracts	.	.	.	.	.	6	.	6
All physical controls	.	.	.	.	.	6	.	6

¹Other sectors include invasive weeds, sports turf, turf growers, water companies and 'Other' respondents

²Whilst there is no weight associated with them, *Heterorhabditis bacteriophora* for chafer grub control and *Steinernema feltiae* for leatherjackets was used in the lawn care sector and *Heterorhabditis bacteriophora* by contractors

Table 18 (cont.) – Pesticide usage collected as part of the 2020 amenity survey – by sector – weight applied (kilogrammes)

	Local authorities	Highways	Railways	Contractors	Golf courses	Lawn care	Other sectors ¹	Total
Herbicides								
2,4-D	24	479	.	.	46	40	197	786
2,4-D/dicamba	.	.	.	.	6	.	.	6
2,4-D/dicamba/fluroxypyr	6	.	.	.	78	1,272	42	1,399
2,4-D/dicamba/MCPA/mecoprop-P	2	.	.	.	.	.	.	2
2,4-D/florasulam	.	.	.	.	53	210	12	275
2,4-D/glyphosate	8	.	1,620	.	.	.	.	1,628
2,4-D/MCPA	.	14	.	.	.	41	.	54
Acetic acid	1	1	169	.	8	254	.	433
Aminopyralid/fluroxypyr	.	142	9	.	1	.	.	152
Aminopyralid/triclopyr	16	35	993	.	.	.	6	1,049
Asulam	54	8	.	.	.	.	56	118
Carfentrazone-ethyl/mecoprop-P	.	.	.	.	<1	.	.	<1
Citronella oil	.	114	.	.	.	.	.	114
Clopyralid/2,4-D/MCPA	<1	.	.	.	.	.	<1	<1
Clopyralid/florasulam/fluroxypyr	4	5	.	<1	23	8	2	42
Clopyralid/fluroxypyr/MCPA	<1	<1	.	.	.	12	6	18
Clopyralid/triclopyr	1	136	.	1	3	2	.	143
Dicamba/MCPA/mecoprop-P	25	4,330	.	.	10	.	5	4,370
Dicamba/mecoprop-P	7	.	.	.	.	58	.	65
Diflufenican/glyphosate	127	3	7,838	.	.	18	.	7,985
Diflufenican/iodosulfuron-methyl-sodium	4	.	55	.	.	4	.	63
Fatty acids: pelargonic acid	9	.	3	.	.	.	.	11
Ferrous sulphate	80	.	.	.	<1	.	.	80
Flazasulfuron	140	44	136	<1	.	<1	<1	208
Florasulam/fluroxypyr	.	.	.	.	.	90	.	90
Flufenacet	.	.	.	.	.	75	.	75
Fluroxypyr	.	.	.	.	1	.	.	1
Fluroxypyr/triclopyr	.	2	.	.	.	.	.	2
Glyphosate	21,075	44,100	41,928	2,343	26	374	615	110,460
Glyphosate/sulfosulfuron	483	.	.	.	.	.	.	483
MCPA/mecoprop-P	8	.	.	.	3	.	.	11
Mecoprop-P	18	26	.	.	25	.	.	70
Propyzamide	3	.	.	.	9	.	.	13
Triclopyr	<1	.	.	.	.	.	<1	<1
All herbicides	21,981	49,441	52,749	2,344	294	2,381	939	130,129

¹Other sectors include invasive weeds, sports turf, turf growers, water companies and 'Other' respondents

Table 18 (cont.) – Pesticide usage collected as part of the 2020 amenity survey – by sector – weight applied (kilogrammes)

	Local authorities	Highways	Railways	Contractors	Golf courses	Lawn care	Other sectors ¹	Total
Fungicides								
Azoxystrobin	<1	32	.	.	3	1	<1	36
Carbendazim	.	.	.	.	2	.	.	2
Chlorothalonil/fludioxonil/propiconazole	<1	.	.	.	.	.	.	<1
Difenoconazole/fludioxonil	<1	.	.	.	17	.	.	17
Fludioxonil	3	.	.	.	.	<1	1	10
Fluopyram/trifloxystrobin	<1	.	.	.	2	.	.	2
Propiconazole	<1	.	.	.	1	.	<1	1
Pyraclostrobin	<1	.	.	.	<1	.	.	<1
Tebuconazole/trifloxystrobin	2	.	.	.	6	288	.	295
All fungicides	6	32	.	.	35	289	1	363
Fungicide/insecticides								
Acetamiprid/triticonazole	<1	.	.	.	.	.	.	<1
All fungicides insecticides	<1	.	.	.	.	.	.	<1
Sulphur	<1	.	.	.	.	.	.	<1
Growth regulators								
Prohexadione	.	.	.	.	<1	.	.	<1
Trinexapac-ethyl	<1	172	.	.	13	<1	2	188
All growth regulators	<1	172	.	.	14	<1	2	188
Insecticides								
<i>Bacillus thuringiensis</i> var. <i>kurstaki</i>	<1	.	.	.	.	.	<1	<1
Chlorantraniliprole	.	.	.	.	4	.	.	4
Deltamethrin	.	.	.	.	.	.	<1	<1
Diflubenzuron	.	<1	.	.	.	.	.	<1
Esfenvalerate	.	.	.	.	<1	.	.	<1
Pyrethrins	<1	.	.	.	.	.	.	<1
All insecticides	<1	<1	.	.	4	.	<1	4
Grand Total²	22,211	51,113	52,798	2,344	592	3,362	950	133,369

¹Other sectors include invasive weeds, sports turf, turf growers, water companies and 'Other' respondents

²The grand total includes adjuvants including unspecified adjuvants and wetters excluded from previous tables

Table 19 – Pesticide usage collected as part of the 2020 amenity survey – by treated surface – weight applied (kilogrammes)

	Golf	Lawn care	Other soft surfaces	Hard & soft surfaces	Railway	Roads	Other hard surfaces	Total
Adjuvants								
Alcohol alkoxylate/trisiloxane organosilicone copolymers	.	.	.	.	.	.	49	49
Alkoxylated alcohol	.	.	.	.	.	74	.	74
Dihydrooxirane, epihydrin	170	298	.	.	.	.	.	468
Non-ionic surfactant	<1	.	.	.	.	.	.	<1
Polyoxyalkylene glycol	100	.	.	.	.	.	.	100
Polyoxyethylene (3 EO) C12-C15 primary alcohol/ polyoxyethylene (7 EO) C12-C15 primary alcohol	.	.	.	7	.	.	.	7
Unspecified adjuvants	.	287	<1	.	.	.	.	287
Unspecified wetter	75	.	8	.	.	.	.	83
All adjuvants	345	585	8	7	.	74	49	1,069
Algicides								
Alkyl (C12-14) dimethyl benzyl ammonium chloride	.	.	.	.	.	.	6	6
All algicides	.	.	.	.	.	.	6	6
Disinfectants								
Citric acid/didecyldimethylammonium chloride	.	90	.	.	.	.	.	90
Didecyldimethylammonium chloride	.	10	1	3	.	<1	1,497	1,513
All disinfectants	.	100	1	3	.	<1	1,497	1,603
Physical control								
Natural plant extracts	.	6	.	.	.	.	.	6
All physical controls	.	6	.	.	.	.	.	6

Table 19 (cont.) – Pesticide usage collected as part of the 2020 amenity survey – by treated surface – weight applied (kilogrammes)

	Golf	Lawn care	Other soft surfaces	Hard & soft surfaces	Railway	Roads	Other hard surfaces	Total
Herbicides								
2,4-D	46	40	678	23	.	.	.	786
2,4-D/dicamba	6	.	.	.	.	.	.	6
2,4-D/dicamba/fluroxypyr	80	1,271	48	.	.	.	.	1,399
2,4-D/dicamba/MCPA/mecoprop-P	2	.	.	.	.	.	.	2
2,4-D/florasulam	53	210	12	.	.	.	.	275
2,4-D/glyphosate	.	.	.	.	1,620	.	8	1,628
2,4-D/MCPA	.	.	.	14	.	.	41	54
Acetic acid	8	254	.	1	.	1	169	433
Aminopyralid/fluroxypyr	1	.	144	.	7	.	.	152
Aminopyralid/triclopyr	.	.	113	11	923	.	2	1,049
Asulam	.	.	110	8	.	.	.	118
Carfentrazone-ethyl/mecoprop-P	<1	.	.	.	.	.	.	<1
Citronella oil	.	.	114	.	.	.	.	114
Clopyralid/2,4-D/MCPA	.	.	<1	.	.	.	.	<1
Clopyralid/florasulam/fluroxypyr	24	8	6	5	.	.	.	42
Clopyralid/fluroxypyr/MCPA	<1	12	6	.	.	.	.	18
Clopyralid/triclopyr	3	.	129	11	.	.	.	143
Dicamba/MCPA/mecoprop-P	10	.	4,360	.	.	.	.	4,370
Dicamba/mecoprop-P	2	58	5	.	.	.	.	65
Diflufenican/glyphosate	.	18	54	104	7,791	.	18	7,985
Diflufenican/iodosulfuron-methyl-sodium	.	.	4	57	.	.	2	63
Fatty acids: pelargonic acid	.	.	9	.	3	.	.	11
Ferrous sulphate	65	.	15	.	.	.	.	80
Flazasulfuron	.	.	11	58	136	<1	2	208
Florasulam/fluroxypyr	.	90	.	.	.	.	.	90
Flufenacet	.	75	.	.	.	.	.	75
Fluroxypyr	1	.	.	.	.	.	.	1
Fluroxypyr/triclopyr	.	.	2	.	.	.	.	2
Glyphosate	4	28	2,541	25,995	34,943	35,811	11,138	110,460
Glyphosate/sulfosulfuron	.	.	164	189	.	.	130	483
MCPA/mecoprop-P	3	.	8	.	.	.	.	11
Mecoprop-P	25	.	44	.	.	.	.	70
Propyzamide	4	.	8	.	.	.	.	13
Triclopyr	.	.	<1	<1	.	.	.	<1
All herbicides	337	1,987	8,584	26,475	45,423	35,812	11,510	130,129

Table 19 (cont.) – Pesticide usage collected as part of the 2020 amenity survey – by treated surface – weight applied (kilogrammes)

	Golf	Lawn care	Other soft surfaces	Hard & soft surfaces	Railway	Roads	Other hard surfaces	Total
Fungicides								
Azoxystrobin	3	1	32	.	.	.	.	36
Carbendazim	2	.	.	.	.	.	.	2
Chlorothalonil/fludioxonil/propiconazole	<1	.	.	.	.	.	.	<1
Difenoconazole/fludioxonil	17	.	.	.	.	.	.	17
Fludioxonil	9	<1	1	.	.	.	.	10
Fluopyram/trifloxystrobin	2	.	.	.	.	.	.	2
Propiconazole	1	.	<1	.	.	.	.	1
Pyraclostrobin	<1	.	<1	.	.	.	.	<1
Tebuconazole/trifloxystrobin	7	288	1	.	.	.	.	295
All fungicides	41	289	34	.	.	.	.	363
Fungicide/insecticides								
Acetamiprid/triticonazole	.	.	<1	.	.	.	.	<1
All fungicides insecticides	.	.	<1	.	.	.	.	<1
Sulphur	.	.	<1	.	.	.	.	<1
Growth regulators								
Prohexadione	<1	.	.	.	.	.	.	<1
Trinexapac-ethyl	13	<1	40	.	.	135	.	188
All growth regulators	14	<1	40	.	.	135	.	188
Insecticides								
<i>Bacillus thuringiensis</i> var. <i>kurstaki</i>	.	.	<1	<1	.	.	.	<1
Chlorantraniliprole	4	.	.	.	.	.	.	4
Deltamethrin	.	.	<1	.	.	.	.	<1
Diiflubenzuron	.	.	<1	.	.	.	.	<1
Esfenvalerate	<1	.	.	.	.	.	.	<1
Pyrethrins	.	.	<1	.	.	.	.	<1
All insecticides	4	.	1	<1	.	.	.	4
Grand Total¹	740	2,968	8,667	26,487	45,423	36,021	13,061	133,369

¹The grand total includes adjuvants including unspecified adjuvants and wetters excluded from previous tables

Table 20 – Pesticide usage collected as part of the 2020 amenity survey – by method of application – weight applied (kilogrammes)

	Controlled droplet applicator	Knapsack	Spray lance	Other hand applicators	Mixed sprayer types	Train sprayer	Hydraulic boom	Total
Adjuvants								
Alcohol alkoxylate/trisiloxane organosilicone copolymers	.	.	.	49	.	.	.	49
Alkoxylated alcohol	.	.	.	.	74	.	.	74
Dihydrooxirane, epihydrin	.	298	.	.	.	.	170	468
Non-ionic surfactant	.	.	.	<1	.	.	.	<1
Polyoxyalkylene glycol	.	.	.	.	.	.	100	100
Polyoxyethylene (3 EO) C12-C15 primary alcohol/ polyoxyethylene (7 EO) C12-C15 primary alcohol	.	.	.	7	.	.	.	7
Unspecified adjuvants	.	287	.	<1	.	.	.	287
Unspecified wetter	.	.	.	.	8	.	75	83
All adjuvants	.	585	.	56	83	.	345	1,069
Algicides								
Alkyl (C12-14) dimethyl benzyl ammonium chloride	.	6	.	.	.	.	.	6
All algicides	.	6	.	.	.	.	.	6
Disinfectants								
Citric acid/didecyltrimethylammonium chloride	.	90	.	.	.	.	.	90
Didecyltrimethylammonium chloride	.	12	.	33	1,468	.	.	1,513
All disinfectants	.	102	.	33	1,468	.	.	1,603
Physical control								
Natural plant extracts	.	.	.	6	.	.	.	6
All physical controls	.	.	.	6	.	.	.	6

Table 20 (cont.) – Pesticide usage collected as part of the 2020 amenity survey – by method of application – weight applied (kilogrammes)

	Controlled droplet applicator	Knapsack	Spray lance	Other hand applicators	Mixed sprayer types	Train sprayer	Hydraulic boom	Total
Herbicides								
2,4-D	.	14	.	21	504	.	247	786
2,4-D/dicamba	.	.	.	.	.	.	6	6
2,4-D/dicamba/fluroxypyr	.	1,115	.	53	165	.	65	1,399
2,4-D/dicamba/MCPA/mecoprop-P	.	.	.	1	.	.	1	2
2,4-D/florasulam	.	203	.	18	.	.	53	275
2,4-D/glyphosate	.	8	.	.	.	1,620	.	1,628
2,4-D/MCPA	.	.	.	.	14	.	41	54
Acetic acid	.	262	.	169	1	.	.	433
Aminopyralid/fluroxypyr	.	1	7	2	88	.	54	152
Aminopyralid/triclopyr	.	2	.	30	39	977	.	1,049
Asulam	.	54	.	.	8	.	56	118
Carfentrazone-ethyl/mecoprop-P	.	.	.	.	.	.	<1	<1
Citronella oil	.	.	.	.	114	.	.	114
Clopyralid/2,4-D/MCPA	.	<1	.	<1	.	.	.	<1
Clopyralid/florasulam/fluroxypyr	.	1	.	2	10	.	29	42
Clopyralid/fluroxypyr/MCPA	.	18	.	<1	<1	.	.	18
Clopyralid/triclopyr	.	4	.	<1	136	.	2	143
Dicamba/MCPA/mecoprop-P	.	.	.	<1	4,330	.	39	4,370
Dicamba/mecoprop-P	.	2	.	1	46	.	16	65
Diflufenican/glyphosate	.	77	37	923	67	6,882	.	7,985
Diflufenican/iodosulfuron-methyl-sodium	.	<1	.	59	.	.	4	63
Fatty acids: pelargonic acid	.	9	.	3	.	.	.	11
Ferrous sulphate	.	61	.	19	.	.	.	80
Flazasulfuron	.	13	<1	12	46	136	1	208
Florasulam/fluroxypyr	.	69	.	9	11	.	.	90
Flufenacet	.	75	.	.	.	.	.	75
Fluroxypyr	.	.	.	.	.	.	1	1
Fluroxypyr/triclopyr	.	.	.	2	.	.	.	2
Glyphosate	172	3,245	3,858	15,061	63,532	24,302	290	110,460
Glyphosate/sulfosulfuron	217	.	.	244	22	.	.	483
MCPA/mecoprop-P	.	8	.	3	.	.	.	11
Mecoprop-P	.	.	.	.	26	.	43	70
Propyzamide	<1	3	.	.	.	.	9	13
Triclopyr	.	<1	.	<1	.	.	.	<1
All herbicides	389	5,169	3,901	16,635	69,162	33,917	956	130,129

Table 20 (cont.) – Pesticide usage collected as part of the 2020 amenity survey – by method of application – weight applied (kilogrammes)

	Controlled droplet applicator	Knapsack	Spray lance	Other hand applicators	Mixed sprayer types	Train sprayer	Hydraulic boom	Total
Fungicides								
Azoxystrobin	.	<1	.	<1	32	.	3	36
Carbendazim	.	.	.	.	.	.	2	2
Chlorothalonil/fludioxonil/propiconazole	.	.	.	<1	.	.	.	<1
Difenoconazole/fludioxonil	.	.	.	<1	.	.	17	17
Fludioxonil	.	2	.	<1	.	.	8	10
Fluopyram/trifloxystrobin	.	.	.	<1	.	.	2	2
Propiconazole	.	<1	.	<1	.	.	1	1
Pyraclostrobin	.	.	.	.	<1	.	<1	<1
Tebuconazole/trifloxystrobin	.	288	.	1	1	.	6	295
All fungicides	.	290	.	2	33	.	38	363
Fungicide/insecticides								
Acetamiprid/triticonazole	.	<1	.	.	.	.	.	<1
All fungicides insecticides	.	<1	.	.	.	.	.	<1
Sulphur	.	.	.	.	<1	.	.	<1
Growth regulators								
Prohexadione	.	.	.	.	.	.	<1	<1
Trinexapac-ethyl	.	<1	.	<1	172	.	16	188
All growth regulators	.	<1	.	<1	172	.	16	188
Insecticides								
<i>Bacillus thuringiensis</i> var. <i>kurstaki</i>	.	<1	.	.	.	.	.	<1
Chlorantraniliprole	.	.	.	.	.	.	4	4
Deltamethrin	.	<1	.	.	.	.	.	<1
Diflubenzuron	.	.	<1	.	.	.	.	<1
Esfenvalerate	.	.	.	.	.	.	<1	<1
Pyrethrins	.	.	.	<1	.	.	.	<1
All insecticides	.	<1	<1	<1	.	.	4	4
Grand Total¹	389	6,152	3,901	16,732	70,918	33,917	1,359	133,369

¹The grand total includes adjuvants including unspecified adjuvants and wetters excluded from previous tables

Table 21 - Principal active substances encountered as part of the 2020 amenity survey (excluding adjuvants)

Active substance	Weight applied (kilogrammes)
Glyphosate	118,796
MCPA	3,525
2,4-D	2,641
Didecyldimethylammonium chloride	1,528
Diflufenican	1,163
Triclopyr	1,069
Mecoprop-P	746
Fluroxypyr	564
Dicamba	452
Acetic acid	433
Flazasulfuron	208
Tebuconazole	197
Trinexapac-ethyl	188
Aminopyralid	130
Asulam	118
Citronella oil	114
Trifloxystrobin	99
Ferrous sulphate	80
Citric acid	75
Clopyralid	48
Azoxystrobin	36
Fludioxonil	18
Propyzamide	13
Fatty acids: pelargonic acid	11
Sulfosulfuron	9
Florasulam	8
Difenoconazole	8
Natural plant extracts	6
Chlorantraniliprole	4
Iodosulfuron-methyl-sodium	2
Carbendazim	2
Propiconazole	1
Fluopyram	1
Pyraclostrobin	<1
Chlorothalonil	<1
<i>Bacillus thuringiensis</i> var. <i>kurstaki</i>	<1
Pyrethrins	<1
Prohexadione	<1
Sulphur	<1
Esfenvalerate	<1
Diflubenzuron	<1
Deltamethrin	<1
Carfentrazone-ethyl	<1
Triticonazole	<1
Acetamiprid	<1
<i>Heterorhabditis bacteriophora</i>	N/A
<i>Steinernema feltiae</i>	N/A

APPENDIX 2 - COMPARISON IN AMENITY PESTICIDE USAGE BETWEEN 2016 & 2020

Whilst it is difficult to directly compare usage between 2016 and 2020 because of the difference in sectors sampled between the two years, some sectors from the 2020 survey have been combined to make this more straightforward. The sector of 'Other areas' in 2020 is new and the reader may want to exclude this sector to make direct comparisons.

The most important difference between the two surveys is the overall number of respondents and the number of those providing pesticide data.

Table 22 – Summary of responses and weight of active substances – 2016 – Amenity survey - UK

Sector	All responses	Responses with pesticide data	Weight of active substances applied (kg)
Contractor ¹	24	7	79,977
Golf course	119	26	1,314
Invasive weeds	11	7	349
Local authority	24	13	2,297
Lawn care	16	14	11,059
Other amenity grass	9	5	1,120
Water company	6	3	1,300
Total	209	75	97,417

¹Includes highway, railway and general contractors

Table 23 – Summary of responses and weight of active substances – 2020 – Amenity survey - UK

Sector	All responses	Responses with pesticide data	Weight of active substances applied (kg)
Contractor ¹	61	48	106,254
Golf course	75	35	592
Invasive weeds	2	2	360
Local authority	109	82	22,211
Lawn care	25	16	3,075
Other amenity grass	9	5	26
Water company	3	2	103
Other areas	20	7	461
Total	304	197	133,082

¹Includes highway, railway and general contractors

Between 2016 and 2020 the overall response rate increased by 45% and the number of respondents providing pesticide data more than doubled. The number of contractors (highway, railway and general) more than doubled between 2016 and 2020, whilst the number of local authority responses increased by more than four times showing how specific targeting in these areas increased response rates.

It is difficult to compare the weights of pesticides applied in each year because of the changing response rates and the number of respondents providing pesticide data in each year.

APPENDIX 3 – DEFINITIONS

- a) 'Pesticide' is used throughout this report to include commercial formulations containing active substances used as acaricides, biological control agents, defoliants, desiccants, fungicides, growth regulators, herbicides, insecticides, molluscicides, nematicides or urea. For this survey it also includes adjuvants and wetting agents used on turf grass.
- b) Where quoted in the text or within figures, reasons for application are the respondents' stated reasons for use of that pesticide and may not always seem entirely appropriate.
- c) Where individual active substances are mentioned in the text, they are listed in descending order of use by weight applied.
- d) Throughout all tables, "." indicates that there was no recorded usage.
- 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) Where highlighted in the text the amount of active substance is calculated from the weight of product applied multiplied by the proportion of each individual active substance within a product. Arthropod biological control agents are applied by number rather than weight, so the weight of biological control agents refers only to preparations of bacterial and fungal origin.
- g) The 'Other' category includes distributors, advisors, arboriculture, garden and grounds maintenance, private estates and civil society organisations.
- h) Other amenity grass includes sports stadiums and turf growers.
- i) Multiple sprayer types include unspecified combinations of handheld and other types of sprayers.
- j) Multiple surface types include unspecified combinations of both hard and soft surfaces.

APPENDIX 4 – METHODOLOGY

METHODS

The survey included representatives from the following sectors: Contractors, Golf courses, Highway contractors, Invasive weed companies, Local authorities, Lawn care companies, Railways, Sports turf, Turf growers and Water companies.

The survey covered all areas of the United Kingdom, but the responses are only a sample of the total population.

In contrast to agricultural and horticultural surveys conducted by the Fera survey team there are no readily available address lists that can be used to draw up representative samples of amenity pesticide users. As such, it was necessary to create new address lists that were as comprehensive as possible.

The three main target sectors were local authorities, transport and infrastructure, and golf. Obtaining information from these sectors used a combination of existing address lists of local authorities, transport and infrastructure, contractors and golf courses, links to websites provided by members of the Amenity Forum and additional internet searches for contact details for local authorities and highway contractors.

The initial step was to identify and obtain email contact details for as many local authorities as possible. The initial available number in our existing address list was small (63 separate email addresses) and the aim of the survey was to contact all local authorities (district councils, county councils and metropolitan boroughs) wherever possible. By searching the internet and with help from the Amenity Forum we were able to obtain 407 local authority contacts. There are 398 local authorities in the United Kingdom, and some have multiple contacts. The main approach was to contact customer services within each local authority and ask to be put in touch with those responsible for pesticide use. For some local authorities it was necessary to complete an online form to do this (33 local authorities) for others to make a Freedom of Information (FOI) request (47 local authorities). For 13 local authorities it was necessary to use an online contact form to submit an FOI request.

Many of the Amenity Forum members are contractors within the Transport and Infrastructure sector; these businesses were aware of the survey and willingly helped. Additional information on Transport and Information was obtained from the list of contractors providing services to the National Highway Sector Schemes (NHSS). The link to the NHSS approved suppliers can be found here - <https://www.scheduleofsuppliers.co.uk/suppliers>. This list provided 85 additional contact details, although several contractors replied to say that they had made minimal applications recently or that they were not applying pesticides to road or rail. Whilst we had excellent responses from the railway contractor members of the Amenity Forum, it was also necessary to contact several Network Rail staff to collect information on railway yards.

Members of the Amenity Forum, primarily The British and International Golf Greenkeepers Association (BIGGA) and a large distributor within the Golf and Sports Turf sector, were instrumental in encouraging golf courses to participate in the survey. Golf course contacts from the previous amenity survey were also contacted for their participation. The Covid pandemic is very likely to have reduced golf course participation, many of which would have been closed during 2020 and some staff would have been on furlough at the time of the survey.

For all other sectors, members of the Amenity Forum encouraged those within their industry to participate. Whilst the main aim was to encourage those within the Local Authority, Transport and Infrastructure and Golf Courses to participate, it was still possible to accept information from a range of sectors.

The approach to the collection of data was primarily using an online Survey Monkey application, which collected both background and pesticide usage information for 2020. The background information was normally complete, however, respondents often had to be emailed to obtain their pesticide data for 2020. Local authorities dealing with the request as an FOI were unable to visit the online website and asked for the questions in a written format (Appendix 6).

All respondents to the online questionnaire received a subsequent email thanking them for their participation and where needed, for additional information.

The Survey Monkey online survey went live on the 12th of January 2021. Responses to the online questionnaire were downloaded on a weekly basis, with the first batch being downloaded on the 15th of January 2021 and the last batch downloaded on the 4th of May 2021. Most of the early responses were made by members of the Amenity Forum.

Emails to local authorities, 392 in total, started on the 22nd of January, with the last email sent on the 30th of March. Responses from the Amenity Forum, which had 15 local authority members, started on the 14th of January and finished 21st of January 2021.

Emails to those on the NHSS address list, 100 in total, started on the 21st of January, with emails completed by the 8th of March 2021. A second email was sent to 25 of the largest contractors on the 8th of March.

A total of 304 responses were made to the survey, of which 65% (197) provided information on their pesticide use. Not all background information from the 304 responses was complete; whilst everyone would have been emailed to obtain the missing information, the information may not have been relevant or available to the person completing the questionnaire.

Of the 304 responses, 252 were received as responses to the online questionnaire, with the remaining 52 being wholly emailed responses. A total of 106 respondents added their pesticide usage data to the online survey, with a further 43 respondents completing the background information on the online survey but emailing the pesticide data separately.

The average length of time taken to complete the online survey, including adding pesticide usage data was 20 minutes.

Fera subjects all data, including pesticide data obtained from online surveys, to the same detailed and rigorous checks as used for other surveys.

The Questionnaire

The online questionnaire was split into two parts; a background questionnaire consisting of 5 sections and a pesticide questionnaire split into a further 5 sections. A copy of the questionnaire can be found in Appendix 5.

The questionnaire was agreed by both HSE and Amenity Forum members before use.

The background questionnaire considered the following topic areas: contact information; type of organisation; membership of assurance schemes; number of staff including those with sprayer certification; number of sprayers.

The pesticide use questionnaire collected information on the products used, the total quantities used in 2020, the surfaces treated, the type of sprayer used and the reason for use. Where available, information was also collected on the timing of application (these were data emailed separately rather than those added to the online response).

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 approval status of all amenity/pesticide combinations; the percentage of active substance (vital for collecting the amount of active substance); the methods of application used to apply pesticides; the timing of pesticide applications.

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 BASIS registered agronomists and the major farm management software companies.

Where inconsistencies are found, for example where there is non-approved product usage, these are checked first against the spray records and secondly with the respondent and amended if necessary.

Reports are written and checked within the team after which they are sent to reviewers for their comments and checking.

Data limitations and use of data

Our experience has shown that the face to face interview and 'main contact plus reserves approach' delivers the highest quality data and minimises non-response bias. However, the extent of the current survey in terms of Covid, geographical location, the potential duration of each visit and the availability of funding meant that a well-designed online questionnaire that could be completed at a time convenient for each respondent was the best approach to take.

The overall number of responses to the survey has increased since 2016 and the data collected are extremely valuable in looking at current behaviours of operators and users of amenity pesticides. The difficulties associated with a knowledge of population sizes meant that national estimates were not possible.

As part of this survey Fera Science Ltd. has implemented the United Kingdom Statistics Authority Code of Practice for Statistics, published in 2009 and revised in 2018. Whilst all three pillars and 14 principles apply, we acknowledge the following:

- Honesty and integrity: people in organisations that release statistics should be truthful, impartial and independent, and meet consistent standards of behaviour that reflect the wider public good.
- Data governance: organisations should look after people's information securely and manage data in ways that are consistent with relevant legislation and serve the public good.
- Efficiency and proportionality: statistics and data should be published in forms that enable their reuse. Producers should use existing data wherever possible and only ask for more where justified.
- Accessibility: statistics and data should be equally available to all, not given to some people before others. They should be published at a sufficient level of detail and remain publicly available.

In accordance with UKSA Code of Practice for Statistics, we work with Defra and HSE statisticians 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, civil society organisations 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.

This report is not considered part of the National Statistics data set because it is not as statistically robust as the agricultural and horticultural surveys we conduct. Unlike the agricultural and horticultural surveys, we do not have information on the national or regional populations of amenity companies, or the size of each company, in terms of usage, from which to make national estimates.

APPENDIX 5 – INDIVIDUAL QUESTIONS ASKED AS PART OF THE ONLINE QUESTIONNAIRE

BACKGROUND INFORMATION

Survey Invitation Reference (either provided to the respondent prior to completing the questionnaire or allocated after completion)

Organisation Name
Contact Name
Contact Number (phone)
Contact email address

Organisation Category
Local authority
Golf course / Sports turf
Transport infrastructure
Other (please specify)

Organisation Assurance Status (tick all that apply)
Amenity assured
Lawn assured
Property Care Association (PCA) Scheme
Other (please specify)

Number of staff and use of spraying certificates
Total number of staff
Total number of staff applying pesticides
Total number of holders of specified certificates (e.g. PA2, PA3, PA4, PA6 etc.)

Equipment Information - total number of sprayers used by your organisation (please note we are not interested in sprayers that are no longer in use)
Knapsack
Hydraulic Boom
Handheld Lance
Stem injection / Herbicide Plugs
Controlled droplet applicator
Manually folding boom
Train sprayer
Motorised knapsack
Other

APPENDIX 5 – INDIVIDUAL QUESTIONS ASKED AS PART OF THE ONLINE QUESTIONNAIRE (cont.)

PESTICIDE USAGE

<i>Product used</i>
<i>Surface Type</i>
Hard surface
Soft surface (e.g. motorway central reservation, roadside verges and embankments)
Ballast (e.g. railway)
Riparian
Sports turf (e.g. football, tennis, rugby)
Golf course / bowling green
Domestic gardens
Derelict land / brown field site
Other (please specify)
<i>Method of application</i>
Granular
Handheld sprayer
Boom sprayer
Near water
Radiarc sprayer
CDA
Other (please specify)
<i>Amount of product (in litres or kg)</i>
<i>Reason for use</i>
Plant growth regulation
<i>Microdochium/Fusarium</i> patch
Dollar spot
<i>Anthracnose</i>
Fairy ring
Red thread
Leatherjackets
Chafer grubs
Earthworms
Other (please specify)

APPENDIX 6 – INDIVIDUAL QUESTIONS ASKED AS PART OF FOI REQUESTS

Q1 – Is your local authority part of an assurance scheme such as Amenity Assured? If so, please specify.

Q2a – Total number of staff

Q2b – Total number of staff applying pesticides

Q2c – Total number of staff with spraying certificates (PA2, PA3, PA4, PA6 etc.)

Q3a – Total number of Knapsack Sprayers

Q3b – Total number of Hand-held Lances

Q3c – Total number of boom sprayers; *boom size in metres; are the boom sprayers NSTS tested*

Q3d – Total number of CDA sprayers

Q3e – Total number and type of other sprayers. Please indicate whether any of these are NSTS tested

For each product -

Q4a - please specify, where possible, the surface type (see list below);

Q4b - the product name;

Q4c - the method of application (see list below);

Q4d - the reason for use of each product.

Q4e – the total quantity (Litres or Kilogramme) of each product used between January and December of 2020

The surface types include:

DL	Derelict land/brown field site
DG	Domestic gardens
GO	Golf course/Bowling greens
HS	Hard surface
RI	Riparian
SS	Soft surface – e.g. motorway central reservation; roadside verges; embankments
ST	Sports Turf – e.g. football; rugby; tennis

The methods of application include:

BC	Biological control
CD	Controlled droplet applicator
HD	Hydraulic boom sprayer
IN	Stem injection (including herbicide plugs)
KN	Knapsack
LA	Spray lance
RD	Radiarc sprayer

APPENDIX 7 – CODES USED FOR SUMMARISING QUESTIONNAIRE RESPONSES

Code	Surface type		Code	Method of application (Meth app)
BA	Ballast (e.g. railway)		BC	Biological control
DL	Derelict land/brown field site		CD	Controlled droplet applicator
DG	Domestic Gardens		DR	Drench (soil drench)
GO	Golf Course/Bowling greens		GB	Granules broadcast (vehicle mounted)
HS	Hard Surface		GI	Granules incorporated (vehicle mounted)
HI	Highways		HA	Hydraulic boom with air assistance
RI	Riparian		HD	Hydraulic boom sprayer
SS	Soft surface – e.g. motorway central reservation; roadside verges; embankments		HG	Hand applied granules
ST	Sports Turf – e.g. football; rugby; tennis		HM	Hand applied molluscicide
			IN	Stem injection (including herbicide plugs)
			KN	Lever operated/pressurised knapsack
			LA	Spray lance
			MB	Molluscicides broadcast (vehicle mounted)
			MI	Molluscicides incorporated (vehicle mounted)
			MK	Motorised knapsack
			PT	Paint
			PB	Pedestrian boom sprayer
			RA	Rotary atomiser
			RD	Radiarc Sprayer
			SB	Shrouded hydraulic boom
			TR	Train Sprayer
			WC	Watering can
			WW	Weed wiper

ACKNOWLEDGEMENTS

Thanks are due to the many operators and companies who willingly participated in this survey, providing invaluable information upon which this report is based. We are especially grateful to the members of the Amenity Forum who have willingly given up their time to review the questionnaire, encourage participation and provide links to the questionnaire to their members.

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