

PESTICIDE USAGE IN NORTHERN IRELAND

Survey Report 294

Northern Ireland Edible Protected Crops 2019

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PESTICIDE USAGE SURVEY REPORT 294

EDIBLE PROTECTED CROPS IN NORTHERN IRELAND 2019

M.K. Lavery, S. Jess, J. Kirbas, and D. Matthews

**Pesticide Usage Monitoring Group
Sustainable Agri-Food Science Division
Newforge Lane
Belfast BT9 5PX**

Tel: 02890 255283

Email: pesticide.science@afbini.gov.uk

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ISBN 978-1-908471-16-1

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The County Regions of Northern Ireland



SUMMARY

This is the third survey examining pesticide usage practices on edible protected crops (excluding soft fruit) grown under permanent protection in Northern Ireland, providing comparative data to that obtained in the previous surveys in 2015 (Lavery *et al.*, 2016) and 2017 (Lavery *et al.*, 2018). A previous report in 1991 included information on pesticide use on vegetable crops, strawberries and protected ornamental crops: Protected Crops (edible and ornamental), (Kidd *et al.*, 1993). For this survey, a number of different vegetable crops and tomatoes, which were propagated and/or grown under permanent cover of glass or polythene until harvested, were included. Information relating to pesticide use on soft fruit crops is recorded in the pesticide usage report Soft Fruit Crops, 2018 (Kirbas *et al.*, 2019).

Protected crop cultivation is a very minor sector of agricultural production in Northern Ireland and includes a range of crops grown on relatively small areas which receive varying degrees of pesticide application. These factors lead to greater statistical uncertainty associated with the estimates produced and, whilst these data give an indication of pesticide use in this sector, they are less statistically robust than the estimates from the other reports in this series and should be interpreted accordingly. In keeping with the 2017 report, this report contains multiple-cropping areas, where successive crops are produced from the same basic area. This may result in figures which differ from the basic farm level information contained in the farm census.

Data were collected from nine holdings, representing 56% of the total area of edible protected crops grown in Northern Ireland (Table 1). Holdings were selected from information contained in the Northern Ireland Agricultural Census, June 2018 (Anon., 2019) and Basic Payment Scheme returns, 2019. Raising factors have been applied to estimate national pesticide usage from sampled data. Data relating to individual crop types have not been published due to the small cultivation and sample areas and the possibility of identifying growers.

A total of fourteen fungicide active substances including formulated fungicide mixtures were recorded in use on edible protected crops in Northern Ireland in 2019. Cyprodinil/fludioxonil represented 16% of the fungicide-treated area and Boscalid/pyraclostrobin represented a further 14% with both accounting for 5% of the

weight of fungicides applied. However, fosetyl-aluminium/propamocarb hydrochloride, which accounted for 14% of the fungicide-treated area, represented 65% of the weight of fungicides applied, primarily on brassica crops during propagation stage for general disease control. Dimethomorph, which represented 16% of the fungicide-treated area, accounted for 4% of the weight of fungicides applied (Tables 7 and 8).

In contrast with 2017, when there was no herbicide use recorded, there were five herbicide active substances applied, accounting for an estimated 6% of the total pesticide-treated area and 7% of the total weight of pesticides applied. The residual benzamide herbicide propyzamide accounted for 85% of the herbicide-treated area and 73% of the weight of herbicides applied, exclusively on lettuce crops for general weed control (Tables 7, 8 and 14).

The oxadiazine insecticide indoxacarb accounted for 31% of the area treated with insecticides, representing 3% of the weight of insecticides applied. Both spirotetramat and spinosad represented 24% of the insecticide-treated area and 8% of the weight of insecticides applied. Chlorpyrifos, an organophosphorus insecticide and acaricide, was applied exclusively to 'other crops' for general insect control and, although representing less than 1% of the insecticide-treated area, accounted for 73% of the weight of insecticides applied. This was due to the high application rate as a drench treatment during the propagation stage when the plants were still in module trays (Tables 7, 8 and 16).

The microbial pesticides *Bacillus subtilis* and *Gliocladium catenulatum*, which accounted for 42% and 54% of the biopesticide treated-area and 36% and 64% of the weight applied, respectively, were applied primarily to lettuce crops for the exclusive control of *Botrytis cinerea*. The only other biopesticide recorded in 2019 was the chalcidoid parasitic wasp, *Encarsia formosa*, which was used exclusively on tomato crops for control of glasshouse whitefly (*Trialeurodes vaporariorum*), representing 4% of the biopesticide-treated area. It should be noted that due to the nature of this control method, only the treated-area has been recorded and not a weight of application. (Tables 7, 8 and 17).

Seed treatments, which accounted for 4% of the total pesticide-treated area and <1% of the weight of pesticides applied, were applied primarily to leafy and flowerhead brassica crops, with iprodione being the only active substance applied to these crops representing

76% of the seed-treated area and 73% of the weight applied. The only other seed treatment active substances applied in 2019 were thiram and metalaxyl-M, which were applied to celery and parsley, onion and leek and 'other crops' seeds.

Lettuce crops accounted for the largest growing area of all edible protected crops, although this was principally due to repeat cropping within the basic growing area. Lettuce crops received 75% of all fungicides applied representing 26% of the weight applied. Conversely, leafy and flowerhead brassica crops, which received 20% of all fungicides applied, accounted for 71% of the weight applied. Lettuce crops received an average of 2.7 fungicide, 1 herbicide, 1.6 insecticide, 2 biopesticide and 1 molluscicide application (Tables 6 and 14).

Commercial edible protected cropping is a relatively specialist area of crop cultivation, extending the natural growing season to provide a continuous supply of crops for retailers. Edible protected crops may also be imported from abroad to augment locally grown crops.

Edible protected crops can be grown on relatively small areas, particularly at propagation stage, but increased space is required to accommodate the crops as the plants mature. Multi-cropping also allows successive crops to be produced from the same basic area.

Growing crops in permanent glasshouse structures or polythene tunnels enables the grower to closely monitor and maintain the conditions within the structure. Biopesticides and pollinators can also be utilised to maximise effectiveness within the enclosed environment. However, increased energy costs and the incidence of pests such as glasshouse whitefly (*Trialeurodes vaporariorum*) that reproduce rapidly under these conditions can prove problematic within a protected structure and lead to increased pesticide inputs.

Crops which were grown outdoors for part of or all of their life cycle are recorded in the Outdoor Vegetable Crops in Northern Ireland 2019 report (Lavery *et al.*, 2020).

DEFINITIONS AND NOTES

- ‘Grown area’ refers to the actual planted area of crop, and is referred to in hectares (ha).
- ‘Basic area’ refers to the actual planted area of crop which received at least one pesticide application and is referred to in hectares (ha).
- ‘Treated area’ refers to the total area treated with a pesticide, including all repeated applications to the basic area, and is referred to in spray hectares (spha).
- ‘Quantity applied’ refers to the weight of pesticides applied, including all repeated applications, and is referred to in kilograms (kg).
- ‘Reasons for use’: the reasons reported for the use of pesticides are the **growers** stated reason for use and may sometimes seem inappropriate or appear similar to other reasons with the same meaning.
- ‘Rounding’: due to rounding of figures, there may be slight differences in totals both within and between tables.
- ‘Beans’: refers to beans (where no type was specified), broad beans and runner beans.
- ‘Leafy and flowerhead brassicas’: refers to broccoli, Brussels sprouts, cabbage, calabrese, cauliflower and kale. ‘Cabbage’ includes savoy, summer and winter cabbage.
- ‘Celery and parsley’: refers to celeriac, table and soup celery and parsley.
- ‘Onions and leeks’: refers to leeks (where no type was specified), table leeks and salad onions.
- ‘Tomatoes’: refers to all tomatoes (tomatoes, cherry tomatoes and plum tomatoes).
- ‘Other crops’: refers to beetroot, courgettes, cucumbers, garlic, kohlrabi, pak choi, peppers, pumpkin, spinach, squash, swede and thyme.
- The following crops received no pesticide treatments: beans (where no type was specified) and runner beans, carrots, table celery, cucumber, garlic, lettuce at propagation stage, pak choi, peppers, salad onions, spinach, squash at propagation stage and tomatoes at propagation stage.
- Crop-specific regional information has not been included due to the small number of businesses in the population.

INTRODUCTION

As a participant of the UK Working Party on Pesticide Usage Surveys, the Agri-Food and Biosciences Institute (AFBI), on behalf of the Department of Agriculture, Environment and Rural Affairs (DAERA), conducts a programme of surveys to examine pesticide usage in all sectors of the agricultural and horticultural industries.

Principally, the data collected provides information for consideration by the UK Expert Committee on Pesticides. In addition, the information may be used by those involved in residue testing, environmental impact studies, public information and for the evaluation and regulation of trends in pesticide usage. Pesticide usage monitoring forms part of an obligation under the Food and Environment Act (1985) for post-registration monitoring of pesticides approved for use. In addition, regulation EC 1185/2009 also provides a statutory requirement for the collection of pesticide statistics. The programme forms an integral part of the government's pesticide safety control arrangements, in providing quantitative and qualitative data on the usage of pesticides in agriculture, horticulture, food storage and associated industries.

This work is also undertaken in England and Wales by FERA Science Ltd (FERA and in Scotland by Science and Advice for Scottish Agriculture (SASA). Pesticide usage reports from these regions may be obtained at the following sites:

[\(https://secure.fera.defra.gov.uk/pusstats/surveys/\)](https://secure.fera.defra.gov.uk/pusstats/surveys/)

[\(https://www.sasa.gov.uk/pesticides/pesticide-usage/pesticide-usage-survey-reports\)](https://www.sasa.gov.uk/pesticides/pesticide-usage/pesticide-usage-survey-reports)

A list of published Northern Ireland Pesticide Usage Survey reports is included in Appendix 1.

Due to the very small area of protected edible crops grown in Northern Ireland, the limited pesticide input and the issues associated with estimating pesticide use, this report may not be produced in subsequent years unless crop area or pesticide input increases. Data will continue to be collected and submitted to the UK reports.

METHODS

The holdings to be surveyed were selected on the basis of the total area of edible protected crops grown (excluding soft fruit), using a combination of data from the Northern Ireland Agricultural Census, June 2018 (*Anon.*, 2019) and Basic Payment Scheme returns, 2019.

The purpose of the survey was explained to the occupiers of selected holdings in preliminary correspondence. The holdings were then surveyed by either telephone or personal interview during February and March 2020. The data collected included the area of crops grown, area treated, target crop, pesticide group, active substance used and number of treatments applied. During analysis, the sample data were raised to the total population level using raising factors calculated from the ratio of the number of farms sampled to the number of farms in the population. The growers' stated reasons for pesticide use were also included but may not always seem appropriate. The collected data were entered using SQL, a relational database programme. Validated data were downloaded for analysis using IBM SPSS Statistics Version 22 software.

CROPS

The number and areas of crops surveyed are shown in Table 1 as combined crop groups. Data from nine farms provided information on 56 crop types. Crops include beans, beetroot, broccoli, Brussels sprouts, cabbage, carrots, cauliflower, celeriac, celery, courgettes, cucumber, garlic, kale, kohlrabi, leeks, lettuce, pak choi, parsley, peppers, pumpkin, salad onion, spinach, squash, swede, thyme and tomatoes. The total area of crops sampled in the survey was representative of the area of edible protected crops grown in Northern Ireland in 2019. A total of 197 treatments, including seed treatments and biopesticides, were applied to edible protected crops using 37 products. There were a number of crops, particularly at propagation stage, representing significantly small areas which did not receive pesticide treatments.

Refer to Table 6 for information relating to proportional area treated and number of spray applications applied to each crop type.

Figure 1 Proportional (%) areas of the different edible protected crop groups grown (ha) in Northern Ireland, 2019 (Table 2).

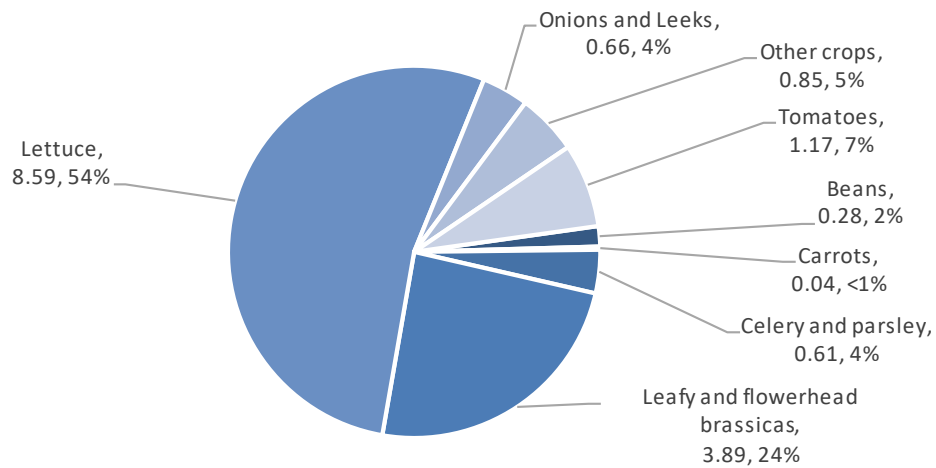


Figure 2 Pesticide usage (spha) on edible protected crops in Northern Ireland, 2019 (Table 4).

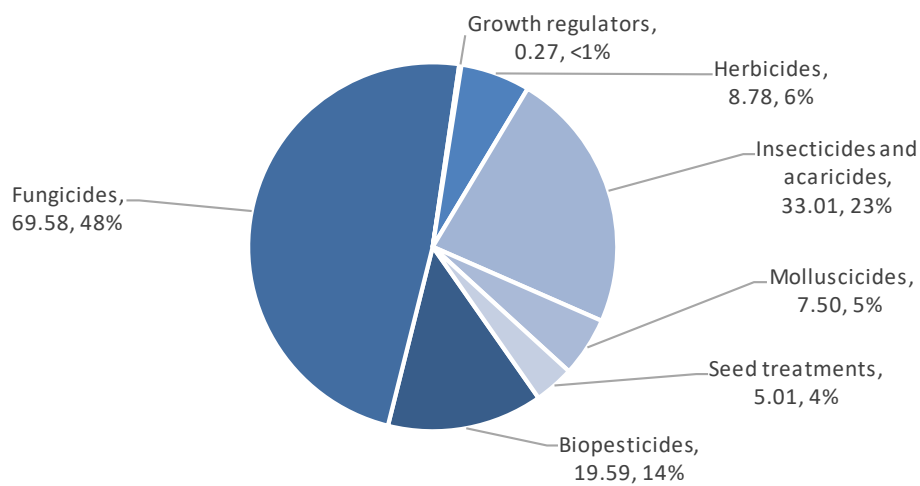


Figure 3 Pesticide usage (kg) on edible protected crops in Northern Ireland, 2019 (Table 5).

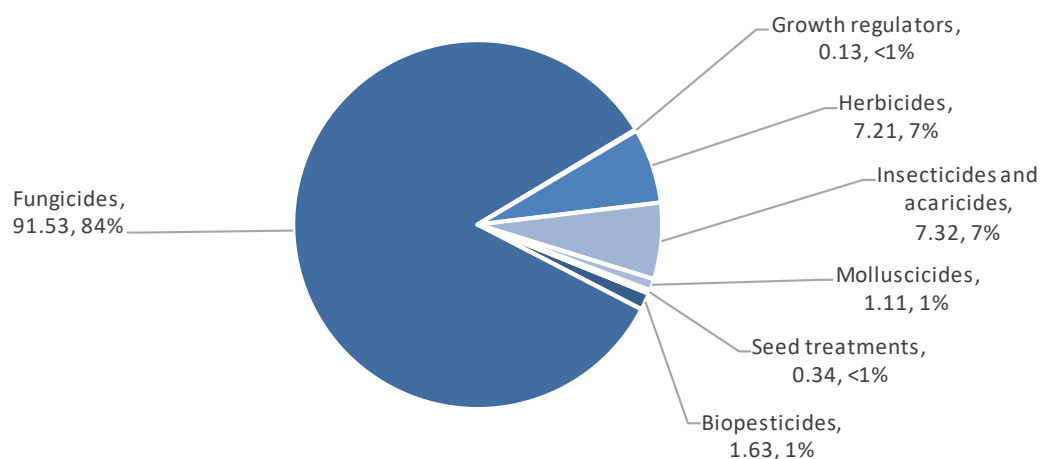


Figure 4 The ten most commonly used pesticide active substances by area treated (spha) in Northern Ireland, 2019 (Table 9).

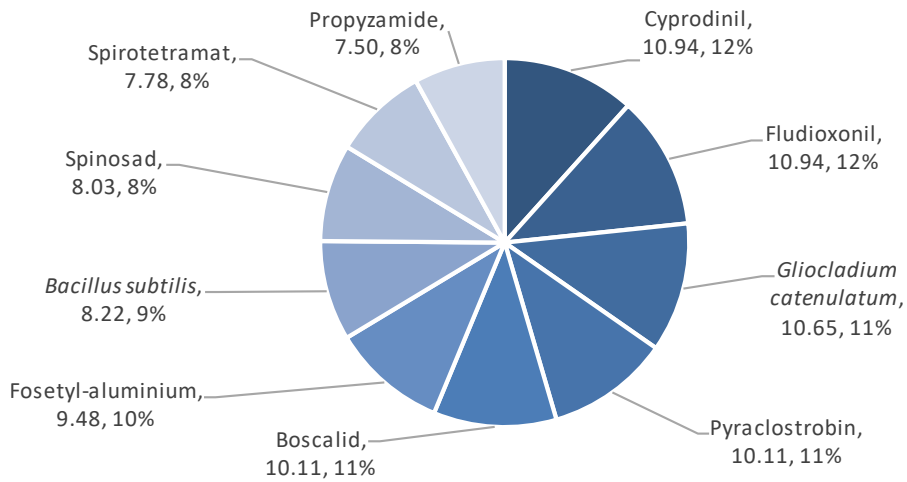


Figure 5 The ten most commonly used pesticide active substances by weight applied (kg) in Northern Ireland, 2019 (Table 10).

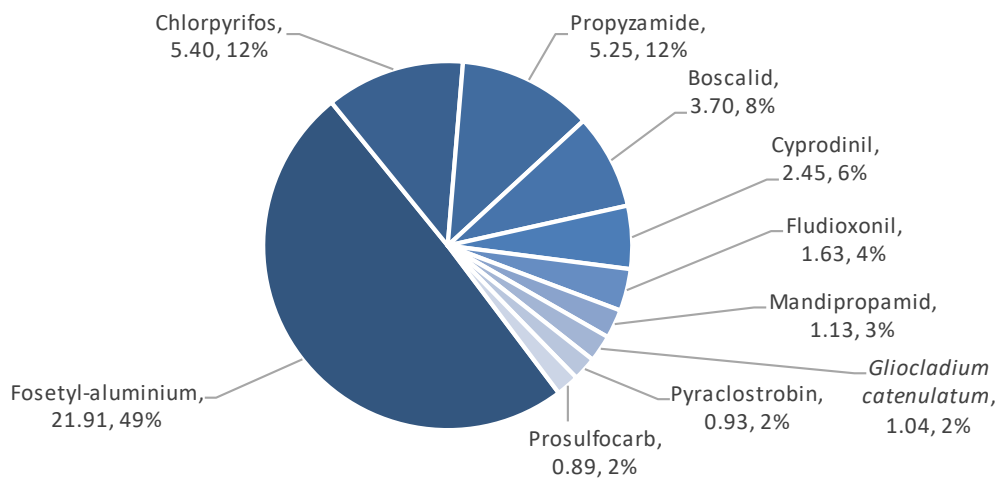
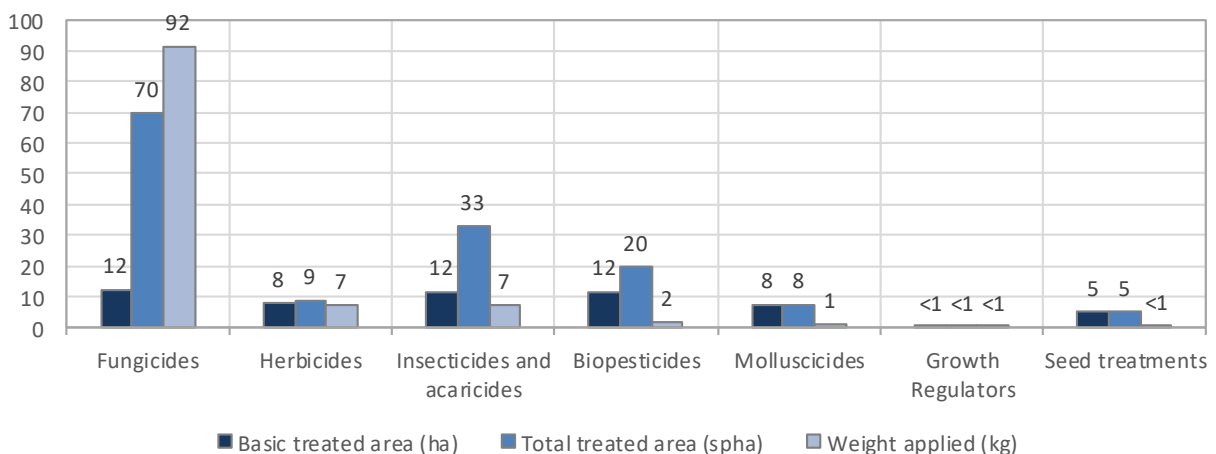


Figure 6 Basic treated area (ha), total treated area (spha) and weight of pesticides applied to edible protected crops in Northern Ireland, 2019 (Tables 4 and 5).



ACKNOWLEDGEMENTS

We, the authors, wish to thank all of the growers who participated in this survey and without whose co-operation the completion of this report would not have been possible. We are also grateful for the assistance of staff at Fera Science Limited (FERA), York and Science & Advice for Scottish Agriculture (SASA), Edinburgh for their advice and assistance on many aspects of this report.

REFERENCES

Kidd, S.L.B., Jess, S., McCallion, T. (1993) Protected crops (edible and ornamental) 1991. *Pesticide Usage Survey Report 110* Belfast. HMSO.

Lavery, M.K., Jess, S., Matthews, D., Kelly, T., Patton, A. (2015). Soft Fruit Crops in Northern Ireland 2014. *Pesticide Usage Survey Report 262*. Belfast: AFBINI.

Lavery, M.K., Jess, S., Matthews, D., Patton, A. (2016). Edible Protected Crops in Northern Ireland 2015. *Pesticide Usage Survey Report 267*. Belfast: AFBINI.

Lavery, M.K., Jess, S., Matthews, D., Patton, A. (2016). Outdoor Vegetable Crops in Northern Ireland 2015. *Pesticide Usage Survey Report 268*. Belfast: AFBINI.

Lavery, M.K., Kirbas, J.M., Jess, S., Matthews, D., (2018). Edible Protected Crops in Northern Ireland 2017. *Pesticide Usage Survey Report 280*. Belfast: AFBINI.

Kirbas, J. M., Lavery, M. K., Jess, S., Matthews, D., Patton, A. (2018). Outdoor Vegetable Crops in Northern Ireland 2017. *Pesticide Usage Survey Report 281*. Belfast: AFBINI.

Kirbas, J. M., Lavery, M. K., Jess, S., Matthews, D., Kelly, T. (2019). Soft Fruit Crops in Northern Ireland 2018. *Pesticide Usage Survey Report 289*. Belfast: AFBINI.

Lavery, M. K., Jess, S., Kirbas J. M., Matthews, D. (2020). Outdoor Vegetable Crops in Northern Ireland 2019. *Pesticide Usage Survey Report 293*. Belfast: AFBINI.

Table 1 Total number and area of crops surveyed (ha) in Northern Ireland, 2019.

<i>Crop group</i>	Number of crops surveyed	Sampled area (ha)
Beans	3	0.28
Carrots	1	0.04
Celery and parsley	6	0.61
Leafy and flowerhead brassicas	10	3.89
Lettuce	5	8.59
Onions and Leeks	3	0.66
Other crops	13	0.85
Tomatoes	6	1.17
All crops	56	16.10

Table 2 Estimated area (ha) of edible protected crops grown in Northern Ireland, 2019.

<i>Crop group</i>	Northern Ireland
Beans	0.28
Carrots	0.04
Celery and parsley	0.61
Leafy and flowerhead brassicas	3.89
Lettuce	8.59
Onions and Leeks	0.66
Other crops	0.85
Tomatoes	1.17
All crops	16.10

Table 3a: Estimated area (spha) of edible protected crops treated regionally in Northern Ireland, 2019 with each pesticide type.

<i>Pesticide type</i>	<i>County</i>			Northern Ireland
	Antrim	Armagh	Down	
Fungicides	0.90	52.50	16.34	69.74
Herbicides	1.28	7.50	.	8.78
Insecticides and acaricides	0.64	22.50	9.87	33.01
Biopesticides	.	15.00	4.59	19.59
Growth regulators	0.27	.	.	0.27
Molluscicides	.	7.50	.	7.50
Seed treatments	0.26	.	4.76	5.01
All pesticides	3.35	105.00	35.56	143.91

Table 3b: Estimated weight (kg) of pesticide applied regionally in Northern Ireland, 2019 with each pesticide type.

<i>Pesticide type</i>	<i>County</i>			Northern Ireland
	Antrim	Armagh	Down	
Fungicides	0.24	23.28	68.09	91.62
Herbicides	1.96	5.25	.	7.21
Insecticides and acaricides	<0.10	1.29	6.02	7.32
Biopesticides	.	0.98	0.65	1.63
Growth regulators	0.13	.	.	0.13
Molluscicides	.	1.11	.	1.11
Seed treatments	<0.10	.	0.34	0.34
All pesticides	2.34	31.92	75.10	109.35

Table 4: The total area (spha) and the basic area (ha) of edible protected crops treated with each pesticide type in Northern Ireland, 2019.

Crop group	Pesticide Type															
	Fungicides		Herbicides		Insecticides and acaricides		Biopesticides		Growth regulators		Molluscicides		Seed		All pesticides	
	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)
Beans	0.45	0.22	0.22	0.22	0.22	0.22	.	.	.	.	.	.	.	.	0.89	0.22
Celery and parsley	0.39	0.30	0.67	0.22	0.22	0.22	0.43	0.35	.	.	.	.	0.43	0.43	2.15	0.57
Leafy and flowerhead brassicas	14.26	2.94	.	.	8.99	2.94	2.40	2.12	.	.	.	.	3.83	3.83	29.47	3.89
Lettuce	52.69	7.69	7.50	7.50	22.69	7.69	15.00	7.50	.	.	7.50	7.50	.	.	105.39	7.69
Onions and Leeks	0.55	0.55	0.39	0.13	0.42	0.42	0.42	0.42	.	.	.	.	0.55	0.55	2.33	0.55
Other crops	1.27	0.58	.	.	0.46	0.28	0.61	0.58	.	.	.	.	0.21	0.21	2.56	0.58
Tomatoes	0.13	0.13	.	.	.	.	0.72	0.72	0.27	0.27	.	.	.	.	1.12	1.12
All crops	69.74	12.42	8.78	8.08	33.01	11.79	19.59	11.68	0.27	0.27	7.50	7.50	5.01	5.01	143.91	14.63

Table 5: The total quantities (kg) of each pesticide type used on edible protected crops in Northern Ireland, 2019.

Crop group	Pesticide type								Total quantity (kg)
	Fungicides	Herbicides	Insecticides and acaricides	Biopesticides	Growth Regulators	Molluscicides	Seed treatments		
Beans	0.11	0.33	<0.10	.	.	.	.	0.45
Celery and parsley	0.18	1.33	<0.10	0.05	.	.	<0.10	1.56	
Leafy and flowerhead brassicas	64.95	.	0.56	0.38	.	.	0.28	66.18	
Lettuce	23.33	5.25	1.30	0.98	.	1.11	.	31.97	
Onions and Leeks	0.11	0.30	0.04	0.07	.	.	0.02	0.54	
Other crops	2.88	.	5.41	0.15	.	.	0.03	8.47	
Tomatoes	0.04	.	.	*N/A	0.13	.	.	0.17	
All crops	91.62	7.21	7.32	1.63	0.13	1.11	0.34	109.35	

**Applied in units other than weight or volume (eg million per hectare) which does not translate readily into a conventional weight.*

Table 6 The proportional area (%) of each crop treated with pesticides and the number of spray applications in Northern Ireland, 2019.

Crop type	Pesticide type															
	Fungicides		Herbicides		Insecticides and acaricides		Biopesticides		Growth Regulators		Molluscicides		Seed treatments		All Pesticides	
	%	Sp apps	%	Sp apps	%	Sp apps	%	Sp apps	%	Sp apps	%	Sp apps	%	Sp apps	%	Sp apps
Beans	78%	2.0	78%	1.0	78%	1.0	.	.	.	.	.	.	.	.	78%	1.3
Celery and parsley	49%	1.5	37%	3.0	37%	1.0	57%	1.3	.	.	.	.	71%	1.0	94%	1.5
Leafy and flowerhead brassicas	76%	3.1	.	.	76%	1.8	54%	1.5	.	.	.	.	98%	1.0	100%	2.1
Lettuce	90%	2.7	87%	1.0	90%	1.6	87%	2.0	.	.	87%	1.0	.	.	90%	1.9
Onions and Leeks	84%	1.0	20%	3.0	64%	1.0	64%	1.0	.	.	.	.	84%	1.0	84%	1.3
Other crops	69%	2.3	.	.	33%	1.7	69%	1.1	.	.	.	.	25%	1.0	69%	1.6
Tomatoes	11%	1.0	.	.	.	.	61%	1.0	23%	1.0	.	.	.	.	95%	1.0
Total	43%	2.4	28%	2.2	41%	1.5	40%	1.3	1%	1.0	26%	1.0	17%	1.0	48%	1.7

Table 7 Estimated area (spha) of edible protected crops treated with pesticide formulations in Northern Ireland, 2019.

Pesticide group and active substance	Crop name							Total
	Beans	Celery and parsley	Leafy and flowerhead brassicas	Lettuce	Onions and Leeks	Other crops	Tomatoes	
Fungicides								
Azoxystrobin	.	.	.	0.10	0.13	.	.	0.23
Azoxystrobin/difenoconazole	0.22	0.21	.	7.59	.	.	0.13	8.16
Boscalid/pyraclostrobin	.	.	2.60	7.50	.	<0.05	.	10.11
Cyprodinil/fludioxonil	.	0.18	2.66	7.50	.	0.60	.	10.94
Difenoconazole	.	.	0.76	.	.	0.09	.	0.85
Dimethomorph	.	.	3.17	7.50	.	0.39	.	11.06
Fenhexamid	.	.	.	7.50	.	.	.	7.50
Fluopicolide/propamocarb hydrochloride	.	.	1.83	.	.	0.09	.	1.92
Fosetyl-aluminium/propamocarb hydrochloride	.	.	1.89	7.50	.	0.09	.	9.48
Mandipropamid	.	.	.	7.50	.	.	.	7.50
Propamocarb hydrochloride	.	.	0.31	.	.	.	.	0.31
Prothioconazole	.	.	.	.	0.42	.	.	0.42
Prothioconazole/tebuconazole	.	.	1.05	.	.	.	.	1.05
Tebuconazole	0.22	.	.	.	.	.	.	0.22
All fungicides	0.45	0.39	14.26	52.69	0.55	1.27	0.13	69.74
Herbicides								
Bromoxynil	.	.	.	.	0.13	.	.	0.13
Cycloxydim	.	0.22	.	.	0.13	.	.	0.35
Pendimethalin	0.22	0.22	.	.	0.13	.	.	0.58
Propyzamide	.	.	.	7.50	.	.	.	7.50
Prosulfocarb	.	0.22	.	.	.	.	.	0.22
All herbicides	0.22	0.67	.	7.50	0.39	.	.	8.78

Table 7 (contd) Estimated area (spha) of edible protected crops treated with pesticide formulations in Northern Ireland, 2019.

Pesticide group and active substance	Crop name							Total
	Beans	Celery and parsley	Leafy and flowerhead brassicas	Lettuce	Onions and Leeks	Other crops	Tomatoes	
<i>Insecticides and acaricides</i>								
Chlorpyrifos	0.09	.	0.09
Cyantraniliprole	.	.	2.94	.	.	.	.	2.94
Deltamethrin	0.18	.	0.18
Indoxacarb	.	.	2.60	7.50	.	0.09	.	10.19
Lambda-cyhalothrin	0.22	0.22	2.12	0.19	.	.	.	2.75
Spinosad	.	.	.	7.50	0.42	0.10	.	8.03
Spirotetramat	.	.	0.28	7.50	.	.	.	7.78
Thiacloprid	.	.	1.05	.	.	.	.	1.05
All insecticides and acaricides	0.22	0.22	8.99	22.69	0.42	0.46	.	33.01
<i>Biopesticides</i>								
<i>Bacillus subtilis</i>	.	0.30	0.28	7.50	.	0.13	.	8.22
<i>Encarsia formosa</i>	0.72	0.72
<i>Gliocladium catenulatum</i>	.	0.13	2.12	7.50	0.42	0.48	.	10.65
All biopesticides	.	0.43	2.40	15.00	0.42	0.61	0.72	19.59

Table 7 (contd) Estimated area (spha) of edible protected crops treated with pesticide formulations in Northern Ireland, 2019.

Pesticide group and active substance	Crop name							Total
	Beans	Celery and parsley	Leafy and flowerhead brassicas	Lettuce	Onions and Leeks	Other crops	Tomatoes	
Growth Regulators								
2-chloroethylphosphonic acid	0.27	0.27
All growth regulators	0.27	0.27
Molluscicides								
Ferric phosphate	.	.	.	7.50	.	.	.	7.50
All molluscicides	.	.	.	7.50	.	.	.	7.50
Seed treatments								
Iprodione	.	.	3.83	.	.	.	.	3.83
Metalaxyl-M	.	0.13	.	.	.	<0.05	.	0.16
Thiram	.	0.30	.	.	0.55	0.18	.	1.03
All seed treatments	.	0.43	3.83	.	0.55	0.21	.	5.01

Table 8 Estimated quantities (kg) of pesticide formulations used on edible protected crops in Northern Ireland, 2019.

Pesticide group and active substance	Crop name							Total
	Beans	Celery and parsley	Leafy and flowerhead brassicas	Lettuce	Onions and Leeks	Other crops	Tomatoes	
Fungicides								
Azoxystrobin	.	.	.	<0.05	<0.05	.	.	0.06
Azoxystrobin/difenoconazole	0.07	0.07	.	2.47	.	.	<0.05	2.65
Boscalid/pyraclostrobin	.	.	0.87	3.76	.	<0.05	.	4.63
Cyprodinil/fludioxonil	.	0.11	1.33	2.34	.	0.30	.	4.08
Difenoconazole	.	.	0.10	.	.	<0.05	.	0.11
Dimethomorph	.	.	1.58	1.35	.	0.19	.	3.13
Fenhexamid	.	.	.	2.81	.	.	.	2.81
Fluopicolide/propamocarb hydrochloride	.	.	2.01	.	.	0.10	.	2.11
Fosetyl-aluminium/propamocarb hydrochloride	.	.	47.66	9.45	.	2.27	.	59.38
Mandipropamid	.	.	.	1.13	.	.	.	1.13
Propamocarb hydrochloride	.	.	11.09	.	.	.	.	11.09
Prothioconazole	.	.	.	.	0.08	.	.	0.08
Prothioconazole/tebuconazole	.	.	0.31	.	.	.	.	0.31
Tebuconazole	<0.05	.	.	.	.	.	.	<0.05
All fungicides	0.11	0.18	64.95	23.33	0.11	2.88	<0.05	91.62
Herbicides								
Bromoxynil	.	.	.	.	<0.05	.	.	<0.05
Cycloxydim	.	0.10	.	.	0.06	.	.	0.16
Pendimethalin	0.33	0.33	.	.	0.20	.	.	0.86
Propyzamide	.	.	.	5.25	.	.	.	5.25
Prosulfocarb	.	0.89	.	.	.	.	.	0.89
All herbicides	0.33	1.33	.	5.25	0.30	.	.	7.21

Table 8 (contd) Estimated quantities (kg) of pesticide formulations used on edible protected crops in Northern Ireland, 2019.

Pesticide group and active substance	Crop name							Total
	Beans	Celery and parsley	Leafy and flowerhead brassicas	Lettuce	Onions and Leeks	Other crops	Tomatoes	
<i>Insecticides and acaricides</i>								
Chlorpyrifos	5.40	.	5.40
Cyantraniliprole	.	.	0.35	.	.	.	.	0.35
Deltamethrin	<0.05	.	<0.05
Indoxacarb	.	.	0.07	0.19	.	<0.05	.	0.26
Lambda-cyhalothrin	<0.05	<0.05	<0.05	<0.05	.	.	.	<0.05
Spinosad	.	.	.	0.54	<0.05	<0.05	.	0.59
Spirotetramat	.	.	<0.05	0.56	.	.	.	0.58
Thiacloprid	.	.	0.10	.	.	.	.	0.10
All insecticides and acaricides	<0.05	<0.05	0.56	1.30	<0.05	5.41	.	7.32
<i>Biopesticides</i>								
<i>Bacillus subtilis</i>	.	<0.05	<0.05	0.50	.	<0.05	.	0.58
<i>Encarsia formosa</i>
<i>Gliocladium catenulatum</i>	.	<0.05	0.34	0.48	0.07	0.13	.	1.04
All biopesticides	.	0.05	0.38	0.98	0.07	0.15	.	1.63

Table 8 (contd) Estimated quantities (kg) of pesticide formulations used on edible protected crops in Northern Ireland, 2019.

Pesticide group and active substance	Crop name							Total
	Beans	Celery and parsley	Leafy and flowerhead brassicas	Lettuce	Onions and Leeks	Other crops	Tomatoes	
Growth Regulators								
2-chloroethylphosphonic acid	0.13	0.13
All growth regulators	0.13	0.13
Molluscicides								
Ferric phosphate	.	.	.	1.11	.	.	.	1.11
All molluscicides	.	.	.	1.11	.	.	.	1.11
Seed treatments								
Iprodione	.	.	0.28	.	.	.	.	0.28
Metalaxyl-M	.	<0.05	.	.	.	<0.05	.	<0.05
Thiram	.	<0.05	.	.	<0.05	<0.05	.	0.06
All seed treatments	.	<0.05	0.28	.	<0.05	<0.05	.	0.34

Table 9 The twenty active ingredients most extensively used on edible protected crops in Northern Ireland, 2019 ranked by treated area (spha).

No.	Active substance	Treated area (spha)
1	Cyprodinil	10.94
2	Fludioxonil	10.94
3	<i>Gliocladium catenulatum</i>	10.65
4	Pyraclostrobin	10.11
5	Boscalid	10.11
6	Fosetyl-aluminium	9.48
7	<i>Bacillus subtilis</i>	8.22
8	Spinosad	8.03
9	Spirotetramat	7.78
10	Propyzamide	7.50
11	Mandipropamid	7.50
12	Lambda-cyhalothrin	2.75
13	Fluopicolide	1.92
14	Prothioconazole	1.47
15	Thiacloprid	1.05
16	Pendimethalin	0.58
17	Cycloxydim	0.35
18	2-chloroethylphosphonic acid	0.27
19	Prosulfocarb	0.22
20	Deltamethrin	0.18

Table 10 The twenty active ingredients most extensively used on edible protected crops in Northern Ireland, 2019 ranked by weight (kg).

No.	Active substance	Treated area (kg)
1	Fosetyl-aluminium	21.91
2	Chlorpyrifos	5.40
3	Propyzamide	5.25
4	Boscalid	3.70
5	Cyprodinil	2.45
6	Fludioxonil	1.63
7	Mandipropamid	1.13
8	<i>Gliocladium catenulatum</i>	1.04
9	Pyraclostrobin	0.93
10	Prosulfocarb	0.89
11	Pendimethalin	0.86
12	Spinosad	0.59
13	<i>Bacillus subtilis</i>	0.58
14	Spirotetramat	0.58
15	Iprodione	0.28
16	Prothioconazole	0.24
17	Fluopicolide	0.19
18	Cycloxydim	0.16
19	2-chloroethylphosphonic acid	0.13
20	Thiacloprid	0.10

Table 11 Beans: pesticide-treated area (spha), basic treated area (ha), quantity applied (kg) and reasons for use.

Pesticide group and active substance	Reasons for treatment			Total treated area (spha)	Basic treated area (ha)	Quantity applied (kg)
	General Fungal Control	General Insect Control	General Weed Control			
Fungicides						
Azoxystrobin/difenoconazole	0.22	.	.	0.22	0.22	0.07
Tebuconazole	0.22	.	.	0.22	0.22	<0.05
All fungicides	0.45	.	.	0.45	.	0.11
Herbicides						
Pendimethalin	.	.	0.22	0.22	0.22	0.33
All herbicides	.	.	0.22	0.22	.	0.33
Insecticides and acaricides						
Lambda-cyhalothrin	.	0.22	.	0.22	0.22	<0.05
All insecticides and acaricides	.	0.22	.	0.22	.	<0.05

Table 12 Celery and parsley: pesticide-treated area (spha), basic treated area (ha), quantity applied (kg) and reasons for use.

Pesticide group and active substance	Reasons for treatment				Total treated area (spha)	Basic treated area (ha)	Quantity applied (kg)
	General Disease Control	General Weed Control	Seed Treatment	Whitefly			
Fungicides							
Azoxystrobin/difenoconazole	0.21	.	.	.	0.21	0.21	0.07
Cyprodinil/fludioxonil	0.18	.	.	.	0.18	0.09	0.11
All fungicides	0.39	.	.	.	0.39	.	0.18
Herbicides							
Cycloxydim	.	0.22	.	.	0.22	0.22	0.10
Pendimethalin	.	0.22	.	.	0.22	0.22	0.33
Prosulfocarb	.	0.22	.	.	0.22	0.22	0.89
All herbicides	.	0.67	.	.	0.67	.	1.33
Insecticides and acaricides							
Lambda-cyhalothrin	.	.	.	0.22	0.22	0.22	<0.05
All insecticides and acaricides	.	.	.	0.22	0.22	.	<0.05
Biopesticides							
<i>Bacillus subtilis</i>	0.30	.	.	.	0.30	0.30	<0.05
<i>Gladiolus catenulatum</i>	0.13	.	.	.	0.13	0.13	<0.05
All biopesticides	0.43	.	.	.	0.43	.	0.05
Seed treatments							
Metalaxyl-M	.	.	0.13	.	0.13	0.13	<0.05
Thiram	.	.	0.30	.	0.30	0.30	<0.05
All seed treatments	.	.	0.43	.	0.43	.	<0.05

Table 13 Leafy and flowerhead brassicas: pesticide-treated area (spha), basic treated area (ha), quantity applied (kg) and reasons for use.

Pesticide group and active substance	Reasons for treatment			Total treated area (spha)	Basic treated area (ha)	Quantity applied (kg)
	General Disease Control	General Insect Control	Seed Treatment			
Fungicides						
Boscalid/pyraclostrobin	2.60	.	.	2.60	2.60	0.87
Cyprodinil/fludioxonil	2.66	.	.	2.66	2.66	1.33
Difenoconazole	0.76	.	.	0.76	0.76	0.10
Dimethomorph	3.17	.	.	3.17	2.88	1.58
Fluopicolide/propamocarb hydrochloride	1.83	.	.	1.83	1.83	2.01
Fosetyl-aluminium/propamocarb hydrochloride	1.89	.	.	1.89	1.89	47.66
Propamocarb hydrochloride	0.31	.	.	0.31	0.31	11.09
Prothioconazole/tebuconazole	1.05	.	.	1.05	1.05	0.31
All fungicides	14.26	.	.	14.26	.	64.95
Insecticides and acaricides						
Cyantraniliprole	.	2.94	.	2.94	2.94	0.35
Indoxacarb	.	2.60	.	2.60	2.60	0.07
Lambda-cyhalothrin	.	2.12	.	2.12	2.12	<0.05
Spirotetramat	.	0.28	.	0.28	0.28	<0.05
Thiacloprid	.	1.05	.	1.05	1.05	0.10
All insecticides and acaricides	.	8.99	.	8.99	.	0.56
Biopesticides						
<i>Bacillus subtilis</i>	0.28	.	.	0.28	0.28	<0.05
<i>Gliocladium catenulatum</i>	2.12	.	.	2.12	2.12	0.34
All biopesticides	2.40	.	.	2.40	.	0.38
Seed treatments						
Iprodione	.	.	3.83	3.83	3.83	0.28
All seed treatments	.	.	3.83	3.83	.	0.28

Table 14 Lettuce: pesticide-treated area (spha), basic treated area (ha), quantity applied (kg) and reasons for use.

Pesticide group and active substance	Reasons for treatment										Total treated area (spha)	Basic treated area (ha)	Quantity applied (kg)
	Aphids	Botrytis	Caterpillars	General Disease Control	General Weed Control	Mildew	Sclerotinia	Slugs	Thrips	Whitefly			
Fungicides													
Azoxystrobin	.	.	.	0.10	.	.	.	.	.	.	0.10	0.10	<0.05
Azoxystrobin/difenoconazole	.	.	.	0.09	.	.	7.50	.	.	.	7.59	7.59	2.47
Boscalid/pyraclostrobin	7.50	.	.	.	7.50	7.50	3.76
Cyprodinil/fludioxonil	.	7.50	.	.	.	.	.	.	.	.	7.50	7.50	2.34
Dimethomorph	7.50	.	.	.	.	7.50	7.50	1.35
Fenhexamid	.	7.50	.	.	.	.	.	.	.	.	7.50	7.50	2.81
Fosetyl-aluminium/propamocarb hydrochloride	7.50	.	.	.	.	7.50	7.50	9.45
Mandipropamid	7.50	.	.	.	.	7.50	7.50	1.13
All fungicides	.	15.00	.	0.19	.	22.50	15.00	.	.	.	52.69	.	23.33
Herbicides													
Propyzamide	7.50	.	.	.	.	.	7.50	7.50	5.25
All herbicides	7.50	.	.	.	.	.	7.50	.	5.25
Insecticides and acaricides													
Indoxacarb	.	.	7.50	.	.	.	.	.	.	.	7.50	7.50	0.19
Lambda-cyhalothrin	0.19	.	0.19	0.19	<0.05
Spinosad	7.50	.	.	7.50	7.50	0.54
Spirotetramat	7.50	.	.	.	.	.	.	.	.	.	7.50	7.50	0.56
All insecticides and acaricides	7.50	.	7.50	.	.	.	.	.	7.50	0.19	22.69	.	1.30

Table 14 (contd) Lettuce: pesticide-treated area (spha), basic treated area (ha), quantity applied (kg) and reasons for use.

Pesticide group and active substance	Reasons for treatment										Total treated area (spha)	Basic treated area (ha)	Quantity applied (kg)
	Aphids	Botrytis	Caterpillars	General Disease Control	General Weed Control	Mildew	Sclerotinia	Slugs	Thrips	Whitefly			
Biopesticides													
<i>Bacillus subtilis</i>	.	7.50	.	.	.	.	.	.	.	.	7.50	7.50	0.50
<i>Gliocladium catenulatum</i>	.	7.50	.	.	.	.	.	.	.	.	7.50	7.50	0.48
All biopesticides	.	15.00	.	.	.	.	.	.	.	.	15.00	.	0.98
Molluscicides													
Ferric phosphate	7.50	.	.	7.50	7.50	1.11
All molluscicides	7.50	.	.	7.50	.	1.11

Table 15 Onions and leeks: pesticide-treated area (spha), basic treated area (ha), quantity applied (kg) and reasons for use.

Pesticide group and active substance	Reasons for treatment				Total treated area (spha)	Basic treated area (ha)	Quantity applied (kg)
	General Disease Control	General Insect Control	General Weed Control	Seed Treatment			
Fungicides							
Azoxystrobin	0.13	.	.	.	0.13	0.13	<0.05
Prothioconazole	0.42	.	.	.	0.42	0.42	0.08
All fungicides	0.55	.	.	.	0.55	.	0.11
Herbicides							
Bromoxynil	.	.	0.13	.	0.13	0.13	<0.05
Cycloxydim	.	.	0.13	.	0.13	0.13	0.06
Pendimethalin	.	.	0.13	.	0.13	0.13	0.20
All herbicides	.	.	0.39	.	0.39	.	0.30
Insecticides and acaricides							
Spinosad	.	0.42	.	.	0.42	0.42	<0.05
All insecticides and acaricides	.	0.42	.	.	0.42	.	<0.05
Biopesticides							
<i>Gliocladium catenulatum</i>	0.42	.	.	.	0.42	0.42	0.07
All biopesticides	0.42	.	.	.	0.42	.	0.07
Seed treatments							
Thiram	.	.	.	0.55	0.55	0.55	<0.05
All seed treatments	.	.	.	0.55	0.55	.	<0.05

Table 16 Other crops: pesticide-treated area (spha), basic treated area (ha), quantity applied (kg) and reasons for use.

Pesticide group and active substance	Reasons for treatment				Total treated area (spha)	Basic treated area (ha)	Quantity applied (kg)
	General Disease Control	General Fungal Control	General Insect Control	Seed Treatment			
Fungicides							
Boscalid/pyraclostrobin	<0.05	.	.	.	<0.05	<0.05	<0.05
Cyprodinil/fludioxonil	0.60	.	.	.	0.60	0.30	0.30
Difenoconazole	0.09	.	.	.	0.09	0.09	<0.05
Dimethomorph	0.39	.	.	.	0.39	0.19	0.19
Fluopicolide/propamocarb hydrochloride	0.09	.	.	.	0.09	0.09	0.10
Fosetyl-aluminium/propamocarb hydrochloride	0.09	.	.	.	0.09	0.09	2.27
All fungicides	1.27	.	.	.	1.27	.	2.88
Insecticides and acaricides							
Chlorpyrifos	.	.	0.09	.	0.09	0.09	5.40
Deltamethrin	.	.	0.18	.	0.18	0.18	<0.05
Indoxacarb	.	.	0.09	.	0.09	0.09	<0.05
Spinosad	.	.	0.10	.	0.10	0.10	<0.05
All insecticides and acaricides	.	.	0.46	.	0.46	.	5.41
Biopesticides							
<i>Bacillus subtilis</i>	0.13	.	.	.	0.13	0.13	<0.05
<i>Gliocladium catenulatum</i>	0.45	<0.05	.	.	0.48	0.48	0.13
All biopesticides	0.58	<0.05	.	.	0.61	.	0.15
Seed treatments							
Metalaxyl-M	.	.	.	<0.05	<0.05	<0.05	<0.05
Thiram	.	.	.	0.18	0.18	0.18	<0.05
All seed treatments	.	.	.	0.21	0.21	.	<0.05

Table 17 Tomatoes: pesticide-treated area (spha), basic treated area (ha), quantity applied (kg) and reasons for use.

Pesticide group and active substance	Reasons for treatment			Total treated area (spha)	Basic treated area (ha)	Quantity applied (kg)
	General Disease Control	Growth Regulation	Whitefly			
Fungicides						
Azoxystrobin/difenoconazole	0.13	.	.	0.13	0.13	<0.05
All fungicides	0.13	.	.	0.13	.	<0.05
Biopesticides						
<i>Encarsia formosa</i>	.	.	0.72	0.72	0.72	N/A*
All biopesticides	.	.	0.72	0.72	.	N/A*
Growth Regulators						
2-chloroethylphosphonic acid	.	0.27	.	0.27	0.27	0.13
All growth regulators	.	0.27	.	0.27	0.27	0.13

*Applied in units other than weight or volume (eg million per hectare) which does not translate readily into a conventional weight.

Table 18 Comparison of the area of edible protected crops grown (ha) in Northern Ireland 2015-2019, by crop group and county.

Crop group	County											
	Antrim			Armagh			Down			Northern Ireland		
	2015	2017	2019	2015	2017	2019	2015	2017	2019	2015	2017	2019
Beans	.	.	0.22	.	.	.	.	.	0.06	.	.	0.28
Carrots	.	.	.	.	.	.	.	.	0.04	.	.	0.04
Celery and parsley	0.61	0.72	0.22	0.66	0.83	.	0.18	0.21	0.38	1.45	1.77	0.61
Leafy and flowerhead brassicas	.	.	<0.10	0.59	.	.	2.49	2.67	3.89	3.08	2.67	3.89
Lettuce	3.54	.	0.19	6.07	13.84	8.40	.	0.17	.	9.61	14.02	8.59
Onions and Leeks	0.68	0.49	0.13	.	.	.	0.53	0.33	0.53	1.21	0.81	0.66
Other crops	.	0.91	0.15	.	0.09	.	0.03	0.17	0.70	0.03	1.18	0.85
Tomatoes	12.55	2.08	0.40	.	0.10	.	7.07	4.17	0.77	19.62	6.34	1.17
All crops	17.38	4.20	1.33	7.32	14.86	8.40	10.31	7.72	6.37	35.00	26.78	16.10

Table 19 Comparison of pesticide usage on edible protected crops 2015-2019, total area treated (spha) with main pesticide groups and quantities (kg) of active ingredient used.

Pesticide group	2015		2017		2019	
	(spha)	(kg)	(spha)	(kg)	(spha)	(kg)
Fungicides	13.85	21.44	107.92	65.44	69.74	91.62
Herbicides	1.49	1.97	.	.	8.78	7.21
Insecticides and acaricides	8.26	141.41	49.19	146.62	33.01	7.32
Biopesticides	2.12	0.68	29.88	2.27	19.59	1.63
Growth regulators	.	.	.	.	0.27	0.13
Molluscicides	.	.	.	.	7.50	1.11
Seed treatments	13.21	0.85	7.50	7.08	5.01	0.34
Total	38.92	166.34	194.48	221.42	143.91	109.35

Northern Ireland Pesticide Usage Survey Published Reports Appendix 1

Report No.	Report title	ISBN
99	Grassland & Fodder Crops 1989	1-855 27 079 X
105	Arable Crops 1990	1-855 27 130 3
106	Soft Fruit Crops 1990	1-855 27 149 4
109	Vegetable Crops 1991	1-855 27 137 0
110	Protected Crops 1991 (edible & ornamental)	1-855 27 283 0
111	Mushroom Crops 1991	1-855 27 150 8
117	Arable Crops 1992	1-855 27 193 1
118	Top Fruit Crops 1992	1-855 27 194 X
124	Grassland & Fodder crops 1993	1-855 27 221 0
131	Forestry 1993	1-855 27 282 2
132	Arable Crops 1994	1-855 27 314 4
139	Vegetable Crops 1995	1-855 27 346 2
140	Mushroom Crops 1995	1-855 27 347 0
146	Arable Crops 1996	1-855 27 469 8
147	Top fruit 1996	1-855 27 470 1
156	Grassland & Fodder Crops 1997	1-855 27 506 6
157	Sheep Treatments 1997	1-855 27 425 6
167	Soft Fruit 1998	1-855 27 540 6
168	Arable Crops 1998	1-855 27 536 8
169	Vegetable Crops 1999	1-855 27 561 9
170	Mushroom Crops 1999	1-855 27 549 X
177	Arable Crops 2000	1-855 27 670 4
178	Top Fruit Crops 2002	1-855 27 618 6
194	Arable Crops 2002	1-855 27 674 7
198	Grassland & Fodder Crops 2003	1-855 27 797 2
199	Hardy Nursery Stock Crops 2003	1-855 27 789 1
201	Protected Ornamental Crops 2003	1-855 27 739 5
206	Arable Crops 2004	1-855 27 833 2
207	Vegetable crops 2004	1-855 27 869 3
208	Grassland & Fodder Crops 2005	1-855 27 998 8
209	Sheep Treatments 2005	1-855 27 999 5

Report No.	Report title	ISBN
209	Sheep Treatments 2005	1-855 27 999 5
216	Arable Crops 2006	1-848 07 035 6
217	Top Fruit Crops 2006	1-848 07 019 6
218	Soft Fruit Crops 2006	1-848 07 036 3
222	Vegetable Crops 2007	1-848 07 062 2
223	Mushroom Crops 2007	1 848 07 061 5
230	Arable Crops 2008	1 848 07 135 3
231	Top Fruit Crops 2008	1-848 07 134 6
238	Grassland & Fodder Crops 2009	1-848 07 186 5
239	Hardy Nursery Stock Crops 2009	1-848 07 187 2
240	Soft Fruit Crops 2010	1-848 07 251 0
241	Top Fruit Crops 2010	1-848 07 250 3
242	Arable Crops 2010	1-848 07 252 7
245	Mushroom crops 2011	1-84807-308-1
246	Vegetable Crops 2011	1-848 07 309 8
247	Arable Crops 2012	1-848 07 404 3
248	Soft Fruit Crops 2012	1-848 07 402 6
249	Top Fruit Crops 2012	1-848 07 403 3
258	Grassland & Fodder Crops 2013	1-84807-485-9
259	Vegetable Crops 2013	1-84807-486-6
260	Arable Crops 2014	1-84807-552-8
261	Top Fruit Crops 2014	1-84807-553-5
262	Soft Fruit Crops 2014	1-84807-571-9
268	Outdoor Vegetable Crops 2015	1-84807-685-3
275	Arable Crops 2016	1-84807-808-6
276	Soft Fruit Crops 2016	1-84807-809-3
277	Top Fruit Crops 2016	1-84807-810-9
280	Edible Protected Crops 2017	1-84807-918-2
281	Outdoor Vegetable Crops 2017	1-84807-917-5
282	Grassland & Fodder Crops 2017	1-84807-916-8
288	Arable Crops 2018	1-83887-064-5
289	Soft Fruit Crops 2018	1-83887-065-2

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Top Fruit Crops 2018

1-83887-066-9

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Outdoor Vegetable Crops 2019

1-908471-15-4

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12/20