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PESTICIDE USAGE SURVEY REPORT 280

EDIBLE PROTECTED CROPS IN NORTHERN IRELAND 2017

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The County Regions of Northern Ireland

SUMMARY

This is the second 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 survey in 2015 (Lavery *et al*., 2016). 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, 2016 (Lavery *et al*., 2017).

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. Also, unlike the previous survey in 2015, 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 eleven holdings, representing 63% of the total area of edible protected crops grown in Northern Ireland. Holdings were selected from information contained in the Northern Ireland Agricultural Census, June 2017 (*Anon*., 2018) and Single Farm Payment returns, 2017. 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 twelve fungicide active substances including formulated fungicide mixtures were recorded in use on edible protected crops in Northern Ireland in 2017. Fosetyl-aluminium/propamocarb hydrochloride and Mancozeb/Metalaxyl-M each represented 11% of the fungicide-treated area. However, they accounted for 27% and 18% of the weight of fungicides applied, respectively, exclusively on brassica and lettuce crops for

general disease and mildew control. Other fungicides used were azoxystrobin, boscalid/pyraclostrobin, chlorothalonil, cyprodinil/fludioxonil, dimethomorph, fenhexamid, fluopicolide/propamocarb hydrochloride, mandipropamid and tolclofos-methyl (Tables 7 and 8).

In 2015, the dinitroaniline herbicide pendimethalin was the only herbicide applied, accounting for an estimated 4% of the total pesticide-treated area and 1% of the total weight of pesticides applied. There was no herbicide use recorded in 2017.

Chlorpyrifos, an organophosphorus insecticide and acaricide, was applied exclusively to brassica crops for control of cabbage root fly (*Delia radicum*). The area treated with this active substance accounted for 5% of the insecticide-treated area but represented 98% of the total weight of insecticides applied. This was due to the high rate of application as a drench treatment to brassicas during the propagation stage when the plants were still in module trays. Indoxacarb, pymetrozine, spinosad and spirotetramat were applied exclusively to lettuce crops for control of aphids, caterpillars and thrips, accounting for 95% of the insecticide-treated area but only 2% of the weight of insecticides applied.

The soil fungus biopesticide, *Gliocladium catenulatum,* was applied as a drench to the compost in module trays containing brassica plant seeds exclusively for general disease control. The predatory mite, *Neoseiulus californicus*, used exclusively on tomato plants for control of two-spotted spider mite (*Tetranychus urticae*), was also recorded but 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. The bacterial fungicide *Bacillus subtilis* was the only other biopesticide used, exclusively on lettuce crops, for control of *Botrytis cinerea*.

Seed treatments, which accounted for 4% of the total pesticide-treated area and 3% of the weight of pesticides applied, were applied to all crops with tomatoes being the only exception. Thiram and thiamethoxam both accounted for 31% the seed-treated area, though thiamethoxam represented 95% of the weight of seed treatments applied. Lettuce seeds accounted for an estimated 93% of the area treated with thiamethoxam.

Azoxystrobin was the only fungicide applied to tomatoes, exclusively for general disease control. An estimated 9% of tomato crops were treated with this active substance. Seeds

were germinated in rockwool and were sown from early spring to allow for summer and autumn cropping. No seed treatments were applied to tomato seeds.

Lettuce crops received an average of 1.7 fungicide, 4 insecticide, 2 biopesticide and 1 seed treatment application. Lettuce crops accounted for the largest growing area of all edible protected crops though this was principally due to repeat cropping within the basic growing area.

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 2017 report (Kirbas *et al*., 2018).

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.
- ‘Rounding’: due to rounding of figures, there may be slight differences in totals both within and between tables.
- ‘All brassicas’: refers to broccoli, Brussels sprouts, summer cabbage, savoy cabbage, summer cauliflower and kale.
- ‘Celery and parsley’: refers to celeriac, celery and parsley.
- ‘Onions and leeks’: refers to leeks and salad onions.
- ‘Tomatoes’: refers to all tomatoes (tomatoes, cherry tomatoes and plum tomatoes).
- ‘Other crops’: refers to beetroot, chives, courgettes, cucumbers, kohlrabi, pak choi, pumpkin, squash, swede and thyme.
- Pak choi, pumpkins and courgettes received no pesticide treatments.
- 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://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 2016 (*Anon*., 2017) and Single Farm Payment returns, 2017.

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 between February and March 2018. 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 eleven farms provided information on 53 crop types. Crops include beetroot, broccoli, Brussels sprouts, cabbage, cauliflower, celeriac, celery, chives, courgettes, cucumber, kale, kohlrabi, leeks, lettuce, pak choi, parsley, pumpkin, salad onion, squash, swedes, 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 2017. A total of 137 treatments, including seed treatments and biopesticides, were applied to edible protected crops using 27 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, 2017.**

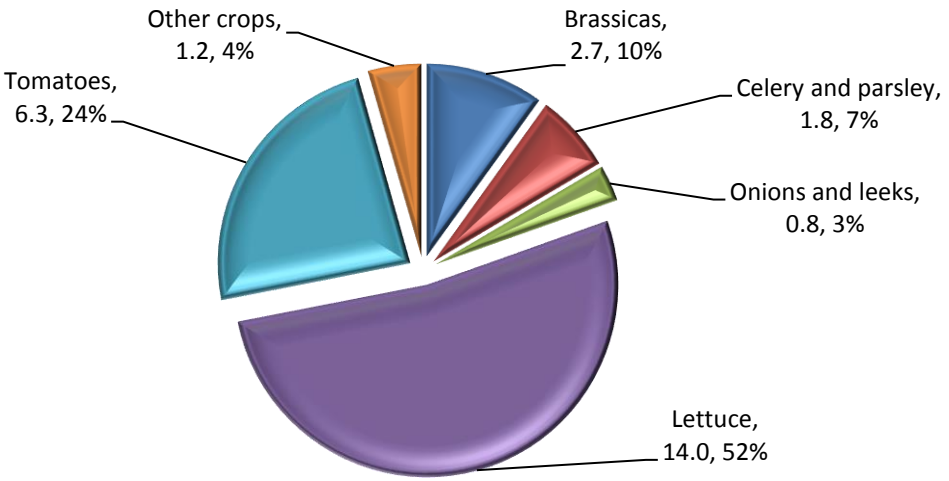

Figure 2 **Pesticide usage (spha) on edible protected crops in Northern Ireland, 2017.**

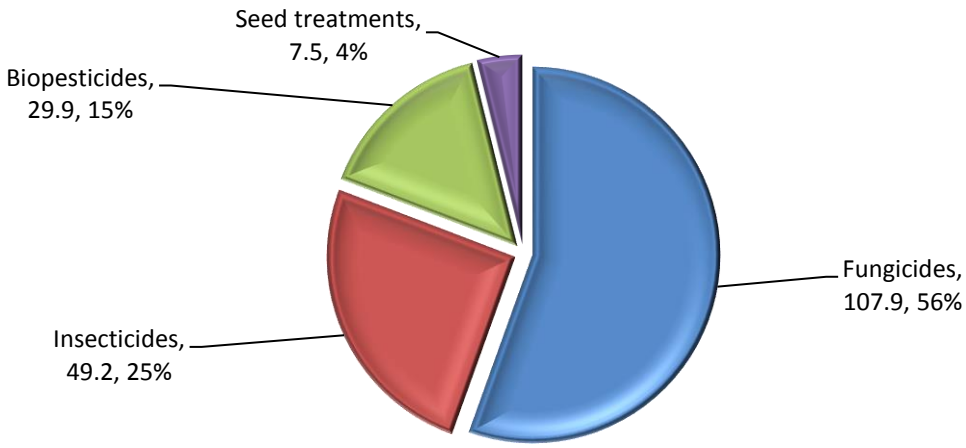

Figure 3 **Pesticide usage (kg) on edible protected crops in Northern Ireland, 2017.**

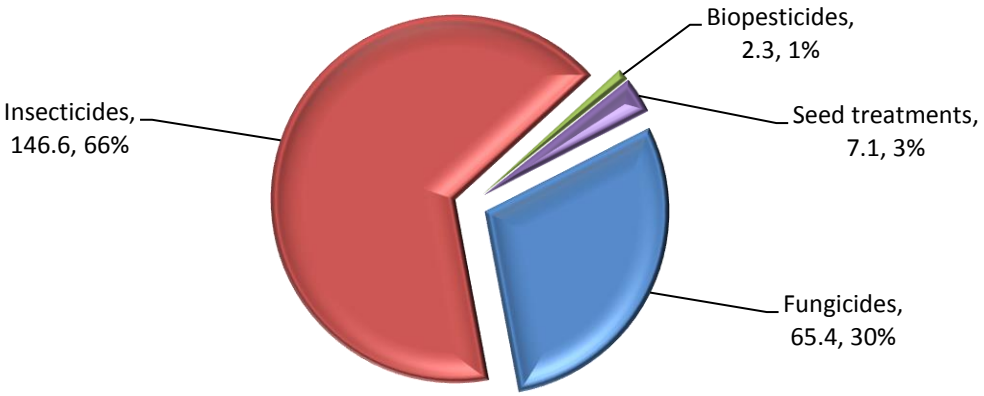

Figure 4 **The ten most commonly used pesticide active substances by area treated (spha) in Northern Ireland, 2017.**

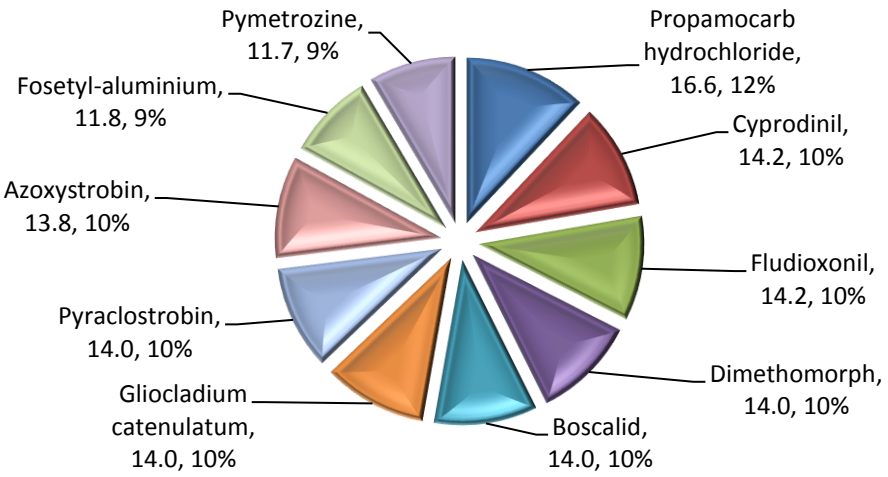

Figure 5 **The ten most commonly used pesticide active substances by weight applied (kg) in Northern Ireland, 2017.**

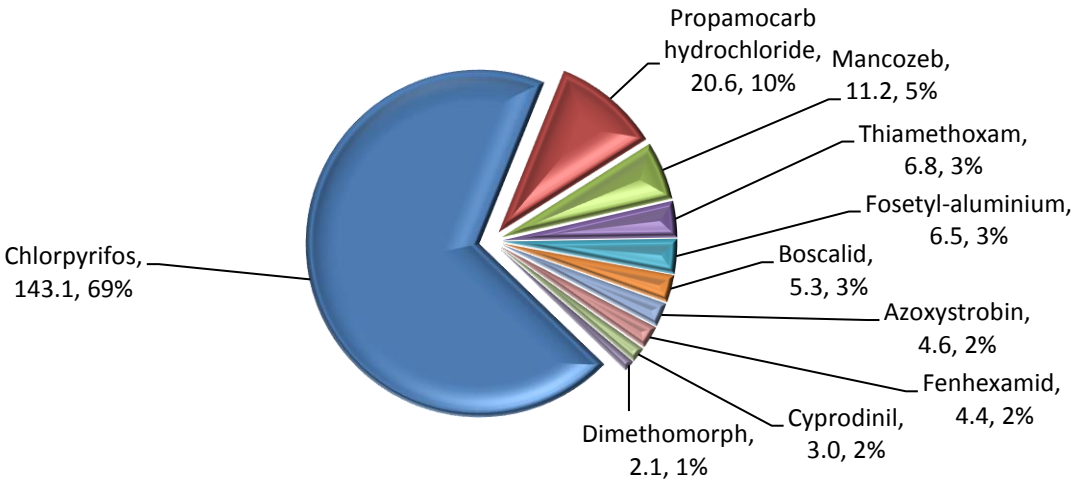

Figure 6 **Basic treated area (ha), total treated area (spha) and weight of pesticides applied to edible protected crops in Northern Ireland, 2017.**

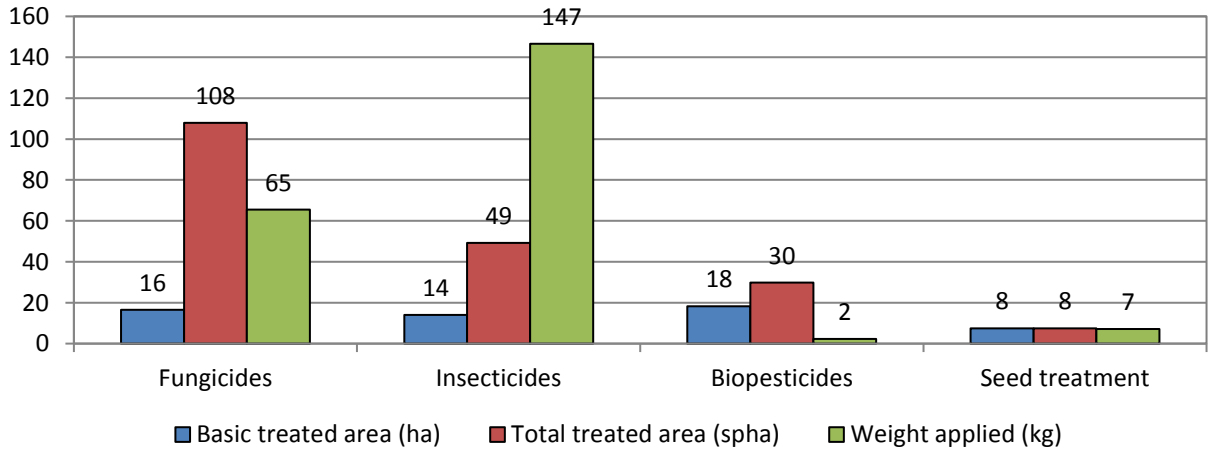

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Table 1 **Total number and area of crops surveyed (ha) in Northern Ireland, 2017.**

Crop group	Number of crops surveyed	Sampled area (ha)
Brassicas	10	2.42
Celery and parsley	6	0.39
Lettuce	4	12.64
Onions and leeks	3	0.39
Tomatoes	7	0.73
Other crops	12	0.28
All crops	**42**	**16.84**

Table 2 **Estimated area (ha) of edible protected crops grown regionally in Northern Ireland, 2017.**

	County			
Crop group	Antrim	Armagh	Down	Northern Ireland
Brassicas	.	.	2.67	2.67
Celery and parsley	0.72	0.83	0.21	1.77
Onions and leeks	0.49	.	0.33	0.81
Lettuce	.	13.84	0.17	14.02
Tomatoes	2.08	0.10	4.17	6.34
Other crops	0.91	0.09	0.17	1.18
All crops	**4.20**	**14.86**	**7.72**	**26.78**

Table 3a: **Estimated area (spha) of edible protected crops treated regionally in Northern Ireland, 2017 with each pesticide type.**

	County			
Pesticide type	Antrim	Armagh	Down	Northern Ireland
Fungicides	2.09	93.60	12.22	107.92
Insecticides	.	46.80	2.39	49.19
Biopesticides	.	23.40	6.48	29.88
Seed treatments	1.21	2.97	3.32	7.50
All pesticides	**3.30**	**166.77**	**24.40**	**194.48**

Table 3b: **Estimated weight (kg) of pesticide applied regionally in Northern Ireland, 2017 with each pesticide type.**

	County			
Pesticide type	**Antrim**	**Armagh**	**Down**	**Northern Ireland**
Fungicides	0.52	48.52	16.40	65.44
Insecticides	.	3.48	143.14	146.62
Biopesticides	.	1.53	0.74	2.27
Seed treatments	0.01	6.71	0.37	7.08
All pesticides	**0.53**	**60.24**	**160.65**	**221.42**

Table 4: **The total area (spha) and the basic area (ha) of edible protected crops treated with each pesticide type in Northern Ireland, 2017.**

	Pesticide Type									
	Fungicides		Insecticides		Biopesticides		Seed treatments		All pesticides	
Crop group	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)
Brassicas	12.00	2.56	2.39	2.39	2.32	2.32	2.62	2.62	19.33	7.57
Celery and parsley	0.85	0.79	.	.	.	.	1.77	1.77	2.62	2.55
Onions and leeks	0.49	0.49	.	.	.	.	0.81	0.81	1.30	1.30
Lettuce	93.64	11.74	46.80	11.70	23.40	11.70	2.19	2.19	166.03	25.63
Tomatoes	0.56	0.56	.	.	4.16	4.16	.	.	4.72	0.56
Other crops	0.37	0.35	<0.01	<0.01	.	.	0.11	0.11	0.48	0.46
All crops	**107.92**	**16.49**	**49.19**	**14.09**	**29.88**	**18.18**	**7.50**	**7.50**	**194.48**	**38.07**

Table 5: **The total quantities (kg) of each pesticide type used on edible protected crops in Northern Ireland, 2017.**

	Pesticide type				
Crop group	Fungicides	Insecticides	Biopesticides	Seed treatments	Total quantity (kg)
Brassicas	15.22	143.12	0.74	0.19	159.27
Celery and parsley	0.25	.	.	<0.01	0.25
Onions and leeks	0.12	.	.	0.02	0.14
Lettuce	49.61	3.48	1.53	6.85	61.47
Tomatoes	0.14	.	N/A*	.	0.14
Other crops	0.11	0.01	.	0.02	0.14
All crops	**65.44**	**146.62**	**2.27**	**7.08**	**221.42**

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, 2017.**

	Pestcide type									
	Fungicides		Insecticides		Biopesticides		Seed treatments		All Pesticides	
Crop type	%	Sp apps	%	Sp apps	%	Sp apps	%	Sp apps	%	Sp apps
Brassicas	96%	1.7	89%	1.0	87%	1.0	98%	1.0	98%	1.3
Celery and parsley	45%	1.1	.	.	.	.	100%	1.0	100%	1.0
Onions and leeks	60%	1.0	.	.	.	.	100%	1.0	100%	1.0
Lettuce	84%	1.7	83%	4.0	83%	2.0	16%	1.0	99%	1.4
Tomatoes	9%	1.0	.	.	66%	1.0	.	.	74%	1.0
Other crops	30%	1.2	<1%	1.0	.	.	9%	1.0	39%	1.1
Total	**37%**	**1.4**	**31%**	**1.4**	**40%**	**1.1**	**17%**	**1.0**	**53%**	**1.2**

Table 7 **Estimated area (spha) of edible protected crops treated with pesticide formulations in Northern Ireland, 2017.**

	Crop group						
Pesticide group and active substance	**Brassicas**	**Celery and parsley**	**Onions and leeks**	**Lettuce**	**Tomatoes**	**Other crops**	**Total treated area (spha)**
Fungicides							
Azoxystrobin	.	0.72	0.49	11.70	0.56	0.32	13.79
Boscalid/pyraclostrobin	2.32	.	.	11.70	.	.	14.02
Chlorothalonil	.	<0.05	.	.	.	.	<0.05
Cyprodinil/fludioxonil	2.32	0.11	.	11.70	.	0.05	14.18
Dimethomorph	2.32	.	.	11.70	.	.	14.02
Fenhexamid	.	.	.	11.70	.	.	11.70
Fluopicolide/propamocarb hydrochloride	2.32	.	.	.	.	.	2.32
Fosetyl-aluminium/propamocarb hydrochloride	0.07	.	.	11.74	.	.	11.82
Mancozeb/metalaxyl-M	.	.	.	11.70	.	.	11.70
Mandipropamid	.	.	.	11.70	.	.	11.70
Propamocarb hydrochloride	2.49	.	.	.	.	.	2.49
Tolclofos-methyl	0.17	.	.	.	.	.	0.17
All fungicides	**12.00**	**0.85**	**0.49**	**93.64**	**0.56**	**0.37**	**107.92**
Insecticides							
Chlorpyrifos	2.39	.	.	.	.	<0.05	2.39
Indoxacarb	.	.	.	11.70	.	.	11.70
Pymetrozine	.	.	.	11.70	.	.	11.70
Spinosad	.	.	.	11.70	.	.	11.70
Spirotetramat	.	.	.	11.70	.	.	11.70
All insecticides	**2.39**	**.**	**.**	**46.80**	**.**	**<0.05**	**49.19**

Table 7 (contd) **Estimated area (spha) of edible protected crops treated with pesticide formulations in Northern Ireland, 2017.**

	Crop group						
Pesticide group and active substance	**Brassicas**	**Celery and parsley**	**Onions and leeks**	**Lettuce**	**Tomatoes**	**Other crops**	**Total treated area (spha)**
Biopesticides							
Bacillus subtilis	.	.	.	11.70	.	.	11.70
Gliocladium catenulatum	2.32	.	.	11.70	.	.	14.02
Neoseiulus californicus	.	.	.	.	4.16	.	4.16
All biological controls	**2.32**	**.**	**.**	**23.40**	**4.16**	**.**	**29.88**
Seed treatments							
Cymoxanil/fludioxonil/metalaxyl-M	.	.	.	.	.	<0.05	<0.05
Fludioxonil	.	<0.05	.	.	.	.	<0.05
Iprodione	2.32	.	.	.	.	<0.05	2.32
Metalaxyl-M	0.17	0.29	.	.	.	.	0.46
Thiamethoxam	0.07	0.00	0.00	2.19	0.00	0.10	2.35
Thiram	0.07	1.46	0.81	.	.	.	2.35
All seed treatments	**2.62**	**1.77**	**0.81**	**2.19**	**.**	**0.11**	**7.50**

Table 8 **Estimated quantities (kg) of pesticide formulations used on edible protected crops in Northern Ireland, 2017.**

	Crop group						
Pesticide group and active substance	**Brassicas**	**Celery and parsley**	**Onions and leeks**	**Lettuce**	**Tomatoes**	**Other crops**	**Total quantity (kg)**
Fungicides							
Azoxystrobin	.	0.18	0.12	4.10	0.14	0.08	4.62
Boscalid/pyraclostrobin	0.76	.	.	5.86	.	.	6.62
Chlorothalonil	.	<0.05	.	.	.	.	<0.05
Cyprodinil/fludioxonil	1.18	0.06	.	3.66	.	<0.05	4.92
Dimethomorph	<0.05	.	.	2.11	.	.	2.15
Fenhexamid	.	.	.	4.39	.	.	4.39
Fluopicolide/propamocarb hydrochloride	2.55	.	.	.	.	.	2.55
Fosetyl-aluminium/propamocarb hydrochloride	1.83	.	.	15.83	.	.	17.67
Mancozeb/metalaxyl-M	.	.	.	11.91	.	.	11.91
Mandipropamid	.	.	.	1.76	.	.	1.76
Propamocarb hydrochloride	7.18	.	.	.	.	.	7.18
Tolclofos-methyl	1.66	.	.	.	.	.	1.66
All fungicides	**15.22**	**0.25**	**0.12**	**49.61**	**0.14**	**0.11**	**65.44**
Insecticides							
Chlorpyrifos	143.12	.	.	.	.	<0.05	143.14
Indoxacarb	.	.	.	0.30	.	.	0.30
Pymetrozine	.	.	.	1.46	.	.	1.46
Spinosad	.	.	.	0.84	.	.	0.84
Spirotetramat	.	.	.	0.88	.	.	0.88
All insecticides	**143.12**	**.**	**.**	**3.48**	**.**	**<0.05**	**146.62**

Table 8 (contd) **Estimated quantities (kg) of pesticide formulations used on edible protected crops in Northern Ireland, 2017.**

	Crop group						
Pesticide group and active substance	**Brassicas**	**Celery and parsley**	**Onions and leeks**	**Lettuce**	**Tomatoes**	**Other crops**	**Total quantity (kg)**
Biopesticides							
Bacillus subtilis	.	.	.	0.78	.	.	0.78
Gliocladium catenulatum	0.74	.	.	0.75	.	.	1.49
Neoseiulus californicus	.	.	.	.	.	.	N/A*
All biological controls	**0.74**	**.**	**.**	**1.53**	**.**	**.**	**2.27**
Seed treatments							
Cymoxanil/fludioxonil/metalaxyl-M	.	.	.	.	.	<0.05	<0.05
Fludioxonil	.	<0.05	.	.	.	.	<0.05
Iprodione	0.17	.	.	.	.	<0.05	0.17
Metalaxyl-M	<0.05	<0.05	.	.	.	.	<0.05
Thiamethoxam	<0.05	.	.	6.85	.	<0.05	6.88
Thiram	<0.05	<0.05	<0.05	.	.	.	<0.05
All seed treatments	**0.19**	**<0.05**	**<0.05**	**6.85**	**.**	**<0.05**	**7.08**

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

Table 9 **The twenty active ingredients most extensively used on edible protected crops in Northern Ireland, 2017 ranked by treated area (spha).**

No.	Active substance	Treated area (spha)
1	Propamocarb hydrochloride	16.62
2	Cyprodinil	14.18
3	Fludioxonil	14.18
4	Dimethomorph	14.02
5	Boscalid	14.02
6	*Gliocladium catenulatum*	14.02
7	Pyraclostrobin	14.02
8	Azoxystrobin	13.79
9	Fosetyl-aluminium	11.82
10	Pymetrozine	11.70
11	Indoxacarb	11.70
12	Mancozeb	11.70
13	Mandipropamid	11.70
14	Metalaxyl-M	11.70
15	*Bacillus subtilis*	11.70
16	Fenhexamid	11.70
17	Spinosad	11.70
18	Spirotetramat	11.70
19	*Neoseiulus californicus*	4.16
20	Chlorpyrifos	2.39

Table 10 **The twenty active ingredients most extensively used on edible protected crops in Northern Ireland, 2017 ranked by weight (kg).**

No.	Active substance	Treated area (spha)
1	Chlorpyrifos	143.14
2	Propamocarb hydrochloride	20.65
3	Mancozeb	11.23
4	Thiamethoxam	6.85
5	Fosetyl-aluminium	6.52
6	Boscalid	5.29
7	Azoxystrobin	4.62
8	Fenhexamid	4.39
9	Cyprodinil	2.95
10	Dimethomorph	2.15
11	Fludioxonil	1.97
12	Mandipropamid	1.76
13	Tolclofos-methyl	1.66
14	*Gliocladium catenulatum*	1.49
15	Pymetrozine	1.46
16	Pyraclostrobin	1.33
17	Spirotetramat	0.88
18	Spinosad	0.84
19	*Bacillus subtilis*	0.78
20	Metalaxyl-M	0.68

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

	Reasons for treatment								
Pesticide group and active substance	**General Disease**	**Botrytis**	**Cabbage Rootfly**	**Damping Off**	**Mildew**	**Seed Treatment**	**Total treated area (spha)**	**Basic treated area (ha)**	**Quantity applied (kg)**
Fungicides									
Boscalid/pyraclostrobin	2.32	.	.	.	.	.	2.32	2.32	0.76
Cyprodinil/fludioxonil	.	2.32	.	.	.	.	2.32	2.32	1.18
Dimethomorph	.	.	0.53	.	1.79	.	2.32	2.32	<0.05
Fluopicolide/propamocarb hydrochloride	2.32	.	.	.	.	.	2.32	2.32	2.55
Fosetyl-aluminium/propamocarb hydrochloride	0.07	.	.	.	.	.	0.07	0.07	1.83
Propamocarb hydrochloride	2.32	.	.	0.17	.	.	2.49	2.49	7.18
Tolclofos-methyl	.	.	.	0.17	.	.	0.17	0.17	1.66
All fungicides	**7.03**	**2.32**	**0.53**	**0.33**	**1.79**	**.**	**12.00**	**.**	**15.22**
Insecticides									
Chlorpyrifos	.	.	2.39	.	.	.	2.39	2.39	143.12
All insecticides	**.**	**.**	**2.39**	**.**	**.**	**.**	**2.39**	**.**	**143.12**
Biopesticides									
Gliocladium catenulatum	2.32	.	.	.	.	.	2.32	2.32	0.74
All biopesticides	**2.32**	**.**	**.**	**.**	**.**	**.**	**2.32**	**.**	**0.74**
Seed treatments									
Iprodione	.	.	.	.	.	2.32	2.32	2.32	0.17
Metalaxyl-M	.	.	.	.	.	0.17	0.17	0.17	<0.05
Thiamethoxam	.	.	.	.	.	0.07	0.07	0.07	<0.05
Thiram	.	.	.	.	.	0.07	0.07	0.07	<0.05
All seed treatments	**.**	**.**	**.**	**.**	**.**	**2.62**	**2.62**	**.**	**0.19**

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

	Reason for treatment				
Pesticide group and active substance	**General Disease Control**	**Seed Treatment**	**Total treated area (spha)**	**Basic treated area (ha)**	**Quantity applied (kg)**
Fungicides					
Azoxystrobin	0.72	.	0.72	0.72	0.18
Chlorothalonil	<0.05	.	<0.05	<0.05	<0.05
Cyprodinil/fludioxonil	0.11	.	0.11	0.06	0.06
All fungicides	**0.85**	**.**	**0.85**	**.**	**0.25**
Seed treatments					
Fludioxonil	.	<0.05	<0.05	<0.05	<0.05
Metalaxyl-M	.	0.29	0.29	0.29	<0.05
Thiram	.	1.46	1.46	1.46	<0.05
All seed treatments	**.**	**1.77**	**1.77**	**.**	**<0.05**

Table 13 **Onions and leeks: pesticide-treated area (spha), basic treated area (ha), quantity applied (kg) and reasons for use.**

	Reasons for treatment				
Pesticide group and active substance	General Disease Control	Seed Treatment	Total treated area (spha)	Basic treated area (ha)	Quantity applied (kg)
Fungicides					
Azoxystrobin	0.49	.	0.49	0.49	0.12
All fungicides	**0.49**	**.**	**0.49**	**.**	**0.12**
Seed treatments					
Thiram	.	0.81	0.81	0.81	<0.05
All seed treatments	**.**	**0.81**	**0.81**	**.**	**<0.05**

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

	Reasons for treatment										
Pesticide group and active substance	**Botrytis**	**Mildew**	**General disease control**	**Sclerotinia**	**Aphids**	**Caterpillars**	**Thrips**	**Seed Treatment**	**Total treated area (spha)**	**Basic treated area (ha)**	**Quantity applied (kg)**
Fungicides											
Azoxystrobin	.	.	.	11.70	.	.	.	.	11.70	11.70	4.10
Boscalid/pyraclostrobin	.	.	.	11.70	.	.	.	.	11.70	11.70	5.86
Cyprodinil/fludioxonil	11.70	.	.	.	.	.	.	.	11.70	11.70	3.66
Dimethomorph	.	11.70	.	.	.	.	.	.	11.70	11.70	2.11
Fenhexamid	11.70	.	.	.	.	.	.	.	11.70	11.70	4.39
Fosetyl-aluminium/propamocarb hydrochloride	.	11.70	<0.05	.	.	.	.	.	11.74	11.74	15.83
Mancozeb/metalaxyl-M	.	11.70	.	.	.	.	.	.	11.70	11.70	11.91
Mandipropamid	.	11.70	.	.	.	.	.	.	11.70	11.70	1.76
All fungicides	**23.40**	**46.80**	**<0.05**	**23.40**	**.**	**.**	**.**	**.**	**93.64**	**.**	**49.61**
Insecticides											
Indoxacarb	.	.	.	.	.	11.70	.	.	11.70	11.70	0.30
Pymetrozine	.	.	.	.	11.70	.	.	.	11.70	11.70	1.46
Spinosad	.	.	.	.	.	.	11.70	.	11.70	11.70	0.84
Spirotetramat	.	.	.	.	11.70	.	.	.	11.70	11.70	0.88
All insecticides	**.**	**.**	**.**	**.**	**23.40**	**11.70**	**11.70**	**.**	**46.80**	**.**	**3.48**
Biopesticides											
Bacillus subtilis	11.70	.	.	.	.	.	.	.	11.70	11.70	0.78
Gliocladium catenulatum	11.70	.	.	.	.	.	.	.	11.70	11.70	0.75
All biopesticides	**23.40**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**23.40**	**.**	**1.53**
Seed treatments											
Thiamethoxam	.	.	.	.	.	.	.	2.19	2.19	2.19	6.85
All seed treatments	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**2.19**	**2.19**	**.**	**6.85**

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

	Reasons for treatment				
Pesticide group and active substance	**Two-Spotted Spider Mite**	**General Disease Control**	**Total treated area (spha)**	**Basic treated area (ha)**	**Quantity applied (kg)**
Fungicides					
Azoxystrobin	.	0.56	0.56	0.56	0.14
All fungicides	**.**	**0.56**	**0.56**	**.**	**0.14**
Biopesticides					
Neoseiulus californicus	4.16	.	4.16	4.16	N/A*
All biopesticides	**4.16**	**.**	**4.16**	**.**	**N/A***

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

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

	Reasons for treatment						
Pesticide group and active substance	**General Disease Control**	**Botrytis**	**General insect control**	**Seed Treatment**	**Total treated area (spha)**	**Basic treated area (ha)**	**Quantity applied (kg)**
Fungicides							
Azoxystrobin	0.32	.	.	.	0.32	0.32	0.08
Cyprodinil/fludioxonil	<0.05	<0.05	.	.	0.05	<0.05	<0.05
All fungicides	**0.32**	**<0.05**	**.**	**.**	**0.37**	**.**	**0.11**
Insecticides							
Chlorpyrifos	.	.	<0.05	.	<0.05	<0.05	<0.05
All insecticides	**.**	**.**	**<0.05**	**.**	**<0.05**	**.**	**<0.05**
Seed treatments							
Cymoxanil/fludioxonil/metalaxyl-M	.	.	.	<0.05	<0.05	<0.05	<0.05
Iprodione	.	.	.	<0.05	<0.05	<0.05	<0.05
Thiamethoxam	.	.	.	0.10	0.10	0.10	<0.05
All seed treatments	**.**	**.**	**.**	**0.11**	**0.11**	**.**	**<0.05**

Table 17 **Comparison of the area of edible protected crops grown (ha) in Northern Ireland 2015-2017, by crop group and county.**

	County							
	Antrim		Armagh		Down		Northern Ireland	
Crop group	2015	2017	2015	2017	2015	2017	2015	2017
Brassicas	.	.	0.59	.	2.49	2.67	3.08	2.67
Celery and parsley	0.61	0.72	0.66	0.83	0.18	0.21	1.45	1.77
Onions and leeks	0.68	0.49	.	.	0.53	0.33	1.21	0.81
Lettuce	3.54	.	6.07	13.84	.	0.17	9.61	14.02
Tomatoes	12.55	2.08	.	0.10	7.07	4.17	19.62	6.34
Other crops	.	0.91	.	0.09	0.03	0.17	0.03	1.18
All crops	**17.38**	**4.20**	**7.32**	**14.86**	**10.31**	**7.72**	**35.00**	**26.78**

Table 18 **Comparison of pesticide usage on edible protected crops 2015-2017, total area treated (spha) with main pesticide groups and quantities of active ingredient (kg) used.**

	2015		2017	
Pesticide group	(spha)	(kg)	(spha)	(kg)
Fungicides	13.85	21.44	107.92	65.44
Herbicides	1.49	1.97	.	.
Insecticides and acaricides	8.26	141.41	49.19	146.62
Molluscicides	.	.	.	.
Biopesticides	2.12	0.68	29.88	2.27
Seed treatments	13.21	0.85	7.50	7.08
Total	**38.92**	**166.34**	**194.48**	**221.42**

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

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