PESTICIDE USAGE IN NORTHERN IRELAND

Survey Report 307

Northern Ireland Edible Protected Crops 2021

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PESTICIDE USAGE SURVEY REPORT

EDIBLE PROTECTED CROPS IN NORTHERN IRELAND 2021

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CONTENTS

FIGURE INDEX

TABLE INDEX

The County Regions of Northern Ireland

SUMMARY

This is the fourth 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), 2017 (Lavery *et al*., 2018) and 2019 (Lavery *et al*., 2020). 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, 2020 (Kirbas *et al*., 2021).

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 2019 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 seven holdings, representing 33% 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 2020 (*Anon*., 2021) and Basic Payment Scheme returns, 2021. 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 2021. Dimethomorph represented 15% of the fungicide-treated area and 1% of the weight of fungicides applied. Cyprodinil/fludioxonil represented a further 14% with both accounting for 3% of the weight

of fungicides applied. However, fosetyl-aluminium/propamocarb hydrochloride, which accounted for 13% of the fungicide-treated area, represented 55% of the weight of fungicides applied, primarily on brassica crops during propagation stage for the control of downy mildew. Propamocarb hydrochloride accounted for only 25 of the fungicide-treated area but 31% of the weight of fungicides applied. (Tables 7 and 8).

There was only one herbicide active substance applied in 2021, exclusively applied to lettuce crops, which accounted for an estimated 5% of the total pesticide-treated area and 3% of the total weight of pesticides applied. (Tables 7, 8 and 13).

A total of five insecticide active ingredients were recorded in 2021. The oxadiazine insecticide indoxacarb accounted for 24% of the area treated with insecticides, representing 11% of the weight of insecticides applied. Both spirotetramat and spinosad represented 60% of the insecticide-treated area and 80% of the weight of insecticides applied. The diamide insecticide cyantraniliprole, applied exclusively to brassica crops, accounted for 3% of the insecticide-treated area and 7% of the weight of insecticides applied. (Tables 7, 8 and 12).

Two microbial pesticides were recorded in 2021, *Bacillus subtilis* and *Gliocladium catenulatum,* applied primarily to lettuce crops for the control of *Botrytis cinerea* accounted for 71% of the biopesticide treated area and 21% of the weight of biopesticides applied. *Bacillus subtilis* accounted for 19% of the biopesticide-treated area of brassica crops and 10% of the weight of biopesticides applied. . (Tables 7, 8 and 11-15).

Seed treatments accounted for 4% of the total pesticide-treated area and <1% of the weight of pesticides applied. The seed treatment active substances applied in 2021 were fludioxonil and metalaxyl-M, were primarily applied to leafy and flowerhead brassica crops, representing 95% of the seed-treated area and 86% of the weight applied. Lettuce was the only crop not to receive a seed treatment.

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 66% of all fungicides applied representing 14% of the weight applied. Conversely, leafy and flowerhead brassica crops, which received 32% of all fungicides applied, accounted for 84% of the weight applied. Lettuce crops received an average of 2.8 fungicide,

1.0 herbicide, 1.6 insecticide, 1.5 biopesticide and 1 molluscicide application (Tables 6 and 13).

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 that were grown outdoors for part of, or all of their life cycle are recorded in the Outdoor Vegetable Crops in Northern Ireland 2021 report (Kirbas *et al*., 2022).

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 purple broccoli, Brussels sprouts, cabbage, calabrese, autumn and summer cauliflower and kale. ‘Cabbage’ includes savoy, white, red, spring, 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, onions, shallots and salad onions.
- ‘Other crops’: refers to beetroot, courgettes, cucumbers, garlic, kohlrabi, pak choi, peppers, pumpkin, spinach, squash, swede, sweetcorn and thyme. The following crops received no pesticide treatments: Beans, carrots, table celery, courgette and courgette at propagation stage, cucumber, garlic, onions at propagation stage, peppers, runner beans, salad onions, spinach, squash at propagation stage, sweetcorn at propagation stage, tomatoes 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://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 2020 (*Anon*., 2021) and Basic Payment Scheme returns, 2021.

The purpose of the survey was explained to the occupiers of selected holdings in preliminary correspondence. The holdings were then surveyed by telephone and email correspondence during April and May 2021. 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.

The Covid pandemic and resulting restrictions have severely impacted our capability to conduct the survey programme. In particular, we have been unable to complete personal interviews, relying on telephone or email correspondence, which is not always convenient to participants. Due to the changes in our data collection method, we were increasingly faced with incomplete or missing data. However, we are pleased that despite these drawbacks, we are able to present the report in a timely manner.

CROPS

The number and areas of crops surveyed are shown in Table 1 as combined crop groups. Data from seven farms provided information on 58 crop types. Crops include beans, beetroot, broccoli, Brussels sprouts, cabbage, carrots, cauliflower, celeriac, celery, courgettes, cucumber, garlic, kohlrabi, leeks, lettuce, pak choi, parsley, peppers, pumpkin, salad onion, spinach, squash, swede, sweetcorn, 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 2021. A total of 195 treatments, including seed treatments and biopesticides, were applied to edible protected crops using 24 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, 2021 (Table 2).**

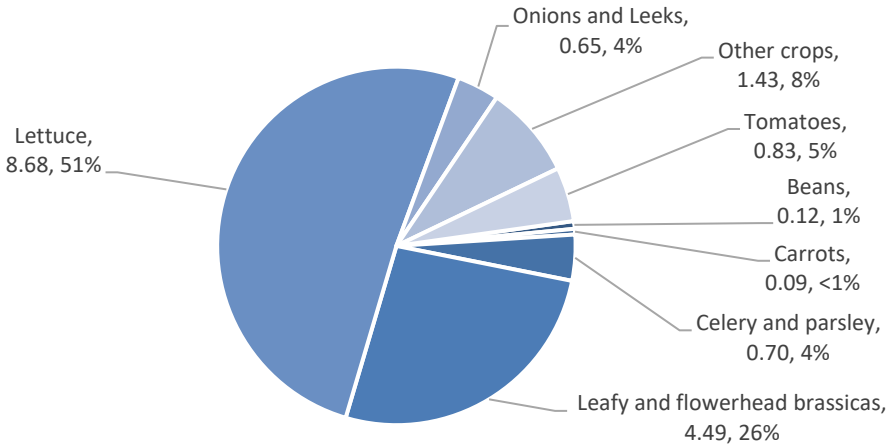

Figure 2 **Pesticide usage (spha) on edible protected crops in Northern Ireland, 2021 (Table 4).**

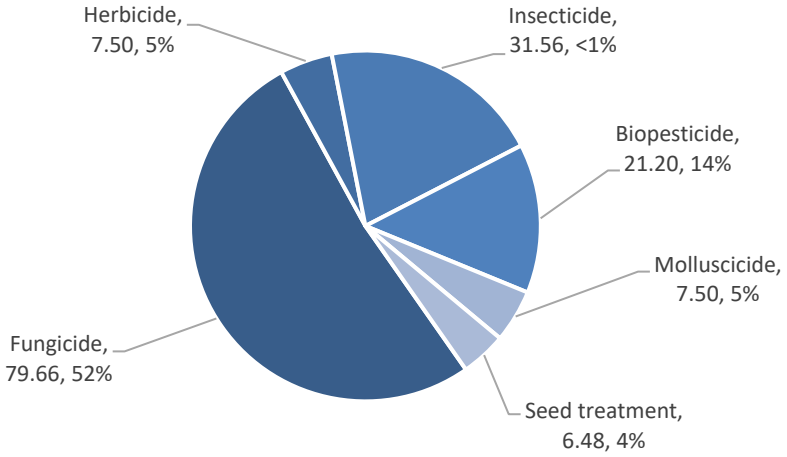

Figure 3 **Pesticide usage (kg) on edible protected crops in Northern Ireland, 2021 (Table 5).**

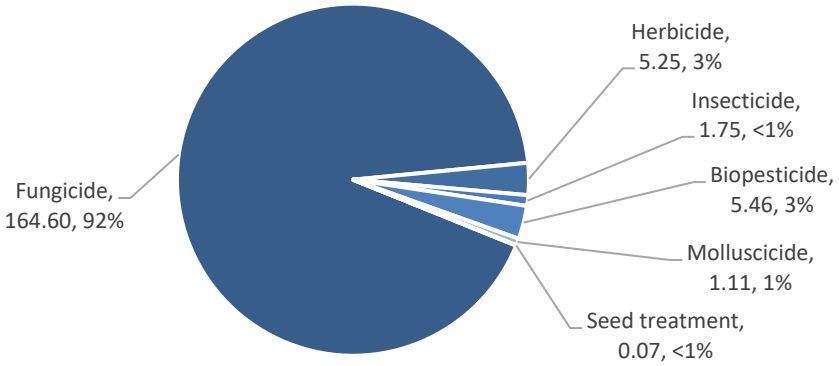

Figure 4 **The ten most commonly used pesticide active substances by area treated (spha) in Northern Ireland, 2021 (Table 9).**

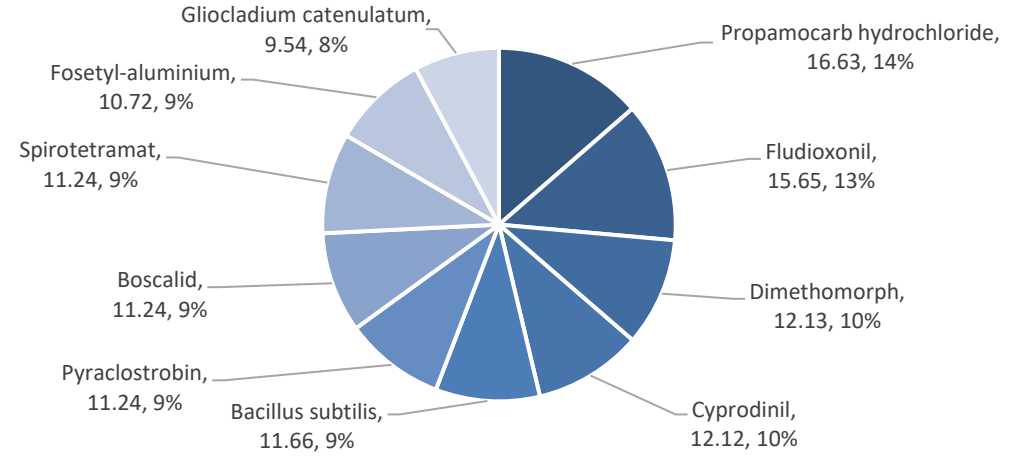

Figure 5 **The ten most commonly used pesticide active substances by weight applied (kg) in Northern Ireland, 2021 (Table 10).**

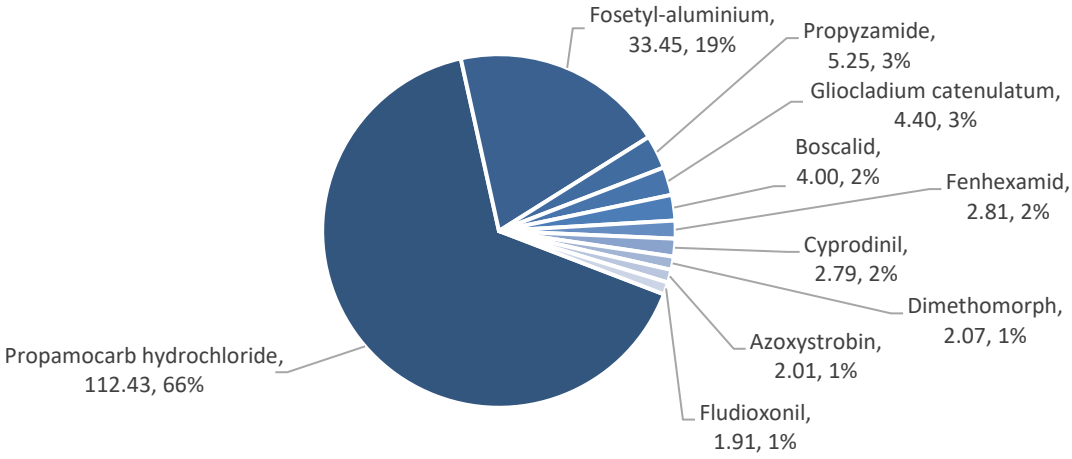

Figure 6 **Basic treated area (ha), total treated area (spha) and weight of pesticides applied to edible protected crops in Northern Ireland, 2021 (Tables 4 and 5).**

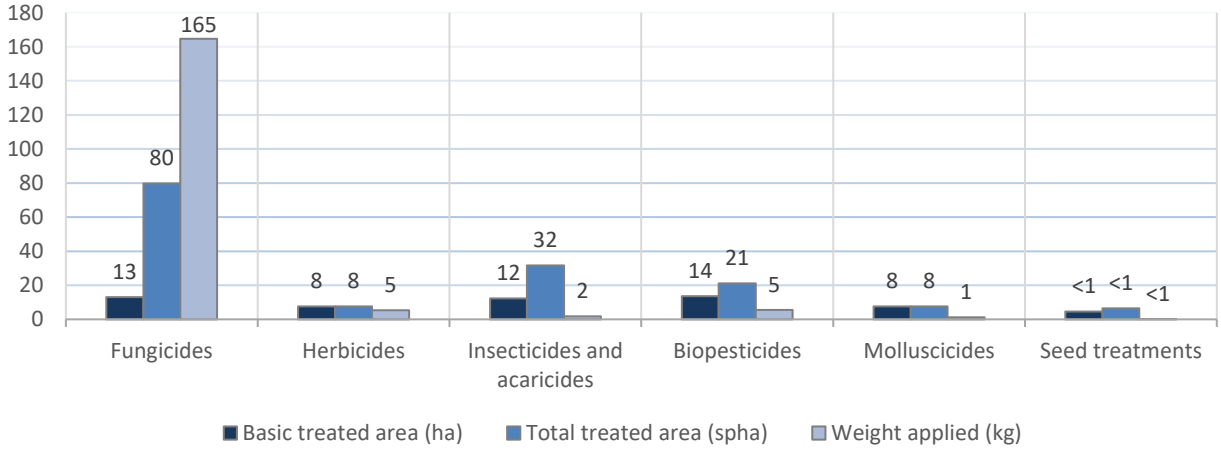

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Table 1 **Total number and area of crops surveyed (ha) in Northern Ireland, 2021.**

Crop group	Number of crops surveyed	Sampled area (ha)
Beans	2	0.12
Carrots	1	0.09
Celery and parsley	4	0.70
Leafy and flowerhead brassicas	14	4.49
Lettuce	5	8.68
Onions and leeks	4	0.65
Other crops	23	1.43
Tomatoes	5	0.83
All crops	**58**	**16.99**

Table 2 **Estimated area (ha) of edible protected crops grown in Northern Ireland, 2021.**

Crop group	Northern Ireland
Beans	0.12
Carrots	0.09
Celery and parsley	0.70
Leafy and flowerhead brassicas	4.49
Lettuce	8.68
Onions and leeks	0.65
Other crops	1.43
Tomatoes	0.83
All crops	**16.99**

Table 3a: **Estimated area (spha) of edible protected crops treated regionally in Northern Ireland, 2021 with each pesticide type.**

	County			
Pesticide type	Antrim	Armagh	Down	Northern Ireland
Fungicides	0.19	52.50	26.97	79.66
Herbicides	.	7.50	.	7.50
Insecticides and acaricides	0.19	22.50	8.86	31.56
Biopesticides	.	15.00	6.20	21.20
Molluscicides	.	7.50	.	7.50
Seed treatments	.	.	6.48	6.48
All pesticides	**0.39**	**105.00**	**48.51**	**153.90**

Table 3b: **Estimated weight (kg) of pesticide applied regionally in Northern Ireland, 2021 with each pesticide type.**

	County			
Pesticide type	**Antrim**	**Armagh**	**Down**	**Northern Ireland**
Fungicides	0.05	22.71	141.84	164.60
Herbicides	.	5.25	.	5.25
Insecticides and acaricides	<0.01	1.29	0.45	1.75
Biopesticides	.	0.98	4.47	5.46
Molluscicides	.	1.11	.	1.11
Seed treatments	.	.	0.07	0.07
All pesticides	**0.05**	**31.35**	**146.83**	**178.23**

Table 4: **The total area (spha) and the basic area (ha) of edible protected crops treated with each pesticide type in Northern Ireland, 2021.**

	Pesticide Type													
	Fungicides		Herbicides		Insecticides and acaricides		Biopesticides		Molluscicides		Seed treatments		All pesticides	
Crop group	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)
Celery and parsley	0.36	0.36	.	.	.	.	0.17	0.17	.	.	0.16	0.16	0.69	0.53
Leafy and flowerhead brassicas	25.43	4.49	.	.	8.59	4.49	4.49	4.49	.	.	6.15	4.20	44.66	4.49
Lettuce	52.69	7.69	7.50	7.50	22.69	7.69	15.08	7.58	7.50	7.50	.	.	105.47	7.77
Onions and leeks	0.38	0.38	.	.	.	.	0.38	0.38	.	.	0.02	0.02	0.78	0.40
Other crops	0.80	0.19	.	.	0.27	0.13	1.08	0.92	.	.	0.15	0.15	2.30	0.92
All crops	**79.66**	**13.11**	**7.50**	**7.50**	**31.56**	**12.32**	**21.20**	**13.54**	**7.50**	**7.50**	**6.48**	**4.53**	**153.90**	**14.00**

Table 5: **The total quantities (kg) of each pesticide type used on edible protected crops in Northern Ireland, 2021.**

	Pesticide type						
Crop group	Fungicides	Herbicides	Insecticides and acaricides	Biopesticides	Molluscicides	Seed treatments	Total quantity (kg)
Celery and parsley	0.09	.	.	0.33	.	<0.01	0.42
Leafy and flowerhead brassicas	138.00	.	0.43	1.53	.	0.06	140.01
Lettuce	22.76	5.25	1.30	1.13	1.11	.	31.56
Onions and leeks	0.07	.	.	0.73	.	<0.01	0.80
Other crops	3.68	.	0.02	1.74	.	<0.01	5.44
All crops	**164.60**	**5.25**	**1.75**	**5.46**	**1.11**	**0.07**	**178.23**

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, 2021.**

	Pestcide type													
	Fungicides		Herbicides		Insecticides and acaricides		Biopesticides		Molluscicides		Seed treatments		All Pesticides	
Crop type	%	Sp apps	%	Sp apps	%	Sp apps	%	Sp apps	%	Sp apps	%	Sp apps	%	Sp apps
Celery and parsley	51%	1.0	.	.	.	.	24%	1.0	.	.	22%	1.0	76%	1.0
Leafy and flowerhead brassicas	100%	5.5	.	.	100%	1.9	100%	1.0	.	.	93%	1.6	100%	2.6
Lettuce	89%	2.8	86%	1.0	89%	1.6	87%	1.5	86%	1.0	.	.	90%	1.8
Onions and leeks	59%	1.0	.	.	.	.	59%	1.0	.	.	3%	1.0	62%	1.0
Other crops	13%	4.0	.	.	9%	1.7	64%	1.3	.	.	11%	1.3	64%	1.9
Total	**44%**	**4.5**	**25%**	**1.0**	**41%**	**1.8**	**45%**	**1.1**	**25%**	**1.0**	**15%**	**1.5**	**47%**	**2.2**

Table 7: **Estimated area (spha) of edible protected crops treated with pesticide formulations in Northern Ireland, 2021.**

	Crop name					
Pesticide group and active substance	**Celery and parsley**	**Leafy and flowerhead brassicas**	**Lettuce**	**Onions and leeks**	**Other crops**	**Total**
Fungicides						
Azoxystrobin	0.36	.	7.69	.	.	8.06
Boscalid/pyraclostrobin	.	3.60	7.50	.	0.13	11.24
Cyprodinil/fludioxonil	.	4.49	7.50	.	0.13	12.12
Difenoconazole	.	3.98	.	.	0.13	4.11
Dimethomorph	.	4.49	7.50	.	0.13	12.13
Fenhexamid	.	.	7.50	.	.	7.50
Fluopicolide/propamocarb hydrochloride	.	4.37	.	.	0.13	4.50
Fosetyl-aluminium/propamocarb hydrochloride	.	3.09	7.50	.	0.13	10.72
Mandipropamid	.	.	7.50	.	.	7.50
Propamocarb hydrochloride	.	1.41	.	.	.	1.41
Prothioconazole	.	.	.	0.38	.	0.38
All fungicides	**0.36**	**25.43**	**52.69**	**0.38**	**0.80**	**79.66**
Herbicides						
Propyzamide	.	.	7.50	.	.	7.50
All herbicides	**.**	**.**	**7.50**	**.**	**.**	**7.50**

Table 7 (contd) **Estimated area (spha) of edible protected crops treated with pesticide formulations in Northern Ireland, 2021.**

	Crop name					
Pesticide group and active substance	**Celery and parsley**	**Leafy and flowerhead brassicas**	**Lettuce**	**Onions and leeks**	**Other crops**	**Total**
Insecticides and acaricides						
Cyantraniliprole	.	1.01	.	.	.	1.01
Indoxacarb	.	.	7.50	.	.	7.50
Lambda-cyhalothrin	.	3.98	0.19	.	<0.05	4.20
Spinosad	.	.	7.50	.	0.11	7.61
Spirotetramat	.	3.60	7.50	.	0.13	11.24
All insecticides and acaricides	**.**	**8.59**	**22.69**	**.**	**0.27**	**31.56**
Biopesticides						
Bacillus subtilis	.	3.98	7.50	.	0.19	11.66
Gliocladium catenulatum	0.17	0.52	7.58	0.38	0.89	9.54
All biopesticides	**0.17**	**4.49**	**15.08**	**0.38**	**1.08**	**21.20**
Molluscicides						
Ferric phosphate	.	.	7.50	.	.	7.50
All molluscicides	**.**	**.**	**7.50**	**.**	**.**	**7.50**
Seed treatments						
Fludioxonil	0.16	3.22	.	.	0.15	3.53
Metalaxyl-M	.	2.93	.	<0.05	<0.05	2.95
All seed treatments	**0.16**	**6.15**	**.**	**<0.05**	**0.15**	**6.48**

Table 8 **Estimated quantities (kg) of pesticide formulations used on edible protected crops in Northern Ireland, 2021.**

	Crop name					
Pesticide group and active substance	**Celery and parsley**	**Leafy and flowerhead brassicas**	**Lettuce**	**Onions and leeks**	**Other crops**	**Total**
Fungicides						
Azoxystrobin	0.09	.	1.92	.	.	2.01
Boscalid/pyraclostrobin	.	1.20	3.76	.	<0.05	5.01
Cyprodinil/fludioxonil	.	2.25	2.34	.	0.06	4.65
Difenoconazole	.	0.50	.	.	<0.05	0.51
Dimethomorph	.	0.71	1.35	.	<0.05	2.07
Fenhexamid	.	.	2.81	.	.	2.81
Fluopicolide/propamocarb hydrochloride	.	4.80	.	.	0.15	4.95
Fosetyl-aluminium/propamocarb hydrochloride	.	77.80	9.45	.	3.40	90.65
Mandipropamid	.	.	1.13	.	.	1.13
Propamocarb hydrochloride	.	50.73	.	.	.	50.73
Prothioconazole	.	.	.	0.07	.	0.07
All fungicides	**0.09**	**138.00**	**22.76**	**0.07**	**3.68**	**164.60**
Herbicides						
Propyzamide	.	.	5.25	.	.	5.25
All herbicides	**.**	**.**	**5.25**	**.**	**.**	**5.25**

Table 8 (contd) **Estimated quantities (kg) of pesticide formulations used on edible protected crops in Northern Ireland, 2021.**

	Crop name					
Pesticide group and active substance	**Celery and parsley**	**Leafy and flowerhead brassicas**	**Lettuce**	**Onions and leeks**	**Other crops**	**Total**
Insecticides and acaricides						
Cyantraniliprole	.	0.12	.	.	.	0.12
Indoxacarb	.	.	0.19	.	.	0.19
Lambda-cyhalothrin	.	<0.05	<0.05	.	<0.05	<0.05
Spinosad	.	.	0.54	.	<0.05	0.55
Spirotetramat	.	0.27	0.56	.	<0.05	0.84
All insecticides and acaricides	**.**	**0.43**	**1.30**	**.**	**<0.05**	**1.75**
Biopesticides						
Bacillus subtilis	.	0.53	0.50	.	<0.05	1.06
Gliocladium catenulatum	0.33	0.99	0.63	0.73	1.71	4.40
All biopesticides	**0.33**	**1.53**	**1.13**	**0.73**	**1.74**	**5.46**
Molluscicides						
Ferric phosphate	.	.	1.11	.	.	1.11
All molluscicides	**.**	**.**	**1.11**	**.**	**.**	**1.11**
Seed treatments						
Fludioxonil	<0.05	<0.05	.	.	<0.05	0.05
Metalaxyl-M	.	<0.05	.	<0.05	<0.05	<0.05
All seed treatments	**<0.05**	**0.06**	**.**	**<0.05**	**<0.05**	**0.07**

Table 9: **The twenty three active ingredients most extensively used on edible protected crops in Northern Ireland, 2021 ranked by treated area (spha).**

No.	Active substance	Treated area (spha)
1	Propamocarb hydrochloride	16.63
2	Fludioxonil	15.65
3	Dimethomorph	12.13
4	Cyprodinil	12.12
5	*Bacillus subtilis*	11.66
6	Pyraclostrobin	11.24
7	Boscalid	11.24
8	Spirotetramat	11.24
9	Fosetyl-aluminium	10.72
10	*Gliocladium catenulatum*	9.54
11	Azoxystrobin	8.06
12	Spinosad	7.61
13	Ferric phosphate	7.50
14	Fenhexamid	7.50
15	Mandipropamid	7.50
16	Propyzamide	7.50
17	Indoxacarb	7.50
18	Fluopicolide	4.50
19	Lambda-cyhalothrin	4.20
20	Difenoconazole	4.11
21	Metalaxyl-M	2.95
22	Cyantraniliprole	1.01
23	Prothioconazole	0.38

Table 10: **The twenty-three active ingredients most extensively used on edible protected crops in Northern Ireland, 2021 ranked by weight (kg).**

No.	Active substance	Treated area (kg)
1	Propamocarb hydrochloride	112.43
2	Fosetyl-aluminium	33.45
3	Propyzamide	5.25
4	*Gliocladium catenulatum*	4.40
5	Boscalid	4.00
6	Fenhexamid	2.81
7	Cyprodinil	2.79
8	Dimethomorph	2.07
9	Azoxystrobin	2.01
10	Fludioxonil	1.91
11	Mandipropamid	1.13
12	Ferric phosphate	1.11
13	*Bacillus subtilis*	1.06
14	Pyraclostrobin	1.00
15	Spirotetramat	0.84
16	Spinosad	0.55
17	Difenoconazole	0.51
18	Fluopicolide	0.45
19	Indoxacarb	0.19
20	Cyantraniliprole	0.12
21	Prothioconazole	0.07
22	Lambda-cyhalothrin	0.04
23	Metalaxyl-M	0.01

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

	Reasons for treatment					
Pesticide group and active substance	**Altenaria**	**Botrytis**	**Seed Treatment**	**Total treated area (spha)**	**Basic treated area (ha)**	**Quantity applied (kg)**
Fungicides						
Azoxystrobin	0.36		.	0.36	0.36	0.09
All fungicides	**0.36**		**.**	**0.36**	**.**	**0.09**
Biopesticides						
Gliocladium catenulatum		0.17	.	0.17	0.17	0.33
All biopesticides		**0.17**	**.**	**0.17**	**.**	**0.33**
Seed treatments						
Fludioxonil	.	.	0.16	0.16	0.16	<0.05
All seed treatments	**.**	**.**	**0.43**	**0.43**	**.**	**<0.05**

Table 12: **Leafy and flowerhead brassicas: pesticide-treated area (spha), basic treated area (ha), quantity applied (kg) and reasons for use.**

	Reasons for treatment												
Pesticide group and active substance	**Altenaria**	**Botrytis**	**Damping off**	**Downy Mildew**	**Rhizoctonia**	**White Blister**	**Aphids**	**Cabbage Root Fly**	**Caterpillars**	**Seed Treatment**	**Total treated area (spha)**	**Basic treated area (ha)**	**Quantity applied (kg)**
Fungicides													
Boscalid/pyraclostrobin	.	.	.	.	.	3.60	.	.	.	.	3.60	3.60	1.20
Cyprodinil/fludioxonil	.	.	.	.	4.49	.	.	.	.	.	4.49	4.49	2.25
Difenoconazole	3.98	.	.	.	.	.	.	.	.	.	3.98	3.98	0.50
Dimethomorph	.	.	.	4.49	.	.	.	.	.	.	4.49	4.49	0.71
Fluopicolide/propamocarb hydrochloride	.	.	.	4.37	.	.	.	.	.	.	4.37	4.37	4.80
Fosetyl-aluminium/propamocarb hydrochloride	.	.	.	3.09	.	.	.	.	.	.	3.09	3.09	77.80
Propamocarb hydrochloride	.	.	.	1.41	.	.	.	.	.	.	1.41	1.41	50.73
All fungicides	**3.98**	**.**	**.**	**13.35**	**4.49**	**3.60**	**.**	**.**	**.**	**.**	**25.43**	**.**	**138.00**
Insecticides and acaricides													
Cyantraniliprole	.	.	.	.	.	.	.	1.01	.	.	1.01	1.01	0.12
Lambda-cyhalothrin	.	.	.	.	.	.	.	.	3.98	.	3.98	3.98	0.04
Spirotetramat	.	.	.	.	.	.	3.60	.	.	.	3.60	3.60	0.27
All insecticides and acaricides	**.**	**.**	**.**	**.**	**.**	**.**	**3.60**	**1.01**	**3.98**	**.**	**8.59**	**.**	**0.43**
Biopesticides													
Bacillus subtilis	.	.	3.98	.	.	.	.	.	.	.	3.98	3.98	0.53
Gliocladium catenulatum	.	0.52	.	.	.	.	.	.	.	.	0.52	0.52	0.99
All biopesticides	**.**	**0.52**	**3.98**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**4.49**	**.**	**1.53**
Seed treatments													
Fludioxonil	.	.	.	.	.	.	.	.	.	3.22	3.22	3.22	0.05
Metalaxyl-M	.	.	.	.	.	.	.	.	.	2.93	2.93	2.93	0.01
All seed treatments	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**6.15**	**44.66**	**.**	**0.06**

Table 13: **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**	**General Disease Control**	**Mildew**	**Sclerotinia**	**Ground Preparation**	**Aphids**	**Caterpillars**	**Thrips**	**Whitefly**	**Slugs**	**Total treated area (spha)**	**Basic treated area (ha)**	**Quantity applied (kg)**
Fungicides													
Azoxystrobin	.	0.19	.	7.50	.	.	.	.	.	.	7.69	7.69	1.92
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**	**.**	**22.76**
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	0.00
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**
Biopesticides													
Bacillus subtilis	7.50	.	.	.	.	.	.	.	.	.	7.50	7.50	0.50
Gliocladium catenulatum	7.58	.	.	.	.	.	.	.	.	.	7.58	7.58	0.63
All herbicides	**15.08**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**15.08**	**.**	**1.13**
Molluscicides													
Ferric phosphate	.	.	.	.	.	.	.	.	.	7.50	7.50	7.50	1.11
All molluscicides	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**		**7.50**	**7.50**	**.**	**1.11**

Table 14: **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	**Altenaria**	**Botrytis**	**Seed Treatment**	**Total treated area (spha)**	**Basic treated area (ha)**	**Quantity applied (kg)**
Fungicides						
Prothioconazole	0.38	.	.	0.38	0.38	0.07
All fungicides	**0.55**	**.**	**.**	**0.55**	**.**	**0.11**
Biopesticides						
Gliocladium catenulatum	.	0.38	.	0.38	0.38	0.73
All biopesticides	**.**	**0.38**	**.**	**0.38**	**.**	**0.73**
Seed treatments						
Metalaxyl-M	.	.	0.02	0.02	0.02	<0.01
All seed treatments	**.**	**.**	**0.02**	**0.02**	**.**	**<0.01**

Table 15: **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	**Altenaria**	**Botrytis**	**Damping off diseases**	**Downy Mildew**	**Rhizoctonia**	**White Blister**	**Cabbage Rootfly**	**Caterpillars**	**Aphids**	**Seed Treatment**	**Total treated area (spha)**	**Basic treated area (ha)**	**Quantity applied (kg)**
Fungicides													
Boscalid/pyraclostrobin	.	.	.	.	.	0.13	.	.	.	.	0.13	0.13	0.05
Cyprodinil/fludioxonil	.	.	.	.	0.13	.	.	.	.	.	0.13	0.08	0.06
Difenoconazole	0.13	.	.	.	.	.	.	.	.	.	0.13	0.13	0.02
Dimethomorph	.	.	.	0.13	.	.	.	.	.	.	0.13	0.13	0.01
Fluopicolide/propamocarb hydrochloride	.	.	.	0.13	.	.	.	.	.	.	0.13	0.13	0.15
Fosetyl-aluminium/propamocarb hydrochloride	.	.	.	0.13	.	.	.	.	.	.	0.13	0.13	3.40
All fungicides	**0.13**	**.**	**.**	**0.40**	**0.13**	**0.13**	**.**	**.**	**.**	**.**	**0.80**	**.**	**3.68**
Insecticides and acaricides													
Lambda-cyhalothrin	.	.	.	.	.	.	.	0.03	.	.	0.03	0.03	0.00
Spinosad	.	.	.	.	.	.	0.11	.	.	.	0.11	0.11	0.01
Spirotetramat	.	.	.	.	.	.	.	.	0.13	.	0.13	0.13	0.01
All insecticides and acaricides	**.**	**.**	**.**	**.**	**.**	**.**	**0.11**	**0.03**	**0.13**	**.**	**0.27**	**.**	**0.02**
Biopesticides													
Bacillus subtilis	.	.	0.19	.	.	.	.	.	.	.	0.19	0.19	0.02
Gliocladium catenulatum	.	0.89	.	.	.	.	.	.	.	.	0.89	0.89	1.71
All biopesticides	**.**	**0.89**	**0.19**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**1.08**	**.**	**1.74**
Seed treatments													
Fludioxonil	.	.	.	.	.	.	.	.	.	0.15	0.15	0.15	<0.01
Metalaxyl-M	.	.	.	.	.	.	.	.	.	<0.01	<0.01	0.00	<0.01
All seed treatments	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**0.15**	**0.15**	**.**	**<0.01**

Table 16: **Comparison of the area of edible protected crops grown (ha) in Northern Ireland 2015-2021, by crop group and county.**

	County															
	Antrim				Armagh				Down				Northern Ireland			
Crop group	2015	2017	2019	2021	2015	2017	2019	2021	2015	2017	2019	2021	2015	2017	2019	2021
Beans	.	.	0.22	.	.	.	.	.	.	.	0.06	0.12	.	.	0.28	0.12
Carrots	.	.	.	.	.	.	.	.		.	0.04	0.09	.	.	0.04	0.09
Celery and parsley	0.61	0.72	0.22	.	0.66	0.83	.	.	0.18	0.21	0.38	0.69	1.45	1.77	0.61	0.70
Leafy and flowerhead brassicas	.	.	<0.10	.	0.59	.	.	.	2.49	2.67	3.89	4.49	3.08	2.67	3.89	4.49
Lettuce	3.54	.	0.19	0.20	6.07	13.84	8.40	8.40	.	0.17	.	0.08	9.61	14.02	8.59	8.68
Onions and Leeks	0.68	0.49	0.13	.	.	.	.	.	0.53	0.33	0.53	0.65	1.21	0.81	0.66	0.65
Other crops	.	0.91	0.15	0.30	.	0.09	.	0.04	0.03	0.17	0.70	1.11	0.03	1.18	0.85	1.43
Tomatoes	12.55	2.08	0.40	.	.	0.10	.	0.04	7.07	4.17	0.77	0.79	19.62	6.34	1.17	0.83
All crops	**17.38**	**4.20**	**1.33**	**0.49**	**7.32**	**14.86**	**8.40**	**8.48**	**10.31**	**7.72**	**6.37**	**8.02**	**35.00**	**26.78**	**16.10**	**16.99**

Table 17: Comparison of pesticide usage on edible protected crops 2015-2021, total area treated (spha) with main pesticide groups and quantities (kg) of active ingredient used.

	2015		2017		2019		2021	
Pesticide group	(spha)	(kg)	(spha)	(kg)	(spha)	(kg)	(spha)	(kg)
Fungicides	13.85	21.44	107.92	65.44	69.74	91.62	79.66	164.60
Herbicides	1.49	1.97	.	.	8.78	7.21	7.50	5.25
Insecticides and acaricides	8.26	141.41	49.19	146.62	33.01	7.32	31.56	1.75
Biopesticides	2.12	0.68	29.88	2.27	19.59	1.63	21.20	5.46
Growth regulators	.	.	.	.	0.27	0.13	.	.
Molluscicides	.	.	.	.	7.50	1.11	7.50	1.11
Seed treatments	13.21	0.85	7.50	7.08	5.01	0.34	6.48	0.07
Total	**38.92**	**166.34**	**194.48**	**221.42**	**143.91**	**109.35**	**153.90**	**178.23**

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

290	Top Fruit Crops 2018	1-83887-066-9
293	Outdoor Vegetable Crops 2019	1-908471-15-4
294	Edible Protected Crops 2019	1-908471-16-1
299	Arable Crops 2020	1-908471-19-2
300	Soft Fruit Crops 2020	1-908471-21-5
301	Top Fruit Crops 2020	1-908471-20-8
306	Outdoor Vegetable Crops 2021	1-908471-26-0
308	Grassland & Fodder Crops 2017	1-908471-25-3

ISBN 1-908471-27-7

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