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PESTICIDE USAGE SURVEY REPORT 276

SOFT FRUIT CROPS IN NORTHERN IRELAND 2016

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The County Regions of Northern Ireland

SUMMARY

This report presents information from a survey of pesticide usage practices on soft fruit crops in Northern Ireland in 2016. Data were collected from 7 growers representing 29% of all soft fruit holdings in Northern Ireland. Quantitative data has been adjusted to provide estimates of total pesticide usage. A survey of the total population was not possible due to non-participation of growers.

Soft fruit 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.

Compared with the previous survey, carried out in 2014, the total area of soft fruit crops grown decreased by 9% to approximately 15 hectares and the area treated with pesticides (spray hectares) decreased by 72%.

A total of 23 kilograms of pesticides were applied to 36 spray hectares of soft fruit crops in 2016. Strawberries were the most commonly produced soft fruit (protected, semi-protected and non-protected), with 17 kilograms of pesticides being applied to 27 spray hectares. This represented 76% of the total pesticide-treated area and 73% of the total quantity of pesticides applied.

Fungicide usage decreased by 84% compared with 2014. Fungicides were applied to 38% of the total pesticide-treated area, representing 36% of the total weight of pesticides used in 2016. Fenhexamid and iprodione were the fungicides applied to the largest area and were also the most frequently used fungicides by weight applied. Grey mould (*Botrytis cinerea*) and powdery mildew (*Podosphaera aphanis*) were the main reasons given for fungicide use on strawberries.

Herbicide usage increased by an estimated 51% compared with 2014. Herbicide active ingredients were applied to 46% of the total pesticide-treated area (56% of the total weight of pesticides used) with glyphosate and propyzamide both accounting for 32% of the herbicide-treated area. Glyphosate, however, accounted for only 7% of the weight of herbicides applied.

Insecticide and acaricide usage, which increased by 110% in 2014 when compared with 2012, decreased by 79% in 2016. Insecticide and acaricide active ingredients accounted for 16% of the total pesticide-treated area and 8% of the total weight of pesticides applied in 2016. The selective insecticide and acaricide abamectin was the most frequently applied active substance, primarily on strawberries, replacing thiacloprid as the most commonly used insecticide/acaricide type. Aphids were the primary reason for insecticide/acaricide use during this survey period.

Biopesticides were applied to <1% of the treated area in 2016, compared with 1% in 2014. Applications were to control grey mould (*Botrytis cinerea*) and caterpillars, with *Bacillus subtilis and Bacillus thuringiensis* respectively the only biopesticides used.

There were no molluscicides or 'other products' (derived completely from natural ingredients but not classified as 'plant protection products') recorded as used on soft fruit during this survey period.

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. 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. In addition, Regulation (EC) No. 1185/2009 also requires data delivery on agricultural use of pesticides.

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)

This is the sixth survey of pesticide usage on soft fruit crops in Northern Ireland. Results from the previous surveys, which reported on pesticide usage practices on soft fruit crops in 1990 (Kidd *et al*; 1994), 1998 (Kearns *et al*; 2002), 2006 (Kearns *et al*; 2008), 2010 (Lavery *et al*, 2011), 2012 (Lavery *et al*, 2013) and 2014 (Lavery *et al*, 2015) are included in the report for comparative purposes.

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

Soft fruit grown under permanent protection (glasshouse and polythene tunnel), outdoors under semi-protection (Spanish tunnels) and in the field without any protection were recorded in this survey.

The soft fruit industry in Northern Ireland has continually decreased in size from an estimated 75 hectares in 1990 to approximately 15 hectares in 2016. Of all soft fruit crops grown, 4% were grown under permanent protection, 29% were grown under semi-protection and the remaining 67% had no protection (Figure 3). Reports prior to 2010 combined protected and semi-protected crops.

The crop types recorded in this survey (area grown in hectares) were strawberries (8.9 ha) and 'other crops' (2.7 ha). 'Other crops' refer to raspberries, blueberries, gooseberries, blackcurrants, redcurrants and tayberries.

The principal pests and diseases recorded were aphids, spider mites (*Tetranychus urticae*), grey mould (*Botrytis cinerea*), strawberry powdery mildew (*Podosphaera aphanis*) and blackspot (Colletotrichum acutatum).

Due to the very small area of soft fruit crops grown in Northern Ireland, the limited pesticide input and the issues associated with estimating pesticide use, this report will 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

Using the Northern Ireland Agricultural Census, June 2015 (Anon; 2016), Single Farm Payment data (unpublished) and details of growers from previous surveys, the population of soft fruit growers was established and holdings to be surveyed selected. A preliminary letter was sent to growers explaining the purpose of the survey. Of a possible 24 growers, 9 participated in the survey. Information from 2 holdings was considered to be unreliable and has not been used in the analyses. Growers were visited during March and April 2016 and data relating to pesticide usage were collected by either personal or telephone interview. This survey covers the period from September 2015 to September 2016. The growers' stated reasons for pesticide use were also included, but may not always be appropriate.

DEFINITIONS AND NOTES

- 'Total grown area' refers to the actual planted area of crop, and is referred to in hectares (ha).
- 'Basic-treated area' refers to the actual planted area of crop which was treated with at least one pesticide application, and is referred to in hectares (ha).
- 'Total-treated area' refers to all applications made to the 'basic-treated area', including all repeat applications, and is referred to in spray hectares (spha).
- 'Protected crops' refers to all crops grown under permanent protection, i.e. glasshouse or polythene tunnel, for the entire duration of their production cycle.
- 'Semi-protected crops' refers to all crops grown outdoors which were covered at various times during production with Spanish tunnels.
- 'Non-protected crops' refers to all crops grown outdoors in field conditions without any protection during their production cycle.
- 'Reasons for use'; the reasons reported for the use of pesticides are the growers' stated reasons for use and may sometimes not reflect label recommendations.
- Some treatments to soft fruit are restricted to the plants or to the ground between them. For the purposes of this report, where a field or crop is referred to, it is assumed the entire field / area was treated with the exception of herbicide usage where 40% of the total area treated for all crops is accounted for by the inter-row area within these crops.
- 'Rounding'; due to rounding of figures, there may be slight differences in totals both within and between tables.
- 'Biopesticides' are recorded by area treated (spha) only, as they are applied in units other than weight or volume (e.g. million per hectare) and this does not translate readily into a conventional weight.
- 'Other crops' refers to raspberries, blueberries, gooseberries, blackcurrants, redcurrants and tayberries.

TRENDS

Figure 1 **Changes in the area (ha) of soft fruit crops grown in Northern Ireland, 1990-2016.**

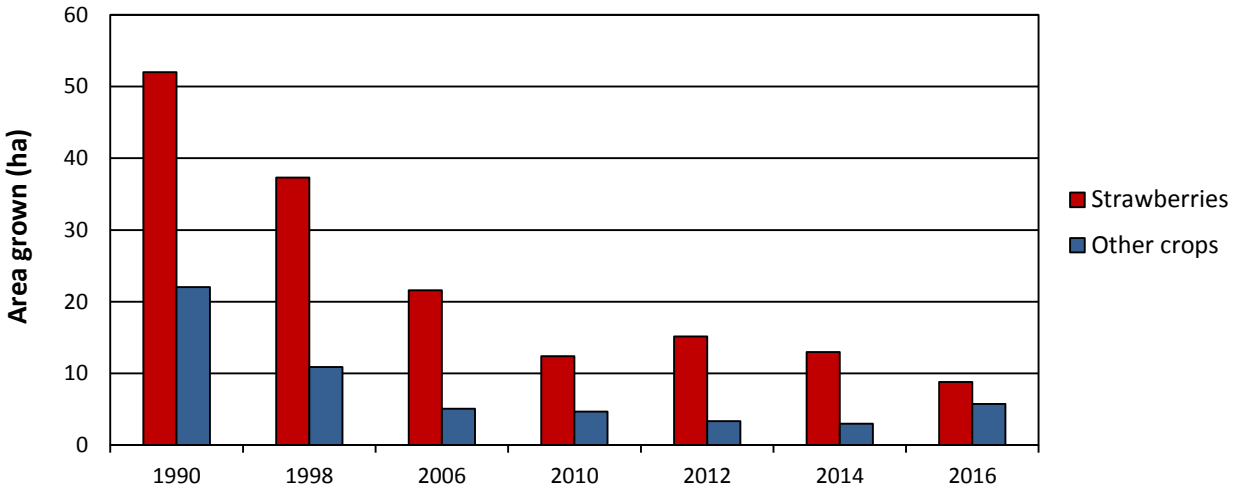
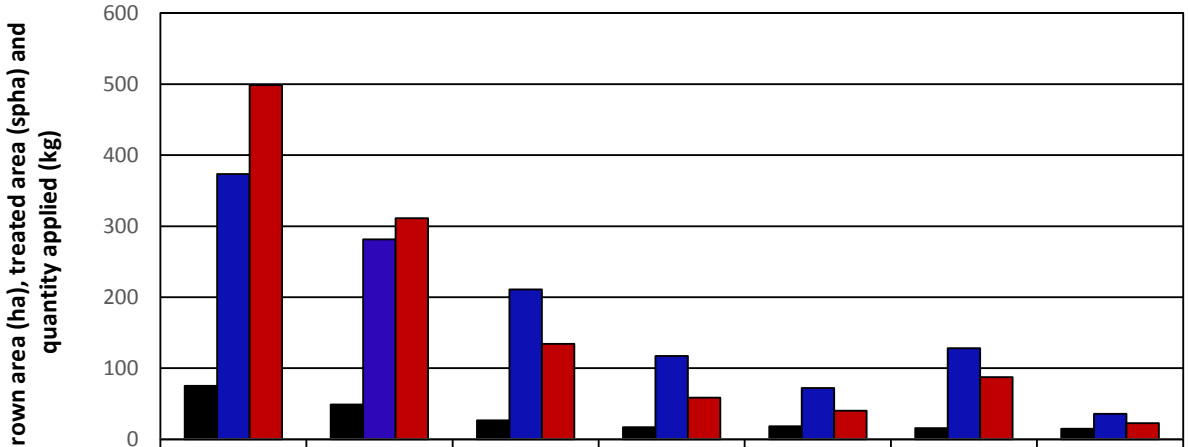


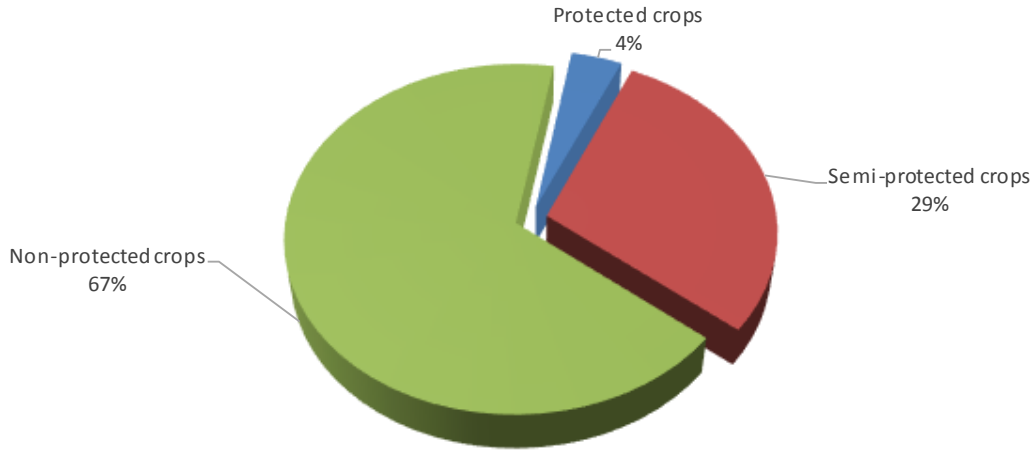
Figure 2 **Changes in the overall grown area (ha), pesticide-treated area (spha) and the total quantity (kg) of active ingredient applied to soft fruit crops in Northern Ireland, 1990-2016**



	1990	1998	2006	2010	2012	2014	2016
ha	74.99	48.73	26.67	17.09	18.48	15.64	14.57
spha	373.31	281.6	210.94	117.27	71.97	128.20	35.89
kg	498.55	311.4	134.19	58.39	40.38	87.60	22.79

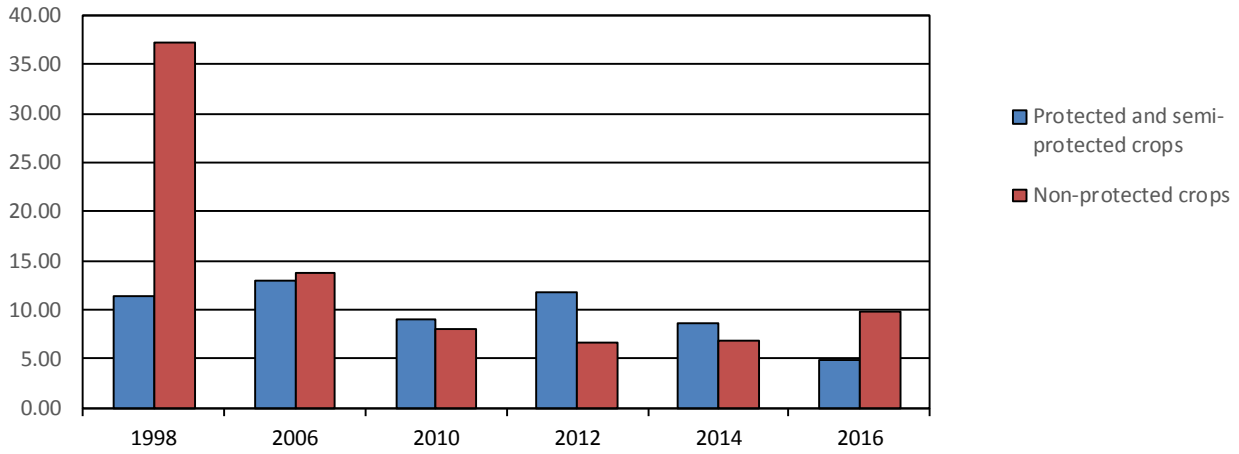
CROP DISTRIBUTION

Figure 3 **Proportion (%) of soft fruit crops grown in Northern Ireland, 2016 by method of protection.**



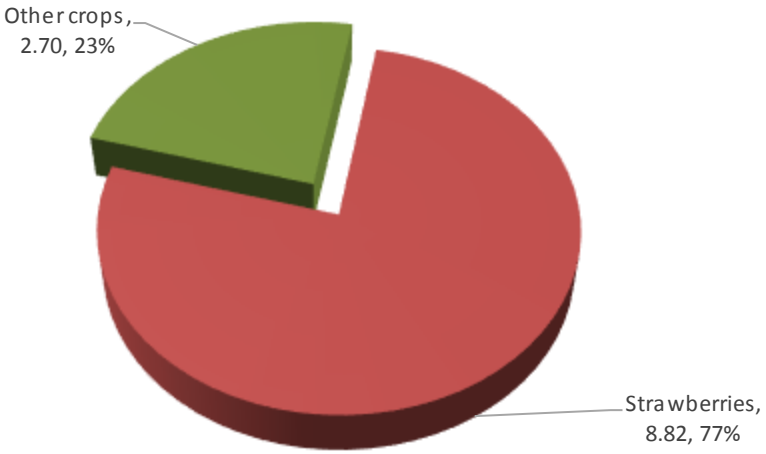
Method of protection	*Estimated cropping area of soft fruit (ha)*
Protected crops	0.57
Semi-protected crops	4.23
Non-protected crops	9.77

Figure 4 **Changes in method of protection used for soft fruit crops between 1998 and 2016.**



Method of protection	*1998 (ha)*	*2006 (ha)*	*2010 (ha)*	*2012 (ha)*	*2014 (ha)*	*2016 (ha)*
Protected and semi-protected crops	11.37	12.99	9.03	11.77	8.70	4.80
Non-protected crops	37.36	13.69	8.06	6.72	6.90	9.77

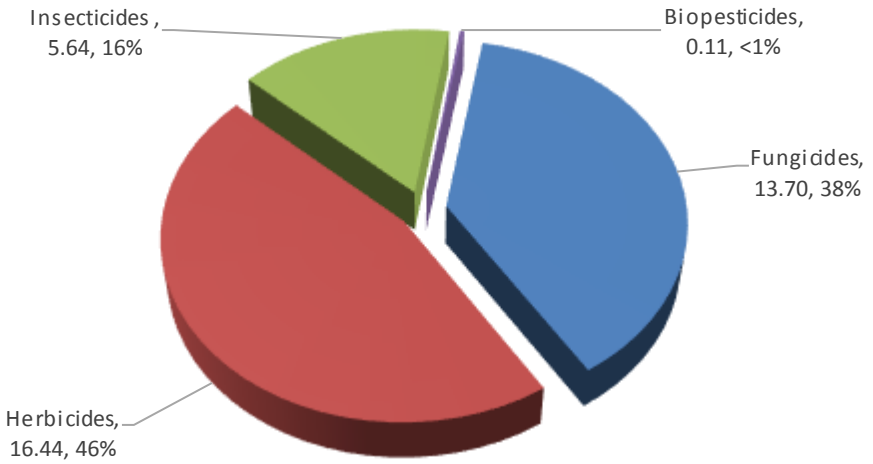
Figure 5 **Utilisation of soft fruit production area in Northern Ireland, 2016.**



Crop	Estimated cropping area of soft fruit (ha)
Strawberries	8.82
Other crops	2.70

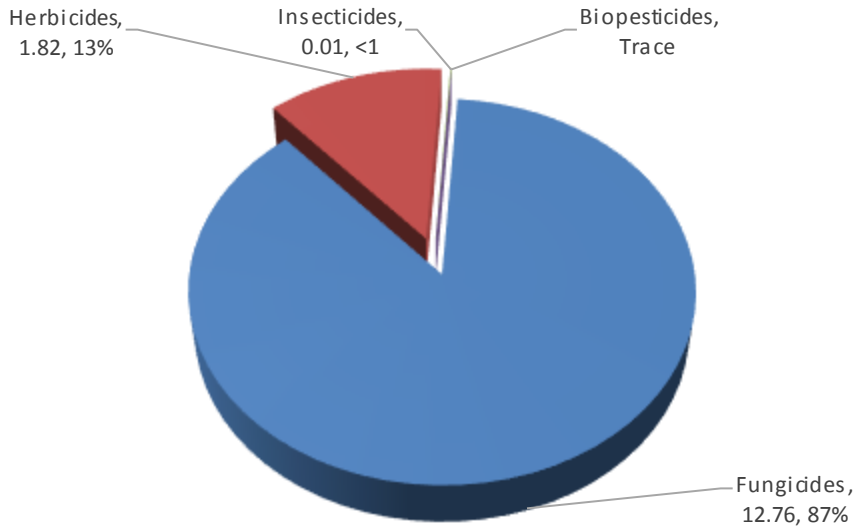
PESTICIDE USAGE ON CROPS

Figure 6 **Proportional area (% spha) of soft fruit crops treated with each pesticide type in Northern Ireland, 2016.**



	Fungicides	Herbicides	Insecticides	Biopesticides
Treated area (spha)	**13.70**	**16.44**	**5.64**	**0.11**

Figure 7 **Proportion (%) of soft fruit crops treated with each pesticide type by weight (kg) in Northern Ireland, 2016.**



	Fungicides	Herbicides	Insecticides	Biopesticides
Quantity applied (kg)	12.76	1.82	0.01	Trace

Figure 8 **Total area (spha) of soft fruit crops treated with fungicide active ingredients in Northern Ireland, 2016.**

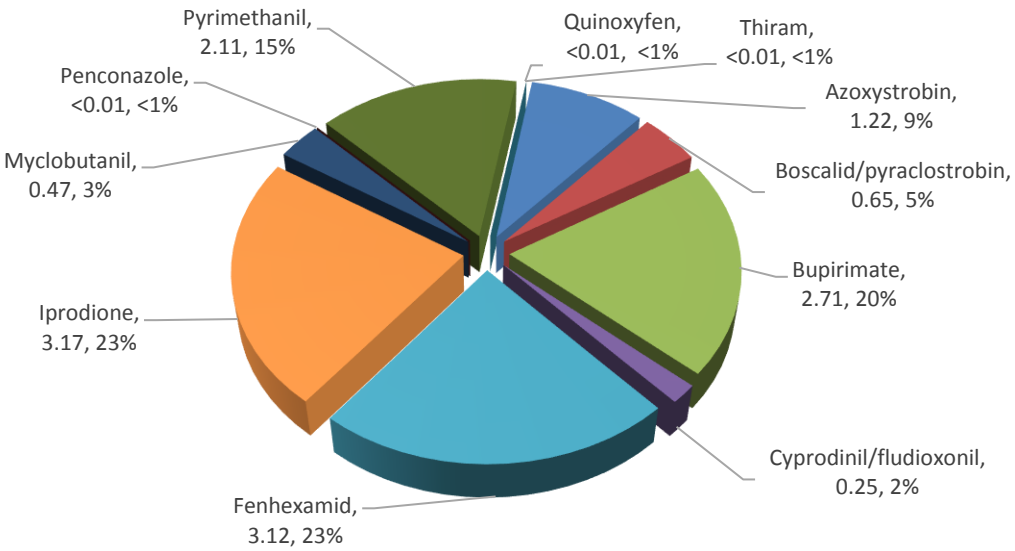


Figure 9 **Total quantity (kg) of fungicide active ingredients applied to soft fruit crops in Northern Ireland, 2016.**

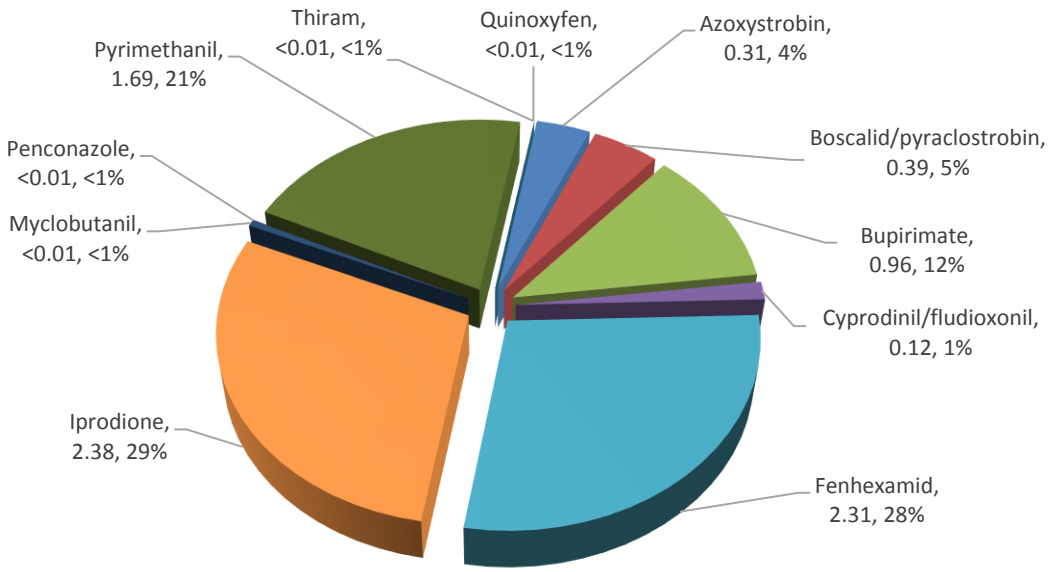


Figure 10 **Total area (spha) of soft fruit crops treated with herbicide active ingredients in Northern Ireland, 2016.**

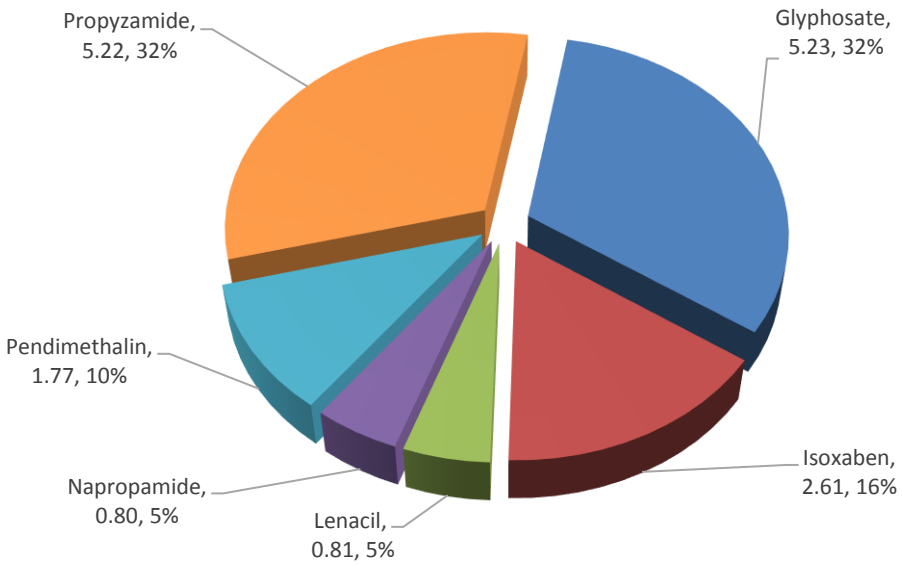


Figure 11 **Total quantity (kg) of herbicide active ingredients applied to soft fruit crops in Northern Ireland, 2016.**

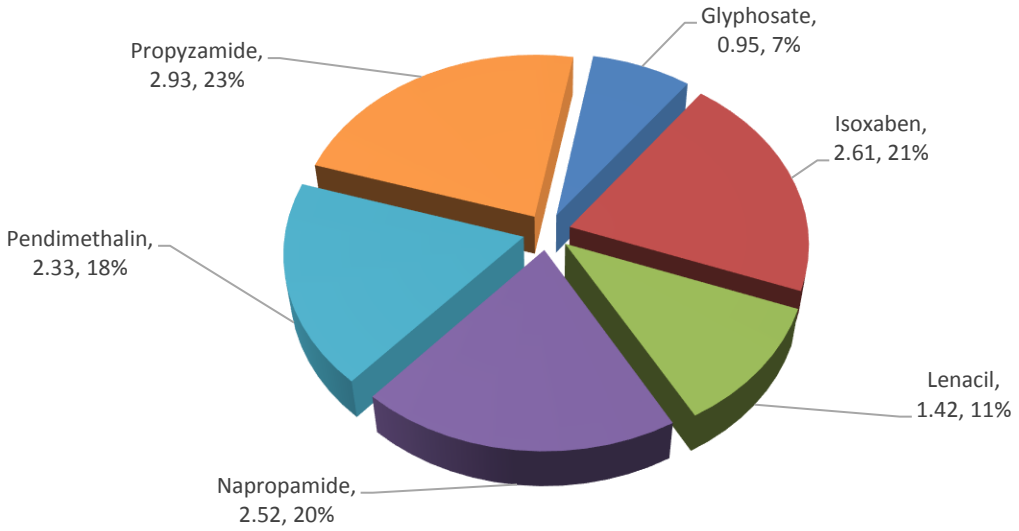


Figure 12 **Total area (spha) of soft fruit crops treated with insecticide active ingredients in Northern Ireland, 2016.**

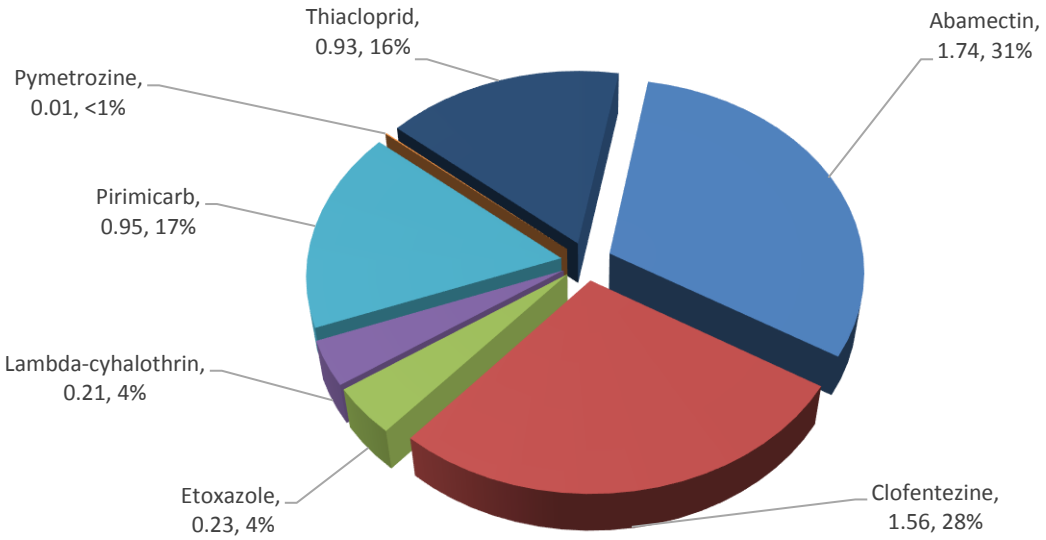


Figure 13 **Total quantity (kg) of insecticide active ingredients applied to soft fruit crops in Northern Ireland, 2016.**

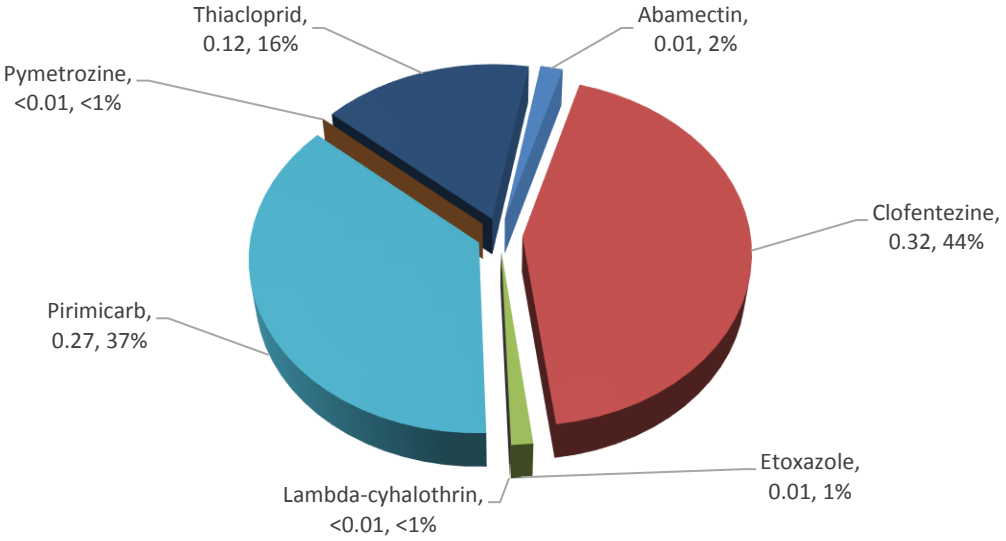


Figure 14: **Strawberries (protected): Reasons for use (spha)**

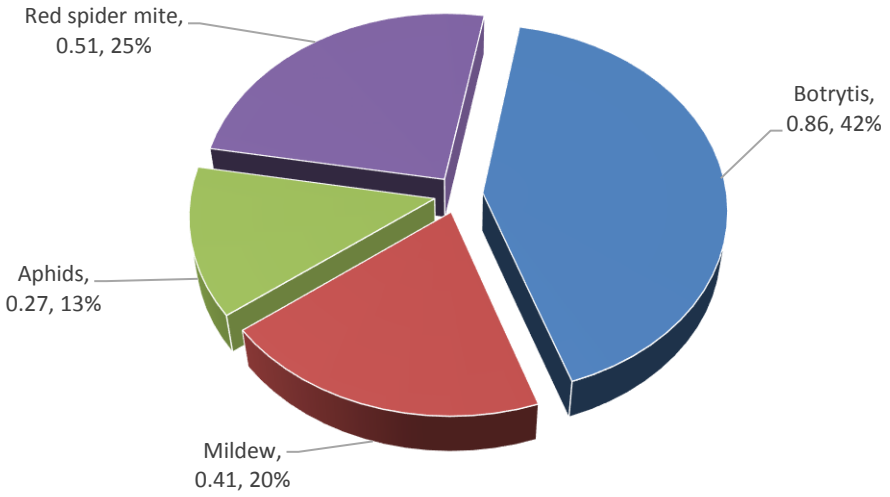


Figure 15: **Strawberries (semi-protected): Reasons for use (spha)**

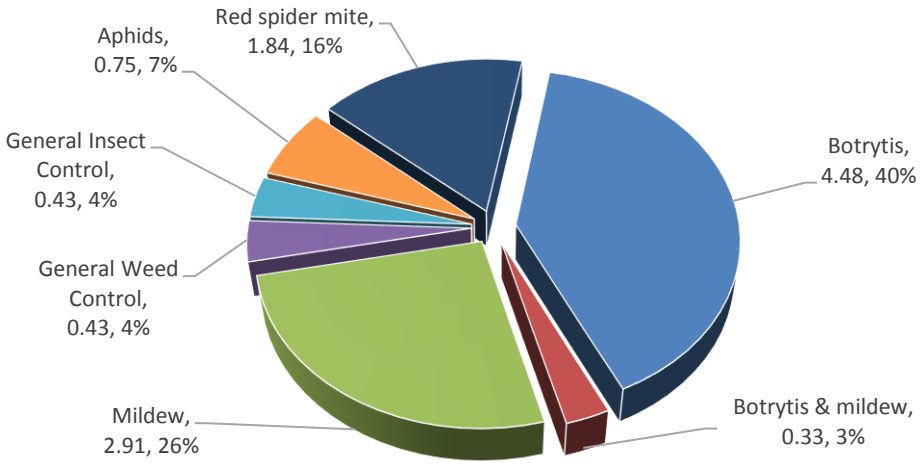


Figure 16: Strawberries (non-protected): Reasons for use (spha)

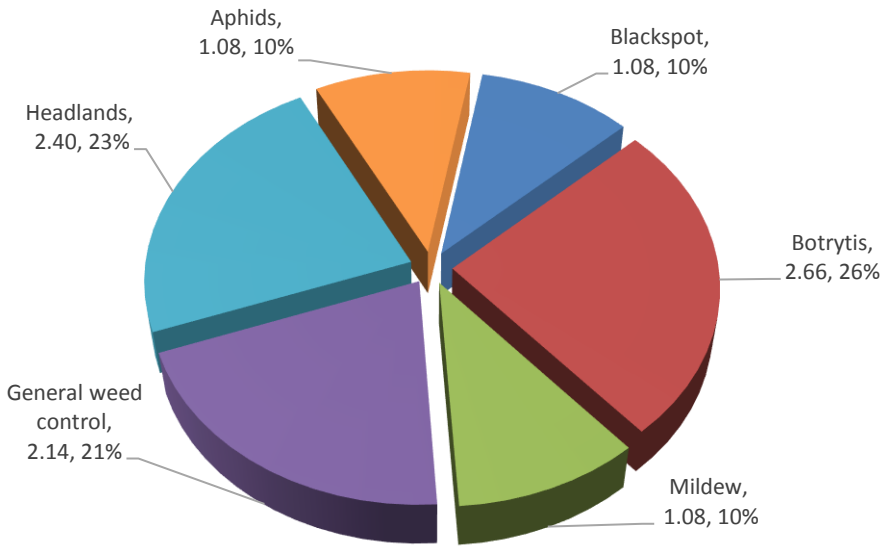


Figure 17: Other crops (protected and non-protected): Reasons for use (spha)

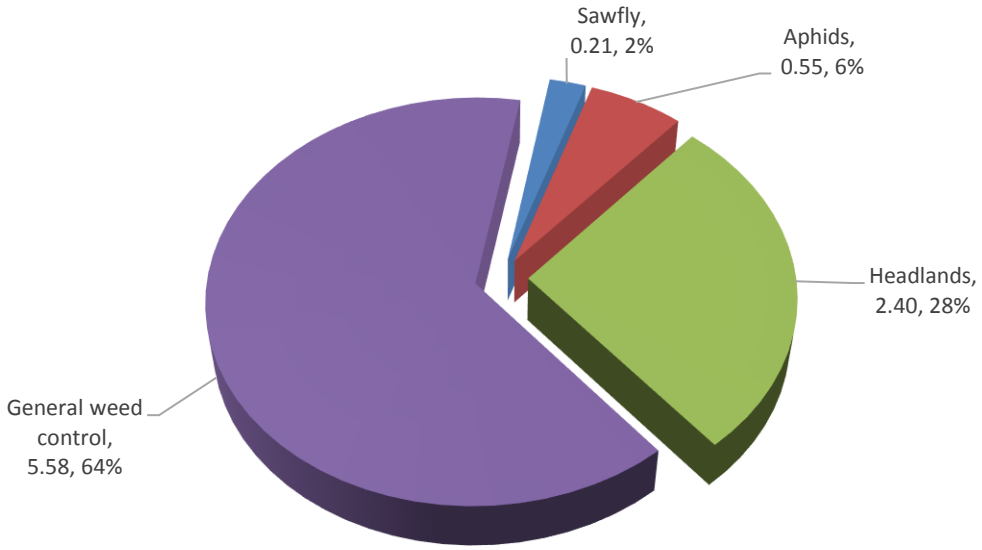


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Table 1 Number of holdings and area (ha) of soft fruit crops sampled in Northern Ireland, 2016.

Region	Total number of holdings	Number of holdings sampled	Area of holding sampled (ha)	Raised area of population (ha)
Northern Ireland	**24**	**9**	**4.86**	**14.57**

Table 2 Number and area (ha) of soft fruit crops surveyed in Northern Ireland, 2016.

Crop type and crop location	No. of crops Surveyed	Surveyed area (ha)
Strawberries permanent protection	8	0.22
Strawberries semi-protection	2	1.59
Strawberries field-grown	4	1.21
Other crops semi-protection	1	<0.01
Other crops field-grown	9	1.86
All crops	**24**	**4.86**

Table 3 Estimated area (ha) of soft fruit crops grown in Northern Ireland, 2016, by method of protection.

	Method of protection			
Crop Type	Protected crops	Semi-protected crops	Non-protected crops	Total
Strawberries	0.57	4.23	4.02	8.82
Other crops	.	0.01	5.75	2.70
All crops	**0.57**	**4.23**	**9.77**	**14.57**

Table 4 **Basic-treated area (ha) and the total-treated area (spha) of soft fruit crops in Northern Ireland, 2016 treated with each pesticide type.**

Method of protection and crop type	Fungicides		Herbicides		Insecticides and acaricides		Biopesticides		All pesticides	
	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)
Protected										
Strawberries	0.14	1.27	.	.	0.14	0.78	.	.	0.14	2.05
Other crops	.	.	.	.	0.27	0.54	.	.	0.27	0.54
All protected	**0.14**	**1.27**	**.**	**.**	**0.41**	**1.32**	**.**	**.**	**0.41**	**2.59**
Semi-protected										
Strawberries	2.11	7.61	0.43	0.43	1.40	3.02	0.11	0.11	2.11	11.17
Other crops	.	.	0.96	0.96	0.11	0.22	<0.01	<0.01	0.96	1.18
All semi-protected	**2.11**	**7.61**	**1.39**	**1.39**	**1.51**	**3.24**	**0.11**	**0.11**	**2.11**	**12.35**
Non-protected										
Strawberries	1.87	4.82	2.68	8.03	1.08	1.08	.	.	2.68	13.93
Other crops	.	.	1.54	7.02	.	.	.	.	1.54	7.02
All non-protected	**1.87**	**4.82**	**4.22**	**15.05**	**1.08**	**4.87**	**.**	**.**	**4.22**	**20.95**
All crops										
Strawberries	4.12	13.70	3.11	8.46	2.62	4.88	0.11	0.11	4.12	27.15
Other crops	.	.	2.50	7.98	0.38	0.76	<0.01	<0.01	2.50	8.74
Total	**4.12**	**13.70**	**5.61**	**16.44**	**3.00**	**5.64**	**0.11**	**0.11**	**6.62**	**35.89**

Table 5 **Total quantity (kg) of pesticide type applied to soft fruit crops in Northern Ireland, 2016.**

Method of protection and crop type	Fungicides (kg)	Herbicides (kg)	Insecticides and acaricides (kg)	Biopesticides (kg)	All pesticides (kg)
Protected					
Strawberries	0.71	.	0.13	.	0.85
Other crops	.	.	0.12	.	0.12
All Protected	**0.71**	**.**	**0.25**	**.**	**0.96**
Semi-protected					
Strawberries	4.41	0.26	0.48	0.01	5.17
Other crops	.	1.27	.	<0.01	1.27
All semi-protected	**4.41**	**1.52**	**0.48**	**0.01**	**6.43**
Non-protected					
Strawberries	3.07	7.63	0.01	.	10.71
Other crops	.	3.61	.	.	3.61
All non-protected	**3.07**	**11.24**	**0.01**	**.**	**14.32**
All locations					
Strawberries	8.20	7.88	0.62	Trace	16.70
Other crops	.	4.88	1.20	Trace	6.08
All crops	**8.20**	**12.76**	**1.82**	**Trace**	**22.78**

Table 6 **The mean number of spray applications to soft fruit crops in Northern Ireland, 2016.**

Crop type	Fungicides sp app.	Herbicides sp app.	Insecticides and acaricides sp app.	Biopesticides sp app.	All pesticides sp app.
Strawberries	4.86	1.75	3.00	1.00	3.42
Blackcurrant	.	2.00	.	.	2.00
Blueberry	.	.	2.00	.	2.00
Gooseberry	.	1.67	2.00	.	1.75
Raspberry	.	1.67	2.00	1.00	1.60
Red currant	.	2.00	.	.	2.00
Tayberry	.	2.00	.	.	2.00
All crops	**4.86**	**1.80**	**2.77**	**1.00**	**2.90**

Table 7 **Estimated area (spha) of soft fruit crops treated with pesticide active ingredients in Northern Ireland, 2016.**

	Crop type		
Pesticide group & active ingredient	**Strawberries**	**Other crops**	**Total treated area (spha)**
Fungicides			
Azoxystrobin	1.22	.	1.22
Boscalid/pyraclostrobin	0.65	.	0.65
Bupirimate	2.71	.	2.71
Cyprodinil/fludioxonil	0.25	.	0.25
Fenhexamid	3.12	.	3.12
Iprodione	3.17	.	3.17
Myclobutanil	0.47	.	0.47
Penconazole	<0.01	.	<0.01
Pyrimethanil	2.11	.	2.11
Quinoxyfen	<0.01	.	<0.01
Thiram	<0.01	.	<0.01
All fungicides	**13.70**	**.**	**13.70**

Table 7 (cont) **Estimated area (spha) of soft fruit crops treated with pesticide active ingredients in Northern Ireland, 2016.**

	Crop type		
Pesticide group & active ingredient	**Strawberries**	**Other crops**	**Total treated area (spha)**
Herbicides			
Glyphosate	2.83	2.40	5.23
Isoxaben	1.07	1.54	2.61
Lenacil	0.81	.	0.81
Napropamide	0.80	.	0.80
Pendimethalin	0.81	0.96	1.77
Propyzamide	2.14	3.08	5.22
All herbicides	**8.46**	**7.98**	**16.44**
Insecticides and acaricides			
Abamectin	1.74	.	1.74
Clofentezine	1.56	.	1.56
Etoxazole	0.23	.	0.23
Lambda-cyhalothrin	.	0.21	0.21
Pirimicarb	0.68	0.27	0.95
Pymetrozine	<0.01	0.01	0.01
Thiacloprid	0.66	0.27	0.93
All insecticdes and acaricides	**4.87**	**0.76**	**5.63**

Table 7 (cont) **Estimated area (spha) of soft fruit crops treated with pesticide active ingredients in Northern Ireland, 2016.**

	Crop type		
Pesticide group & active ingredient	**Strawberries**	**Other crops**	**Total treated area (spha)**
Biopesticides			
B.thuringiensis	.	<0.01	<0.01
Bacillus subtilis	0.11	.	0.11
All biopesticides	**0.11**	**<0.01**	**0.11**
All pesticides	**27.14**	**8.74**	**35.88**

Table 8 **Estimated quantities (kg) of pesticide active ingredients applied to soft fruit crops in Northern Ireland, 2016.**

	Crop type		
Pesticide group & active ingredient	**Strawberries**	**Other crops**	**Total quantity applied (kg)**
Fungicides			
Azoxystrobin	0.31	.	0.31
Boscalid/pyraclostrobin	0.39	.	0.39
Bupirimate	0.96	.	0.96
Cyprodinil/fludioxonil	0.12	.	0.12
Fenhexamid	2.31	.	2.31
Iprodione	2.38	.	2.38
Myclobutanil	0.04	.	0.04
Penconazole	<0.01	.	<0.01
Pyrimethanil	1.69	.	1.69
Quinoxyfen	<0.01	.	<0.01
Thiram	<0.01	.	<0.01
All fungicides	**8.20**	**.**	**8.20**

Table 8 (cont) **Estimated quantities (kg) of pesticide active ingredients applied to soft fruit crops in Northern Ireland, 2016.**

	Crop type		
Pesticide group & active ingredient	**Strawberries**	**Other crops**	**Total quantity applied (kg)**
Herbicides			
Glyphosate	0.60	0.35	0.95
Isoxaben	1.07	1.54	2.61
Lenacil	1.42		1.42
Napropamide	2.52		2.52
Pendimethalin	1.07	1.27	2.33
Propyzamide	1.20	1.72	2.93
All herbicides	**7.88**	**4.88**	**12.76**
Insecticides and acaricides			
Abamectin	0.01		0.01
Clofentezine	0.32		0.32
Etoxazole	0.01		0.01
Lambda-cyhalothrin		0.00	0.00
Pirimicarb	0.19	0.08	0.27
Pymetrozine	<0.01	0.00	0.00
Thiacloprid	0.08	0.04	0.12
All insecticdes and acaricides	**0.62**	**0.12**	**0.75**

Table 8 (cont) **Estimated quantities (kg) of pesticide active ingredients applied to soft fruit crops in Northern Ireland, 2016.**

	Crop type		
Pesticide group & active ingredient	**Strawberries**	**Other crops**	**Total quantity applied (kg)**
Biopesticides			
B.thuringiensis		Trace	Trace
Bacillus subtilis	Trace		Trace
All biopesticides	**Trace**	**Trace**	**Trace**
All pesticides	**16.72**	**5.00**	**21.72**

Table 9 **The active ingredients most extensively used on soft fruit crops in Northern Ireland, 2016 ranked by treated area (spha).**

No.	Active ingredient	Treated area (spha)
1	Glyphosate	5.23
2	Propyzamide	5.22
3	Iprodione	3.17
4	Fenhexamid	3.12
5	Bupirimate	2.71
6	Isoxaben	2.61
7	Pyrimethanil	2.11
8	Pendimethalin	1.77
9	Abamectin	1.74
10	Clofentezine	1.56
11	Azoxystrobin	1.22
12	Pirimicarb	0.95
13	Thiacloprid	0.93
14	Lenacil	0.81
15	Napropamide	0.80
16	Boscalid/pyraclostrobin	0.65
17	Myclobutanil	0.47
18	Cyprodinil/fludioxonil	0.25
19	Etoxazole	0.23
20	Lambda-cyhalothrin	0.21
21	*Bacillus subtilis*	0.11
22	Pymetrozine	0.01
23	*B.thuringiensis*	<0.01
24	Penconazole	<0.01
25	Quinoxyfen	<0.01
26	Thiram	<0.01

Table 10 **The active ingredients most extensively used on soft fruit crops in Northern Ireland, 2016 ranked by weight (kg).**

No.	Active ingredient	Quantity applied (kg)
1	Propyzamide	2.93
2	Isoxaben	2.61
3	Napropamide	2.52
4	Iprodione	2.38
5	Pendimethalin	2.33
6	Fenhexamid	2.31
7	Pyrimethanil	1.69
8	Lenacil	1.42
9	Bupirimate	0.96
10	Glyphosate	0.95
11	Boscalid/pyraclostrobin	0.39
12	Clofentezine	0.32
13	Azoxystrobin	0.31
14	Pirimicarb	0.27
15	Cyprodinil/fludioxonil	0.12
16	Thiacloprid	0.12
17	Myclobutanil	0.04
18	*Bacillus subtilis*	Trace
19	Abamectin	0.01
20	Etoxazole	0.01
21	Lambda-cyhalothrin	<0.01
22	*B.thuringiensis*	Trace
23	Pymetrozine	<0.01
24	Penconazole	<0..01
25	Quinoxyfen	<0.01
26	Thiram	<0.01

Table 11 **Strawberries (protected): Reason for use, total cropping area (ha), total-treated area (spha), basic-treated area (ha), percentage of cropping area treated and quantity applied (kg).**

	Reason for treatment					
Pesticide group & active ingredient	**Aphids**	***Botrytis***	**Mildew**	**Red spider mite**	**Total treated area (spha)**	**Quantity applied (kg)**
Fungicides						
Azoxystrobin	.	.	0.14	.	0.14	0.04
Bupirimate	.	.	0.12	.	0.12	0.05
Cyprodinil/fludioxonil	.	0.25	.	.	0.25	0.12
Fenhexamid	.	0.25	.	.	0.25	0.15
Iprodione	.	0.37	.	.	0.37	0.33
Myclobutanil	.	.	0.14	.	0.14	0.02
All fungicides	**.**	**0.86**	**0.41**	**.**	**1.27**	**0.71**
Insecticides and acaricides						
Abamectin	.	.	.	0.12	0.12	0.00
Clofentezine	.	.	.	0.27	0.27	0.06
Etoxazole	.	.	.	0.12	0.12	0.01
Pirimicarb	0.14	.	.	.	0.14	0.04
Thiacloprid	0.12	.	.	.	0.12	0.02
All insecticides and acaricides	**0.27**	**.**	**.**	**0.51**	**0.78**	**0.13**

Table 12 **Strawberries (semi-protected): Reason for use, total grown area (ha), total-treated area (spha), basic-treated area (ha), percentage of grown area treated and quantity applied (kg).**

	Reason for treatment									
Pesticide group & active ingredient	**Aphids**	**Botrytis**	**Botrytis & mildew**	**General Insect Control**	**General Weed Control**	**Mildew**	**Red spider control**	**Red Spider Mites**	**Total treated area (spha)**	**Quantity applied (kg)**
Fungicides										
Boscalid/pyraclostrobin	.	0.43	0.22	.	.	.	.	.	0.65	0.39
Bupirimate	.	.	.	.	.	2.59	.	.	2.59	0.91
Fenhexamid	.	0.22	.	.	.	.	.	.	0.22	0.16
Iprodione	.	1.72	.	.	.	.	.	.	1.72	1.24
Myclobutanil	.	.	.	.	.	0.32	.	.	0.32	0.03
Penconazole	.	.	.	.	.	<0.01	.	.	<0.01	<0.01
Pyrimethanil	.	2.11	.	.	.	.	.	.	2.11	1.69
Quinoxyfen	.	.	.	.	.	<0.01	.	.	<0.01	<0.01
Thiram	.	<0.01	.	.	.	.	.	.	<0.01	<0.01
Al lfungicides	**.**	**4.48**	**0.22**	**.**	**.**	**2.91**	**.**	**.**	**7.61**	**4.41**
Herbicides										
Glyphosate					0.43				0.43	0.26
All herbicides	**.**	**.**	**.**	**.**	**0.43**	**.**	**.**	**.**	**0.43**	**0.26**

Table 12 contd **Strawberries (semi-protected): Reason for use, total grown area (ha), total-treated area (spha), basic-treated area (ha), percentage of grown area treated and quantity applied (kg).**

	Reason for treatment									
Pesticide group & active ingredient	**Aphids**	**Botrytis**	**Botrytis & mildew**	**General Insect Control**	**General Weed Control**	**Mildew**	**Red spider control**	**Red Spider Mites**	**Total treated area (spha)**	**Quantity applied (kg)**
Insecticides and acaricides										
Abamectin	.	.	.	0.11	.	.	0.43	.	0.54	<0.01
Clofentezine	.	.	.	.	.	.	0.22	1.08	1.29	0.26
Etoxazole	.	.	.	.	.	.	0.11	.	0.11	<0.01
Pirimicarb	0.54	.	.	.	.	.	.	.	0.54	0.15
Pymetrozine	<0.01	.	.	.	.	.	.	.	0.00	<0.01
Thiacloprid	0.22	.	.	0.32	.	.	.	.	0.54	0.06
All insecticides and acaricides	**0.75**	**.**	**.**	**0.43**	**.**	**.**	**0.76**	**1.08**	**3.02**	**0.47**
Biopesticides										
Bacillus subtilis	.	0.11	.	.	.	.	.	.	0.11	Trace
All biopesticides	**.**	**0.11**	**.**	**.**	**.**	**.**	**.**	**.**	**0.11**	**Trace**

Table 13 **Strawberries (non-protected): Reason for use, total grown area (ha), total-treated area (spha), basic-treated area (ha), percentage of grown area treated and quantity applied (kg).**

	Reason for use							
Pesticide group & active ingredient	**Aphids**	**Blackspot**	***Botrytis***	**General weed control**	**Headlands**	**Mildew**	**Total treated area (spha)**	**Quantity applied (kg)**
Fungicides								
Azoxystrobin	.	1.08	.	.	.	.	1.08	0.27
Fenhexamid	.	.	1.58	.	.	1.08	2.66	2.00
Iprodione	.	.	1.08	.	.	.	1.08	0.81
All fungicides	**.**	**1.08**	**2.66**	**.**	**.**	**1.08**	**4.82**	**3.08**
Herbicides								
Glyphosate	.	.	.	.	2.40	.	2.40	0.35
Isoxaben	.	.	.	1.07	.	.	1.07	1.07
Lenacil	.	.	.	0.81	.	.	0.81	1.42
Napropamide	.	.	.	0.80	.	.	0.80	2.52
Pendimethalin	.	.	.	0.81	.	.	0.81	1.07
Propyzamide	.	.	.	2.14	.	.	2.14	1.20
All herbicides	**.**	**.**	**.**	**5.63**	**2.40**	**.**	**8.03**	**7.63**
Insecticides and acaricides								
Abamectin	1.08	.	.	.	.	.	1.08	0.01
All insecticides and acaricides	**1.08**	**.**	**.**	**.**	**.**	**.**	**1.08**	**0.01**

Table 14 **Other crops: Reason for use, total grown area (ha), total-treated area (spha), basic-treated area (ha), percentage of grown area treated and quantity applied (kg).**

	Reason for use					
Pesticide group & active ingredient	**Aphids**	**General weed control**	**Headlands**	**Sawfly**	**Total treated area (spha)**	**Quantity (kg)**
Herbicides						
Glyphosate	.	.	2.40	0.21	2.61	0.35
Isoxaben	.	1.54	.	.	1.54	1.54
Pendimethalin	.	0.96		.	0.96	1.27
Propyzamide	.	3.08	.	.	3.08	1.72
All insecticides and acaricides	**.**	**5.58**	**2.40**	**0.21**	**8.19**	**4.88**
Insecticides and acaricides						
Lambda-cyhalothrin	.	.	.	0.21	0.21	<0.01
Pirimicarb	0.27	.	.	.	0.27	0.08
Pymetrozine	0.01	.	.	.	0.01	<0.01
Thiacloprid	0.27	.	.	.	0.27	0.04
All insecticides and acaricides	**0.54**	**.**	**.**	**0.21**	**0.76**	**0.12**

Table 15 **Comparison of pesticide usage on soft fruit crops 1990-2016, total area treated (spha) with main pesticide groups and quantities of active ingredient (kg) used.**

Pesticide group	1990		1998		2006		2010		2012		2014		2016	
	(spha)	(kg)	(spha)	(kg)	(spha)	(kg)	(spha)	(kg)	(spha)	(kg)	(spha)	(kg)	(spha)	(kg)
Fungicides	171.37	277.61	154.09	189.10	134.88	97.65	82.30	40.52	50.44	30.71	87.40	45.90	13.70	8.20
Herbicides	159.40	199.54	61.80	95.60	25.57	27.60	6.45	9.96	5.63	7.07	10.90	16.80	16.44	12.76
Insecticides and acaricides	33.71	19.61	41.25	16.70	37.37	7.65	20.86	5.99	12.66	2.44	26.60	6.00	5.64	1.82
Molluscicides	8.83	1.79	22.96	10.00	1.72	1.29	.	.	1.09	0.16	1.10	0.20	.	.
Biopesticides	.	.	1.50	Trace	11.40	Trace	7.04	Trace	2.15	Trace	1.20	Trace	0.11	Trace
Other products	.	.	.	.	.	.	0.62	1.91	.	.	0.90	18.70	.	.
Total	**373.31**	**498.55**	**281.60**	**311.40**	**210.94**	**134.19**	**117.27**	**58.39**	**71.97**	**40.38**	**128.20**	**87.60**	**35.89**	**22.78**

Table 16 **Comparison of pesticide usage on strawberry crops* 1990-2016, total area (spha) treated with main pesticide groups and quantities of active ingredient (kg) used.**

Pesticide group	1990		1998		2006		2010		2012		2014		2016	
	(spha)	(kg)	(spha)	(kg)	(spha)	(kg)	(spha)	(kg)	(spha)	(kg)	(spha)	(kg)	(spha)	(kg)
Fungicides	135.67	229.57	132.16	156.41	121.53	81.42	80.05	39.31	44.24	26.88	80.60	42.80	13.70	8.20
Herbicides	112.80	133.31	41.11	52.60	22.00	22.25	4.73	7.46	5.31	6.55	8.10	12.20	8.46	7.88
Insecticides and acaricides	23.64	14.56	37.49	12.82	35.62	6.84	20.67	5.92	11.39	2.23	21.70	4.80	4.88	0.62
Molluscicides	8.42	1.70	22.47	9.91	1.72	1.29	.	.	1.09	0.16	1.10	0.20	.	.
Biopesticides	.	.	1.45	Trace	11.31	Trace	6.79	Trace	2.15	Trace	1.20	Trace	0.11	Trace
Other products	.	.	.	.	.	.	0.62	1.91	.	.	0.90	18.70	.	.
Total	**280.53**	**379.14**	**234.68**	**231.74**	**192.18**	**111.80**	**112.86**	**54.60**	**64.18**	**35.82**	**113.60**	**78.70**	**27.15**	**16.70**

Combined total of protected, semi-protected & non-protected strawberries.

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

Northern Ireland Pesticide Usage Survey Published Reports Appendix 1 (contd.)

Report No.	Report title	ISBN
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
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	1-848 07 308 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	1-848 07 485 9
259	Vegetable Crops 2013	1-848 07 486 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
267	Edible Protected Crops 2015	1-84807-684-6
268	Outdoor Vegetable Crops 2015	1-84807-685-3

ISBN 978-1-84807-809-3

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