PESTICIDE USAGE IN NORTHERN IRELAND

Survey Report 315

Northern Ireland Top Fruit Crops 2022

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PESTICIDE USAGE SURVEY REPORT

NORTHERN IRELAND
TOP FRUIT CROPS
2022

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CONTENTS

Figures Index

Table Index

The County Regions of Northern Ireland

(An estimated 96% of Northern Ireland top fruit is produced in County Armagh)

SUMMARY

This report presents information from a survey of the pesticide usage practices of top fruit growers in Northern Ireland in 2022. This is the twelfth pesticide usage survey to be conducted on top fruit crops in the region since 1992. There was an estimated total of 208 top fruit holdings in Northern Ireland in 2022. Since the previous survey, the total area of top fruit crops grown decreased by 8% to 1,256 hectares with a decrease of 7% in the area of Bramley apples grown. A sample of 53 growers was selected to provide information on crop applications, storage treatments and orchard floor treatments. An estimated 96% of all top fruit crops were grown in County Armagh, with Bramley apple orchards accounting for 99% of the total top fruit grown in Northern Ireland. There was an estimated 47,980 tonnes of Bramley apples harvested in 2022, a 24% increase compared to 2022. The yield of apples in 2022 was reported to be much higher than previous years.

Overall, an estimated 16.4 tonnes of pesticide active ingredients (fungicides, herbicides, insecticides and growth regulators) were applied to 24,831 spray hectares. The pesticide-treated area decreased by 9% compared with 2020, and the weight of active ingredients applied decreased by 11%.

Fungicide application accounted for 88% of total pesticide-treated area (not including 'other' products) and 93% of weight applied. When compared with 2020, the area treated with fungicides decreased by 8%, and the weight of fungicides applied decreased by 10%. Captan (27%), dodine (12%), pyrimethanil (11%), and the formulation boscalid/pyraclostrobin (9%) were the fungicide active ingredients most commonly used on top fruit crops, collectively accounting for 58% of fungicide-treated area. An estimated 89% of all fungicide applications were applied to control apple scab (*Venturia inaequalis*).

Insecticide and acaricide application represented 7% and <1% of total pesticide use by area treated and weight of active substance applied, respectively. The area treated with insecticides and acaricides decreased by 6% when compared with 2020. Deltamethrin represented 57% of the insecticide treated area. Chlorantraniliprole accounted for 26% of the insecticide treated area. The pyridine carboxamide flonicamid accounted for 11% of insecticide treated area. Aphid control accounted for 20% of insecticide application and a further 55% was attributed to 'general insect control'.

Herbicide application represented 3% of total pesticide use by area treated and 7% of weight applied. Overall, the area treated with herbicide decreased by 31% and the weight of herbicides applied decreased by 23%, when compared with 2020. The formulation 2, 4-D/glyphosate was the most frequently used herbicide accounting for 64% of total herbicide application. Glyphosate accounted for 26% of the total herbicide treated area. The most common weed management practice was to apply herbicides in strips under the tree canopy and mow the inter-row grass area between the rows of trees, with 89% of growers using this method. The remaining 11% of growers either mowed or grazed the strips under the tree canopy in addition to the inter-row area.

Growth regulators accounted for 3% of the pesticide-treated area and less than 1% of the total weight of pesticide applied. Gibberellins and prohexadione were the only growth regulator active ingredients applied. Prohexadione accounted for 75% of the area treated with a growth regulator and 99% of the total weight of growth regulator applied.

An estimated 5.5 tonnes of ‘other products’ were applied to 5,914 spray hectares. These included foliar feeds, trace elements and calcium-based products. A majority of applications were to treat potential nutritional disorders.

Data were also collected on post-harvest storage treatments applied to top fruit crops. Only Bramley apples were stored with an estimated 11,873 tonnes, of which, 10,635 tonnes were treated. The pesticide active 1-methylcyclopropene was the only pesticide active used on stored top fruit crops in 2022.

INTRODUCTION

As a participant in the UK Working Party on Pesticide Usage Surveys, the Agri-Food and Biosciences Institute (AFBI) on behalf of the Department of Agriculture, Environmental and Rural Affairs for Northern Ireland (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 also be used by those involved in residue testing, for public information and to evaluate the impact of policy and trends in pesticide usage.

This is the twelfth survey of pesticide usage on top fruit crops in Northern Ireland. Results from the previous surveys which reported on pesticide usage practices on top fruit crops in 1992 (Kidd *et al*., 1994), 1997 (Kidd *et al*., 2001), 2002 (Kearns *et al*., 2004), 2006 (Kearns *et al*., 2007), 2008 (Kirbas *et al*., 2009), 2010 (Lavery *et al*., 2011), 2012 (Lavery *et al*., 2013), 2014 (Lavery *et al*., 2015),2016 (Jess *et al*., 2017),2018 (Kirbas *et al*., 2019) and 2020 (Kirbas *et al*., 2022) are included in the report for comparative purposes. A list of published Northern Ireland Pesticide Usage Survey reports is shown in Appendix 1.

METHODS

Using the Northern Ireland Agricultural Census, June 2022 (Anon., 2022) and also Basic Farm Payment Scheme data (unpublished), a sample of holdings to be surveyed was selected. The sample was stratified into five county regions of Northern Ireland, (there is limited top fruit production in County Londonderry, which was omitted from this survey) and into five size groups based on the total area of top fruit crops grown in each county. The total number of holdings, together with the number surveyed, are shown in Table 1. Due to the relatively low numbers involved, counties Antrim, Down, Fermanagh and Tyrone have been combined and renamed ‘All other counties’.

The survey period comprises the end of the 2021 harvest to the end of the 2022 harvest. The purpose of the survey was explained to selected growers in preliminary correspondence. A total of 53 holdings (representing 25% of all top fruit growers) was contacted and data collected by telephone and email. The growers’ reasons for pesticide use were also included but may not always seem appropriate. Holdings selected in the original sample which were unable to provide data were replaced with those from the same county and size group held on a reserve list.

Since the Covid pandemic and resulting restrictions that commenced in early 2020 we have been unable to complete personal interviews, relying on telephone or email correspondence, which is not always convenient to participants. In particular, 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.

The collected data were analysed using SPSS (Statistical Package for the Social Sciences) software.

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 was treated with at least one pesticide, and is referred to in hectares (ha).
- **'Pesticide-treated area'** refers to the total area treated with a pesticide (fungicides, herbicides, insecticides and acaracides and growth regulators) which includes all repeated applications to the basic area, and is referred to in spray hectares (spha).
- **'Spray applications'** refers to the number of treatments by any pesticide type to the treated areas.
- Generally, orchards recorded in this survey are laid out with trees planted in rows and the area between the rows, referred to in the report as the **'inter-row'** area, is sown with grass**. 'Herbicide strip'** refers to the area beneath the canopy of each tree. Herbicide treatments are applied solely to 'Herbicide strips' and not the entire orchard floor.
- **'Reason for treatment'**; the reasons reported for the use of pesticides are the growers' stated Reason for treatment and may not reflect label recommendations.
- Non-fruiting and fruiting crops were combined and recorded only as **'Bramley apples'** and **'Other' top fruit** which covered all ages of top fruit crops. Non-fruiting crops are generally newly planted trees that have not yet produced fruit.
- **'Rounding'**; due to rounding of figures, there may be slight differences in totals both within and between tables.
- **Log10 scales** have been used in Figures 4, 5 12 and 13 to assist data visualization as the difference between measures is comparatively large.

RESULTS AND DISCUSSION

Crops

The estimated area of top fruit crops grown, and the area surveyed are shown in Table 2, together with the proportion (%) of each crop surveyed. An estimated 96% of the total area of top fruit crops was grown in County Armagh, with Bramley apples accounting for 99% of the total area of top fruit crops grown. 'Other top fruit crops' comprising of dessert apples accounted for the remaining1%. (Table 3, Figure 1).

Regional Pesticide Usage (Tables 4 & 5, Figures 4 & 5)

Regionally, County Armagh is the main production centre for top fruit in Northern Ireland (primarily Bramley apples), accounting for 96% of both the total pesticide-treated area and the weight of pesticides applied. A very limited quantity of top fruit is produced in the remaining counties of Northern Ireland.

Pesticide Usage on Crops (Tables 6 & 7, Figures 19 to 30)

The estimated quantities of pesticide active ingredients applied and the area of crops treated with pesticides are shown in Tables 6 & 7 (Figures 19 to 30). Bramley apples accounted for both 99% of the pesticide-treated area and the weight of active ingredients applied. 'Other' top fruit crops accounted for the remainder of both the weight of pesticides applied and the pesticide-treated area.

Number of Spray Applications (Table 8)

The mean number of spray applications of pesticides to top fruit crops is shown in Table 8. All pesticide types were used on all crops. The total grown area of top fruit crops received at least one pesticide application.

Bramley apples received a mean of 19 fungicide applications from 13 spray rounds. On average these crops also received 1 herbicide application, 2 insecticide/acaricide applications and 2 applications of growth regulators. Bramley apples also received on average 7 applications of 'other products' from 6 spray rounds.

'Other' top fruit crops received a mean of 18 fungicide applications from 8 spray rounds, 2 herbicide applications and 1 insecticide/acaricide application. There were no growth regulators or 'other products' applied to 'other' top fruit.

Total Pesticide Usage (Tables 4, 5, 9, 10, 11 & 12, Figures 2, 3, 4 & 5)

Approximately 16.4 tonnes of pesticide active ingredients (including fungicides, herbicides, insecticides and acaracides and growth regulators) were applied to 24,831 spray hectares of top fruit crops grown in Northern Ireland in 2022. In addition to this, approximately 5.5 tonnes of 'other' products were applied to 5,914 spray hectares. (Tables 4 & 5, Figures 4 & 5).

Fungicides were applied to 88% of the pesticide-treated area, representing 93% of the weight of pesticides applied. Insecticides/acaricides, applied to 7% of the pesticide-treated area, represented less than 1% of the total weight of pesticides used. Herbicides accounted for 3% of the area treated and 7% of the total weight of pesticides used. Growth regulators represented 3% of the pesticide-treated area and less than 1% of the weight of active ingredients applied. The pesticide groups, comprising the active ingredients and formulations applied are shown in Tables 9 and 10.

Captan was applied to 27% of the fungicide-treated area, representing 41% of the weight of fungicides applied. Dodine accounted for a further 12% of the fungicide-treated area and 14% of the weight of fungicides applied. Pyrimethanil was applied to 11% of the fungicide-treated area, accounting for 6% of the weight of fungicides applied. The formulation boscalid/pyraclostrobin was applied to 9% of the fungicide treated area accounting for 4% of the weight of fungicides applied. The formulation dithianon/potassium phosphonates was applied to 8% of the fungicide-treated area and represented 17% of the weight of fungicides applied. Fungicide applications to orchards for the control of apple scab (*Venturia inaequalis*) accounted for 89% of all fungicides used. The remaining 11% of fungicide applications were for canker (*Nectria galligena*), mildew (*Podosphaera leucotricha*), general disease control, storage rot control and storage aid. In total, 19 fungicide active ingredients were applied to Bramley apple crops.

The formulation 2,4-D/glyphosate (applied to 64% of the herbicide-treated area) was the most commonly applied herbicide active ingredient accounting for 72% of the weight of herbicide active ingredients applied. Glyphosate accounted for 26% of herbicide-treated area and 24% of the weight of herbicide active ingredients applied. The formulation fluroxypyr/triclopyr and the active ingredients dicamba/MCPA/mecoprop-P in different formulations accounted for the remaining herbicide application.

The pyrethroid active ingredient deltamethrin was applied to 57% of the insecticide-treated area but only accounted for 21% of the weight of insecticides applied. The ryanodine receptor modulator active ingredient chlorantraniliprole represented a further 26% of the insecticide/acaricide-treated area and 28% of the weight of insecticides applied. The synthetic pyridine insecticide flonicamid was applied to 11% of the insecticide-treated area and 23% of the weight of insecticides applied. General insect control accounted for 55% of insecticide application, with a further 21% applied to control aphids. Control of *Blastobasis* spp. accounted for only 8% of insecticide application to top fruit in Northern Ireland.

Caterpillars, aphids, apple sucker, sawfly and woolly aphid were the other reasons given for insecticide application.

Growth regulators were applied to an estimated 631 spray hectares of top fruit crops. The cyclohexanecarboxylate growth regulator prohexadione represented 75% of the area treated and 99% of the weight of growth regulators applied. Gibberellins accounted for the remaining 25% of the treated area and only 1% of the weight of growth regulators applied. Growth regulators were primarily applied to control and suppress shoot growth on the apple trees.

The active ingredients recorded, ranked by application area and weight applied, are shown in Tables 11 & 12, respectively.

An estimated 5.5 tonnes of 'other products' were applied to 5,914 spray hectares of top fruit crops (Table 15, Figures 27 & 28). A total of 25 'other products' were applied. These included foliar feeds, trace elements and calcium-based products, of which, a majority were used to treat potential nutritional disorders. Calcium-based products were applied to 27% of the treated area of 'other products' used, primarily as foliar feeds and trace elements. Nitrogen-based products were applied to 17% of the area treated, representing 39% of the weight of 'other products' applied. Seaweed extract was applied to 18% of the total area treated by 'other products' and 6% of the total weight of 'other products'. Products containing boron, magnesium, phosphorus, potassium and zinc were also applied to top fruit crops.

'OTHER' TOP FRUIT CROPS

'Other' top fruit represented less than 1% of the total area of top fruit grown with dessert apples being the principal other top fruit grown in Northern Ireland. There may be other small holdings of top fruit, which were not recorded on the Northern Ireland Agricultural Census (2022) and therefore not selected for this survey. This made it extremely difficult to estimate the amount of 'other' top fruit being grown. Fungicides accounted for 90% of the pesticide treated area and 82% of weight applied to 'other' top fruit crops. (Figures 29 and 30). Herbicides and insecticide applications accounted for the remaining 10% of the pesticide treated area. All pesticide usage on 'other' top fruit with reasons for treatment is shown in Table 14. A comparison of the grown area of 'other' top fruit is shown in Table 16.

COMPARISON WITH PREVIOUS SURVEYS

Comparative information on pesticide usage on top fruit crops grown in Northern Ireland during 1992 to 2022 is included in Tables 16, 17a, 17b, 18, 20a, 20b and Figures 6 to 14.

Area of top fruit crops grown (Table 16)

The number of orchard holdings in Northern Ireland remained similar to 2020, only increasing by 3%. The area of top fruit grown in Northern Ireland in 2022 decreased by 8% during the period, with the area of Bramley apple crops decreasing to 1,247 ha. This would suggest that some consolidation has taken place within the industry since 2020. The survey also recorded a 67% decrease in the overall area of 'other' top fruit crops grown (including dessert apple, pear and plum orchards), from 26 ha to 9 ha. As in all previous surveys, a majority of the total top fruit area in Northern Ireland was associated with Bramley apple production (99%).

Comparison of pesticide usage (Tables 17a, 17b 18, Figures 6 to 13)

There was a 9% decrease in the total area of pesticide application to top fruit crops between 2020 and 2022. The weight of pesticides applied in 2022 decreased by 11% when compared to 2020. This was due to an overall reduction in pesticide application across all pesticide types. (Figures 8 & 9).

The area of top fruit crops treated with fungicides decreased by 8% since 2020, and the weight of fungicides applied decreased by 10%. Herbicide applications decreased by 31% for the total area treated and the total weight of active ingredients applied decreased by 23%.

The area of top fruit crops treated with insecticide/acaricide decreased by 6% and the weight of active ingredients applied decreased by 42% since 2020 (Figures 10 & 11). Pyrethroid applications remain similar to that in 2020 only decreasing by 1% in area treated and quantity applied remaining the same. Carbamate insecticides were recorded in 2022 for the first time since 2016. Other insecticides included systemic pyridines and diamides.

An estimated 631 spray hectares were treated with growth regulators in 2022, a decrease of 32% since 2020. The weight of growth regulators applied decreased by 52% between 2020 and 2022.

The active ingredients most extensively used in 2022 are shown in Table 18, which also provides the trend in application from 1992 -2022.

Storage of top fruit crops (Tables 19, 20a & 20b, Figures 14 to 16)

An estimated 11,783 tonnes of Bramley apples were stored in 2022, of which 90% (10,635) tonnes) received a post-harvest treatment. There was a 30% decrease in the weight of apples stored in 2022 when compared with 2020 (Figure 15).

Five different storage methods were identified during this survey. Un-scrubbed controlled atmosphere stores, representing 6% of stored apples, are refrigerated un-vented stores, which use a method to remove and expel carbon dioxide and other gasses from the atmosphere. Scrubbed controlled atmosphere stores, which are refrigerated and use vents to reduce carbon dioxide levels, accounted for 62% of stored apples. Cold/refrigerated stores, which have no modified atmosphere and use cooled, forced air ventilation, accounted for 28% of stored apples. A further 2% of stored apples were stored in unventilated barns and 1% in carbon dioxide stores.

The ethylene inhibitor, 1-methylcyclopropene, was the only product recorded in use on stored apples, accounting for all stored apples treated. Due to its application method, it was impossible to calculate the weight of active ingredient applied.

Tonnes treated and the active ingredient recorded in use on stored apples are shown in Tables 19, 20a and 20b.

ACKNOWLEDGEMENTS

We, the authors, wish to thank all of the growers who participated in this survey, without whose co-operation, the completion of this report would not have been possible. We are also grateful for the invaluable assistance of Ms Ciara Isaac and Mrs Alison Faulkner who worked tirelessly on key aspects of this report.

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FIGURES

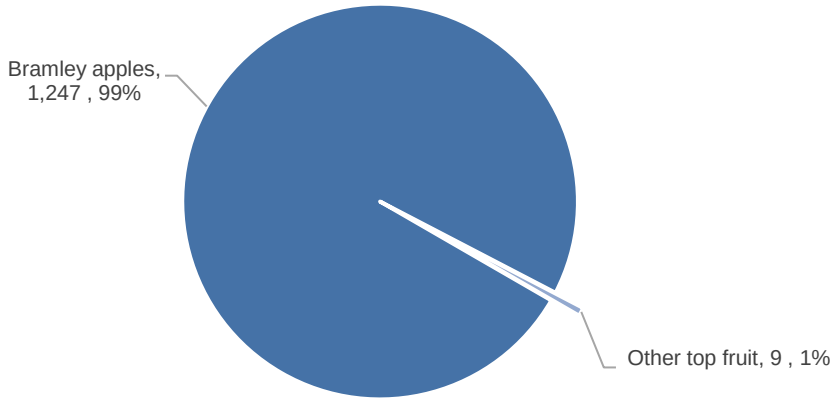


Figure 1 **Total area of top fruit production (ha) and proportion (%) in Northern Ireland, 2022.**

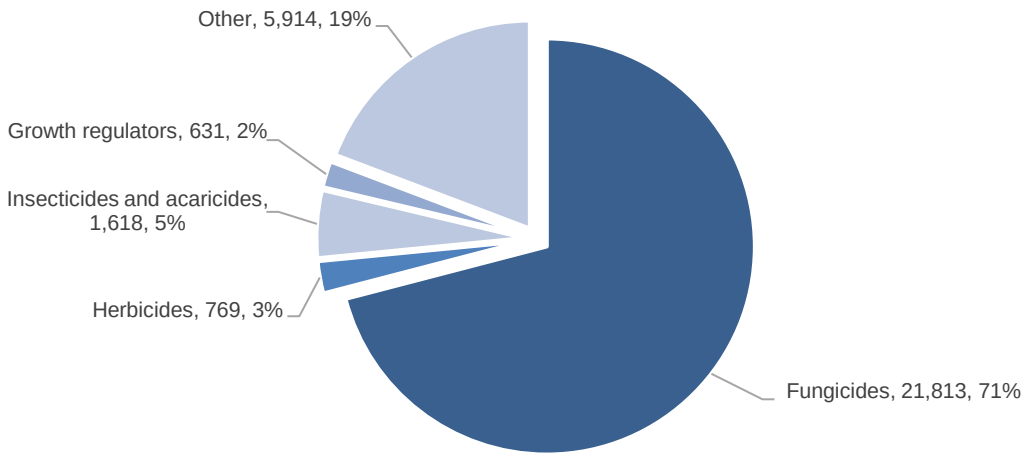


Figure 2 **Pesticide type by area treated (spha) and proportion (%) applied to top fruit crops in Northern Ireland, 2022.**

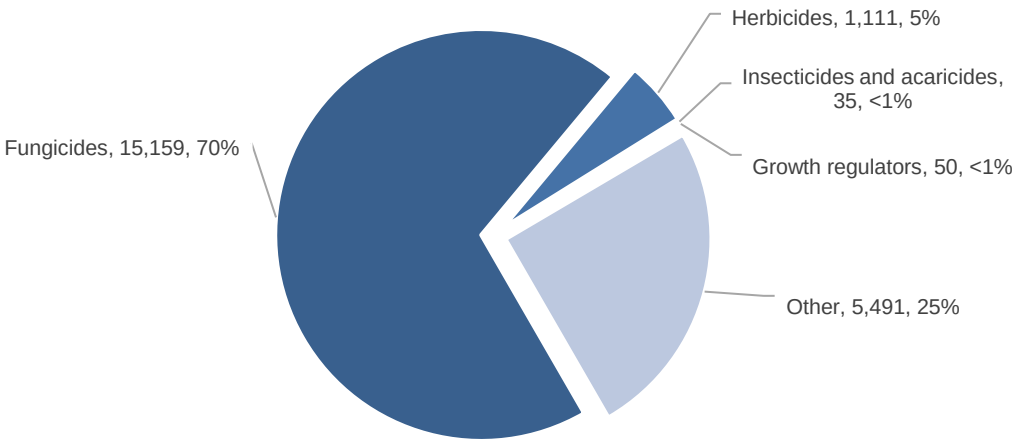
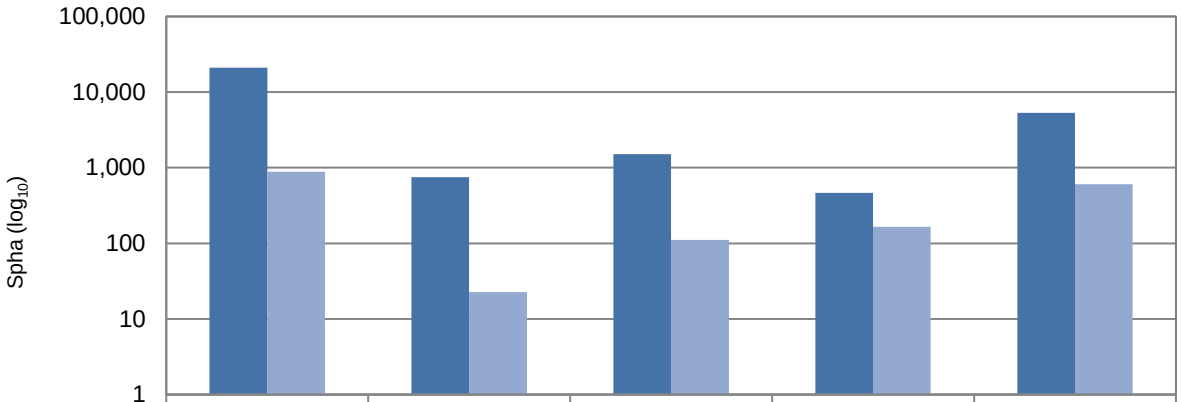
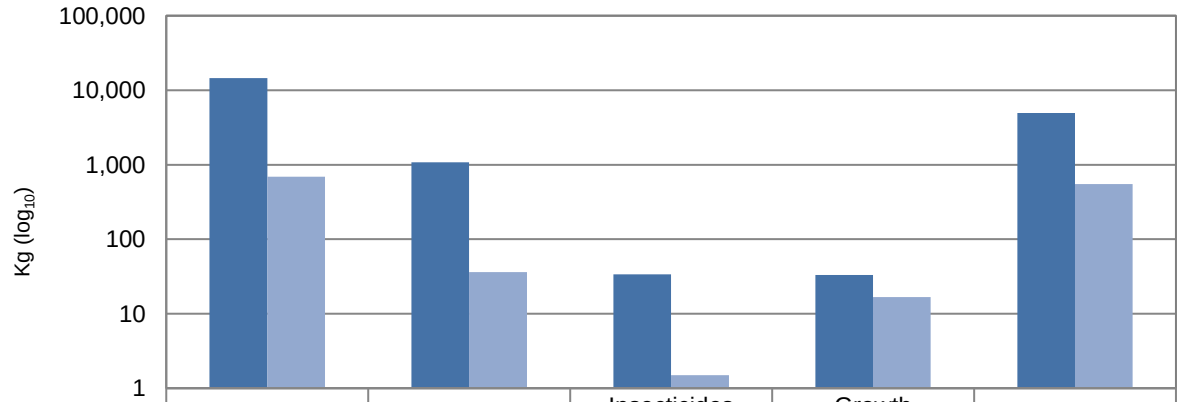


Figure 3 **Pesticide type by weight applied (kg) and proportion (%) applied to top fruit crops in Northern Ireland, 2022.**



	Fungicides	Herbicides	Insecticides and acaricides	Growth regulators	Other
Armagh	20,929	747	1,508	465	5,306
All other counties	884	23	111	166	608

Figure 4 **Area (spha (log_{10})) of top fruit crops treated with each pesticide type in the county regions of Northern Ireland, 2022.**



	Fungicides	Herbicides	Insecticides and acaricides	Growth regulators	Other
Armagh	14,465	1,075	34	33	4,939
All other counties	693	36	1.5	17	552

Figure 5 **Quantity (kg (log_{10})) of each pesticide type applied to top fruit crops in the county regions of Northern Ireland, 2022.**

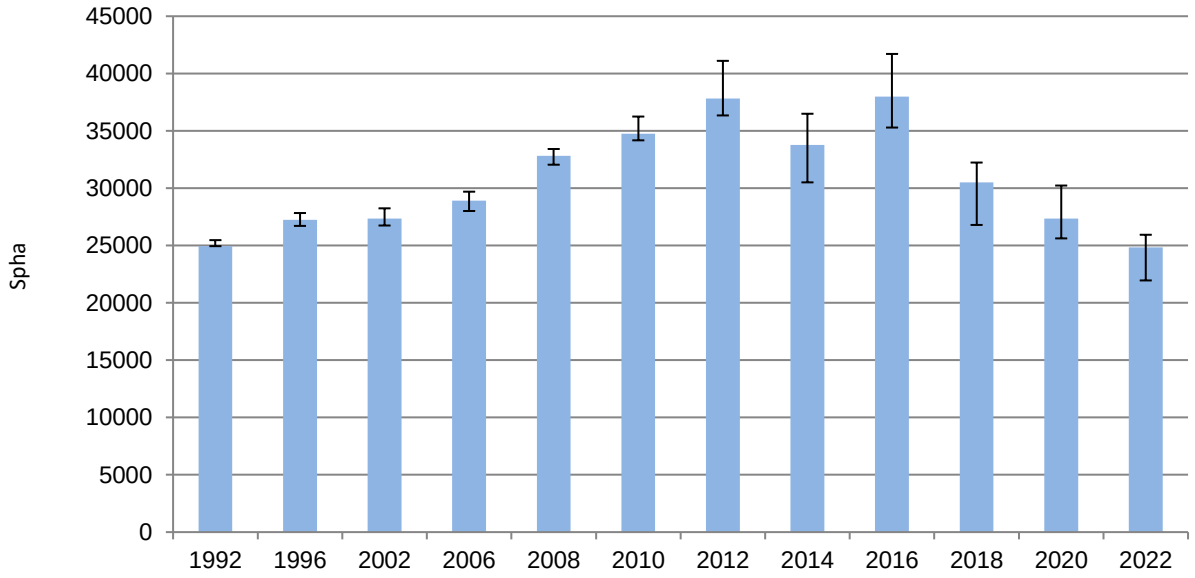


Figure 6 **Comparison of pesticide usage* on top fruit crops by area treated (spha) in Northern Ireland, 1992-2022** (*Bars are Standard Error*).

*** Figures include fungicides, herbicides, insecticides and acaricides and growth regulators. "Other products" not included.**

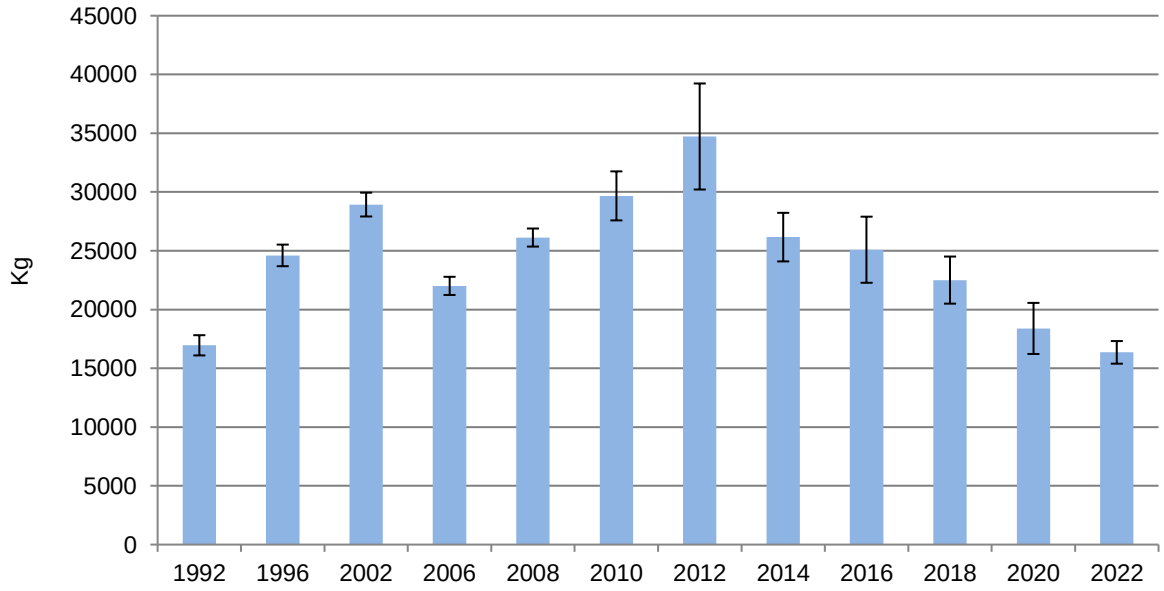


Figure 7 **Comparison of pesticide usage* on top fruit crops by total weight applied (kg) in Northern Ireland, 1992-2022** (*Bars are Standard Error*).

*** Figures include fungicides, herbicides, insecticides and acaricides and growth regulators. "Other products" not included.**

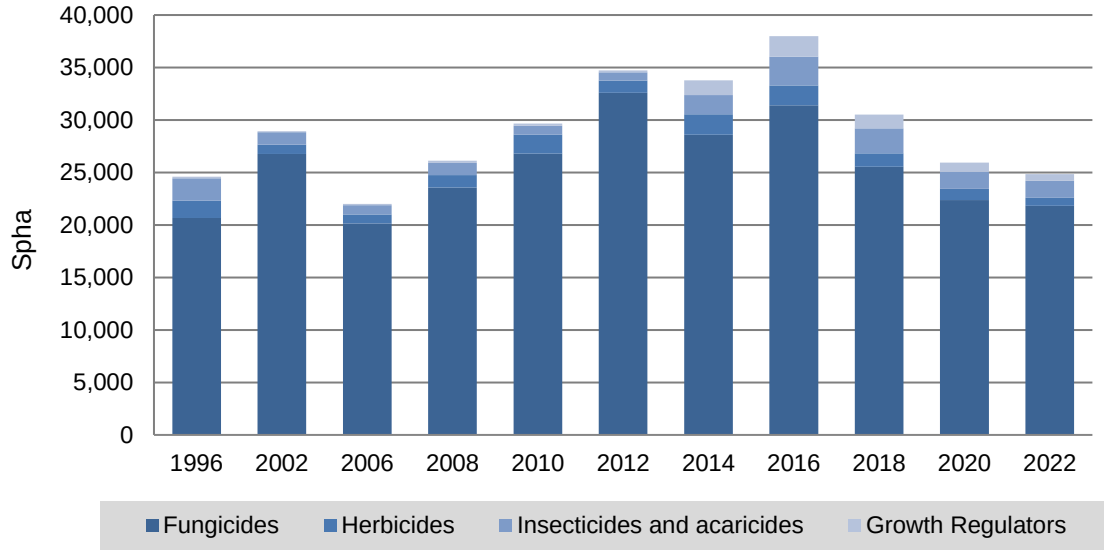


Figure 8 **Comparison of area treated (spha) with different pesticide groups in Northern Ireland, 1992-2022.**

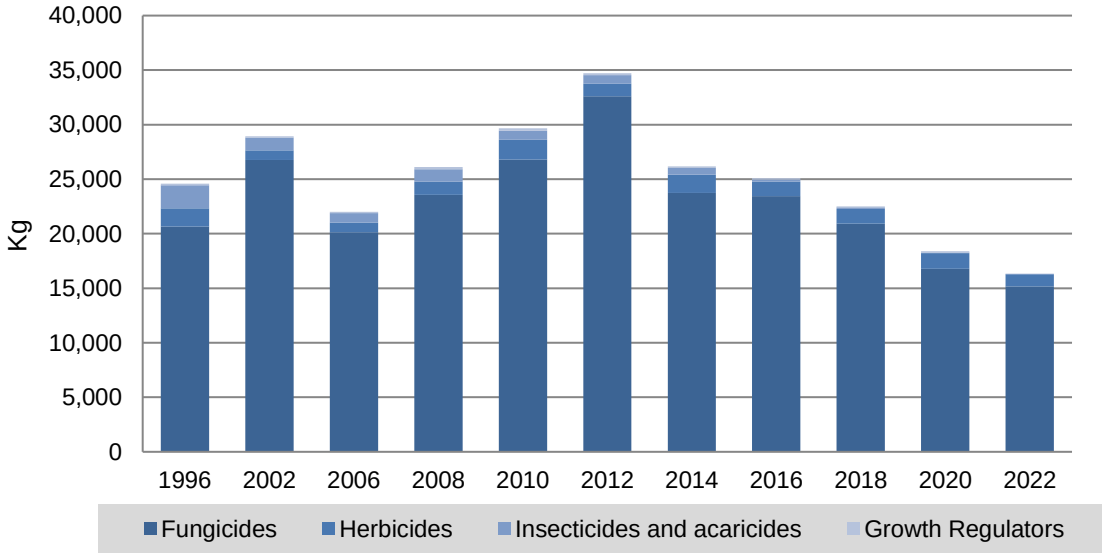


Figure 9 **Comparison of quantity (kg) of different pesticide groups applied to top fruit crops in Northern Ireland, 1992-2022.**

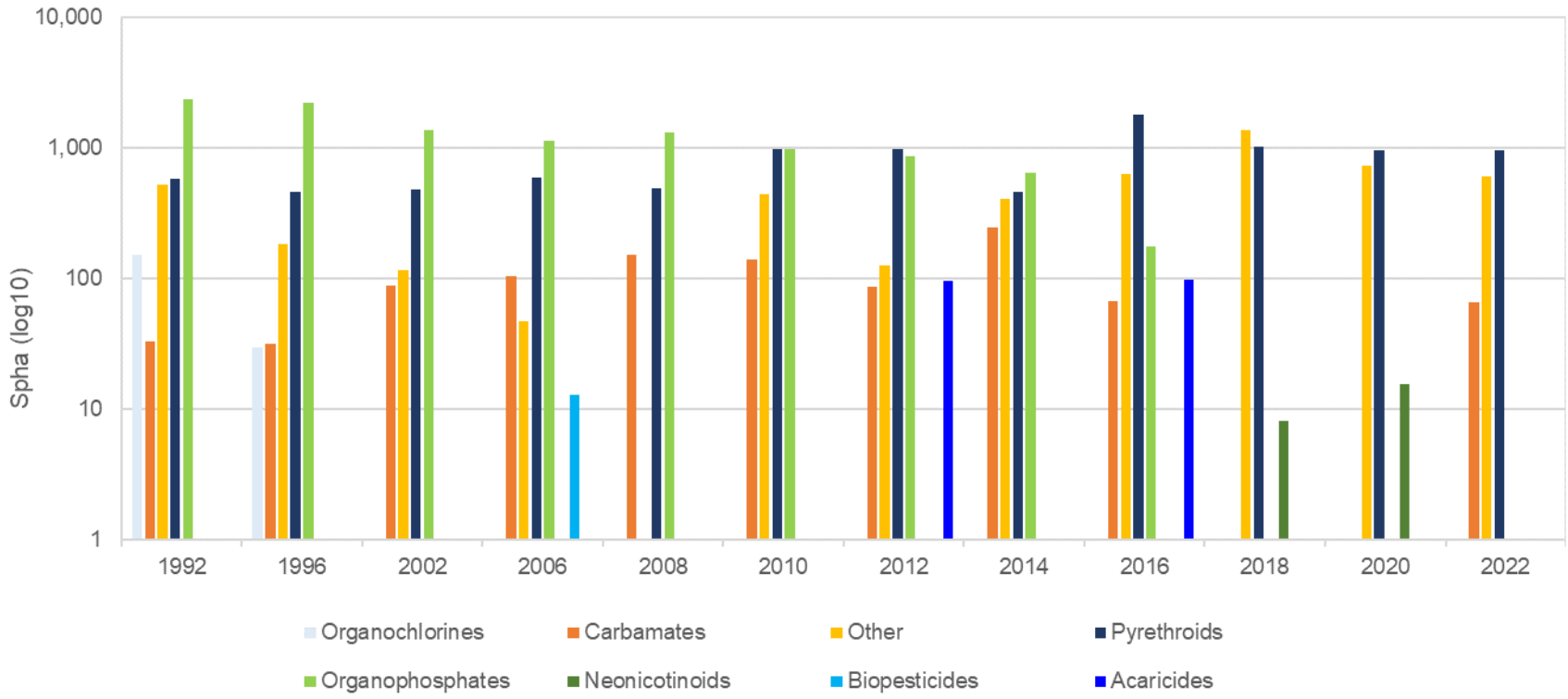


Figure 10 **Comparison of area (spha (log_{10})) of top fruit crops treated with different insecticide types* in Northern Ireland, 1992-2022.**

Acaricides previously included with 'Other' from 1992-2010

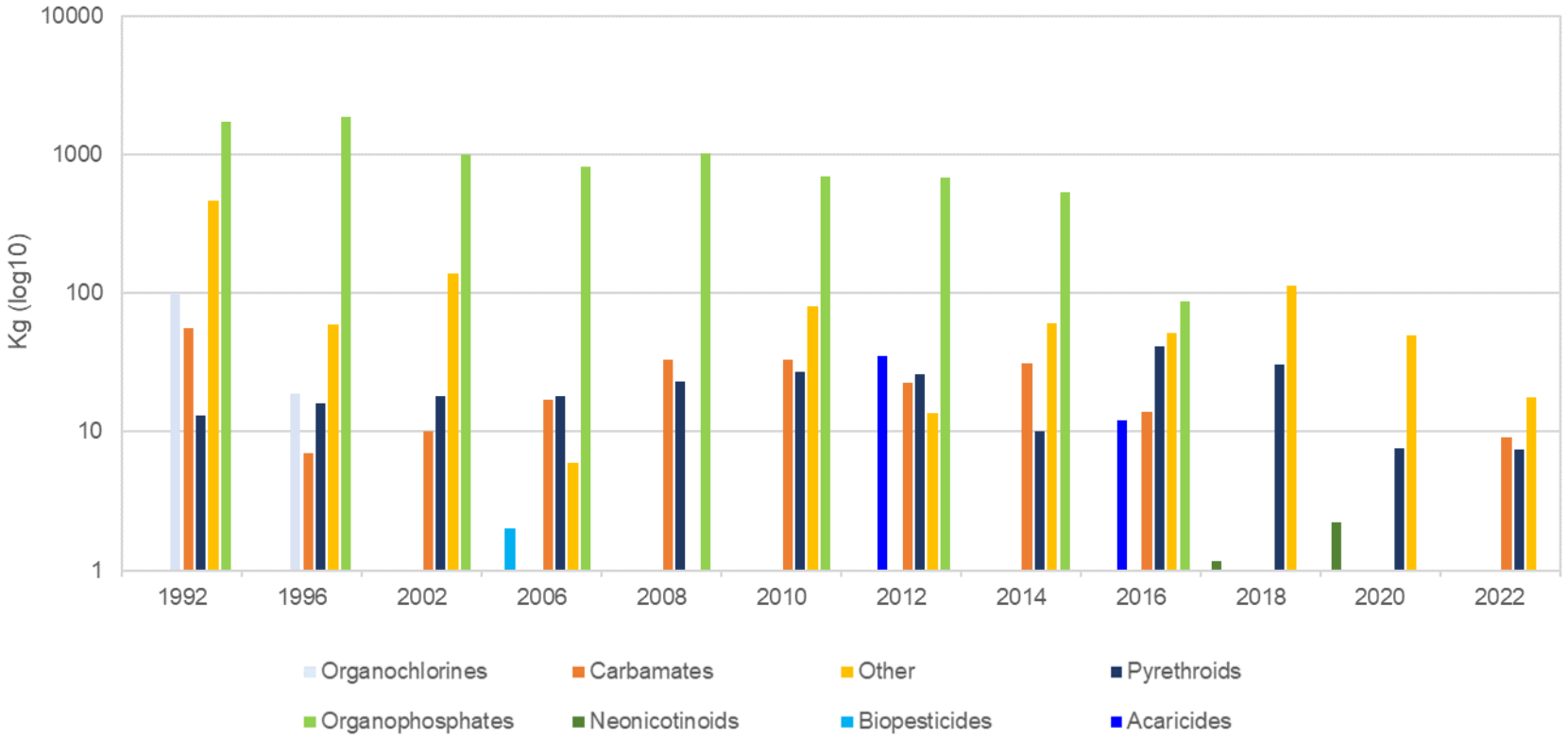


Figure 11 **Comparison of quantity (kg (log_{10})) of different insecticide types* applied to top fruit crops in Northern Ireland, 1992-2022.**

Acaricides previously included with 'Other' from 1992-2010

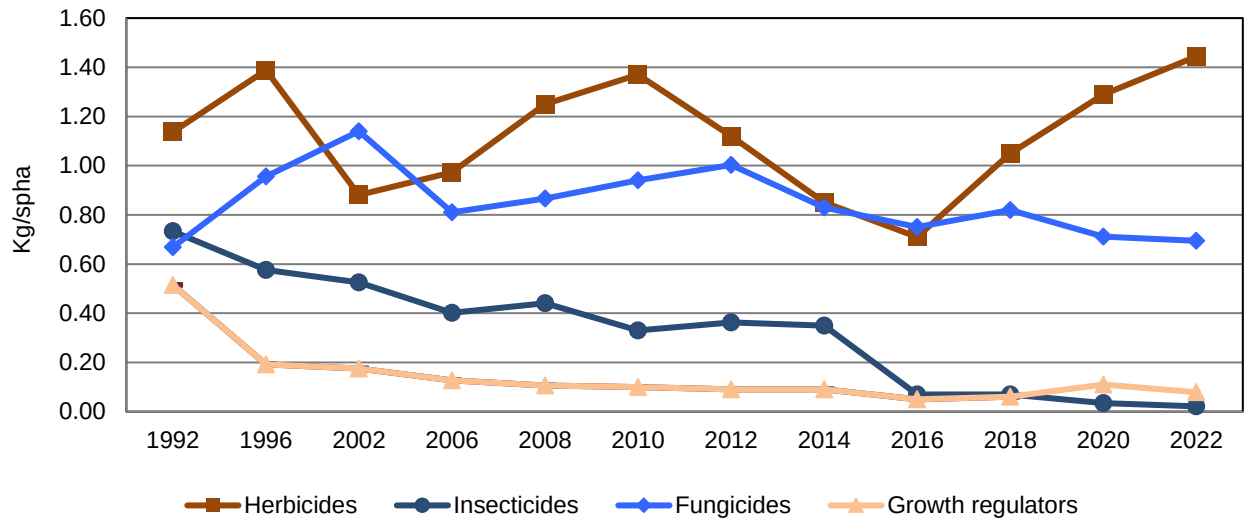


Figure 12 **Application rates (kg/spha) for each pesticide type used on top fruit crops in Northern Ireland, 1992-2022.**

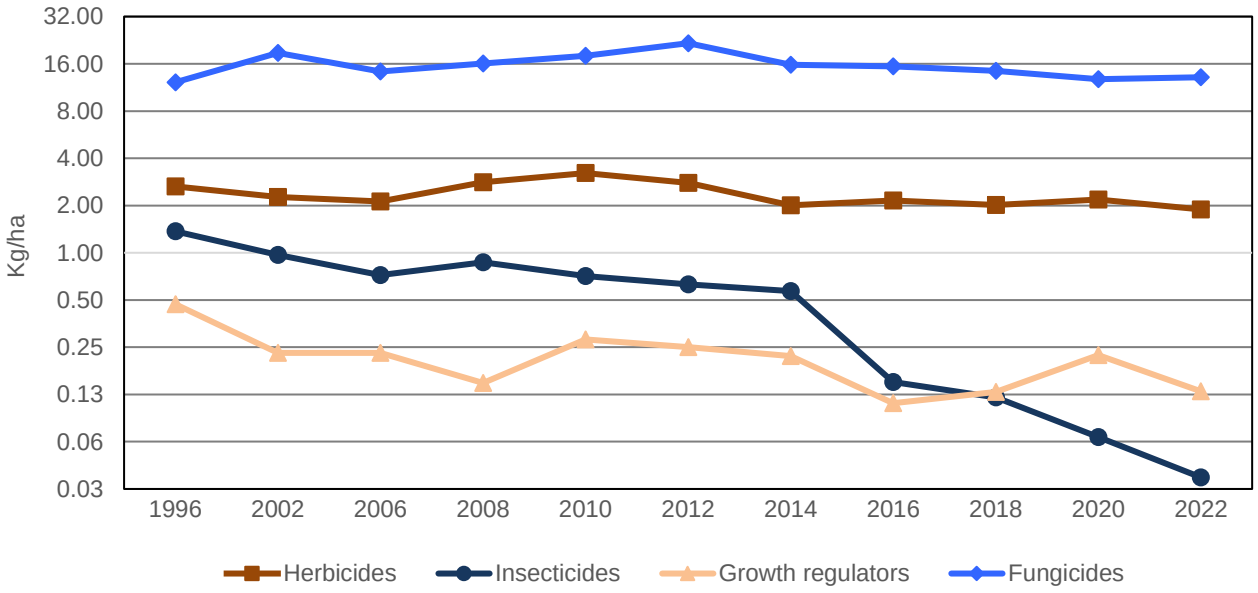


Figure 13 **Quantity of fungicides, herbicides, insecticides and growth regulators applied per basic hectare of top fruit crops (kg/ha) in Northern Ireland, 1996-2022.**

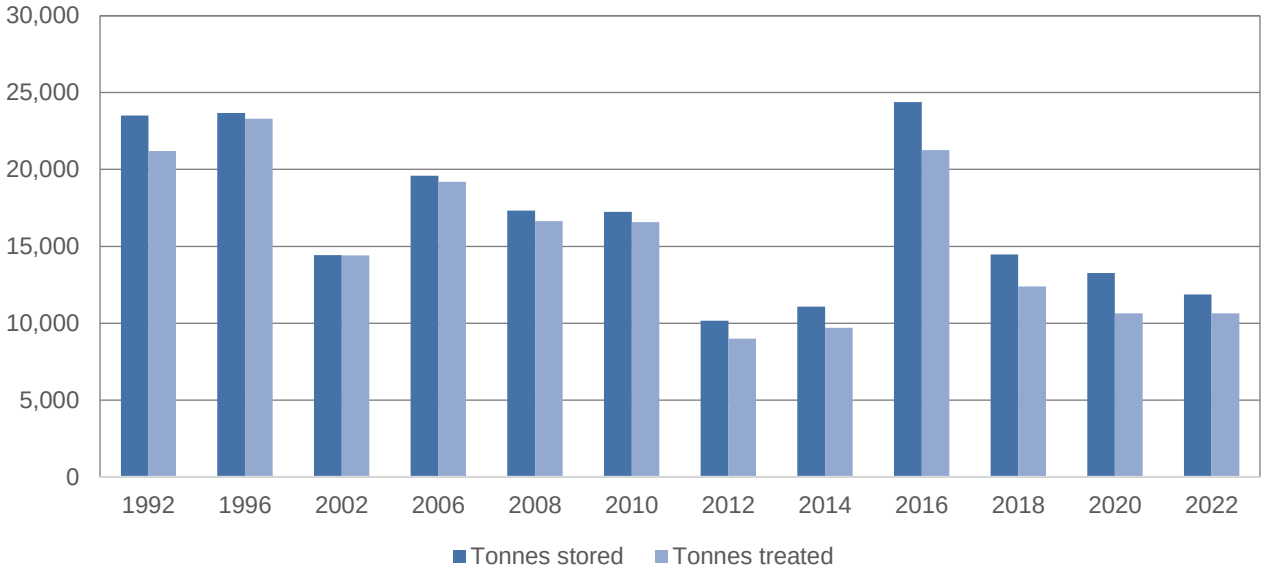


Figure 14 **Quantity of Bramley apples stored (tonnes) and quantity receiving a post-harvest treatment (tonnes) in Northern Ireland, 1992-2022.**

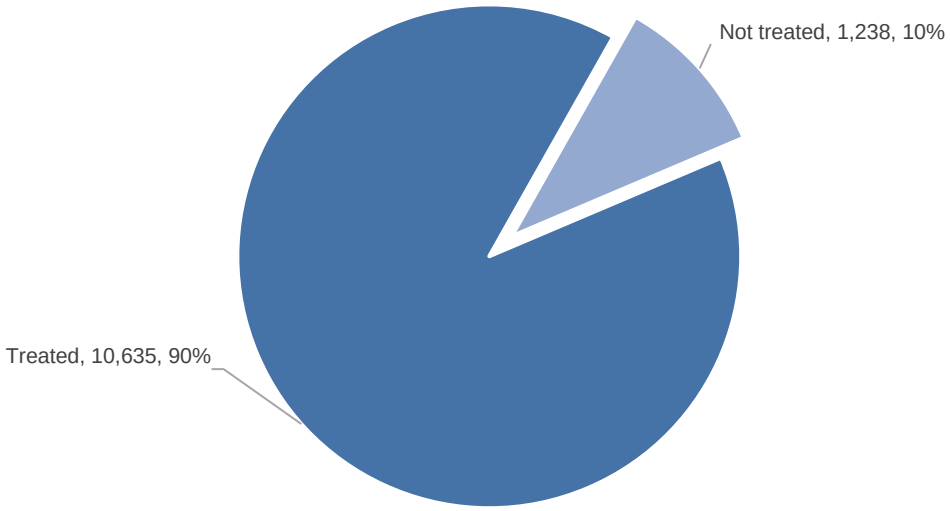


Figure 15 **Quantity (tonnes) and proportion (%) of stored Bramley apples receiving post-harvest treatments in Northern Ireland, 2022.**

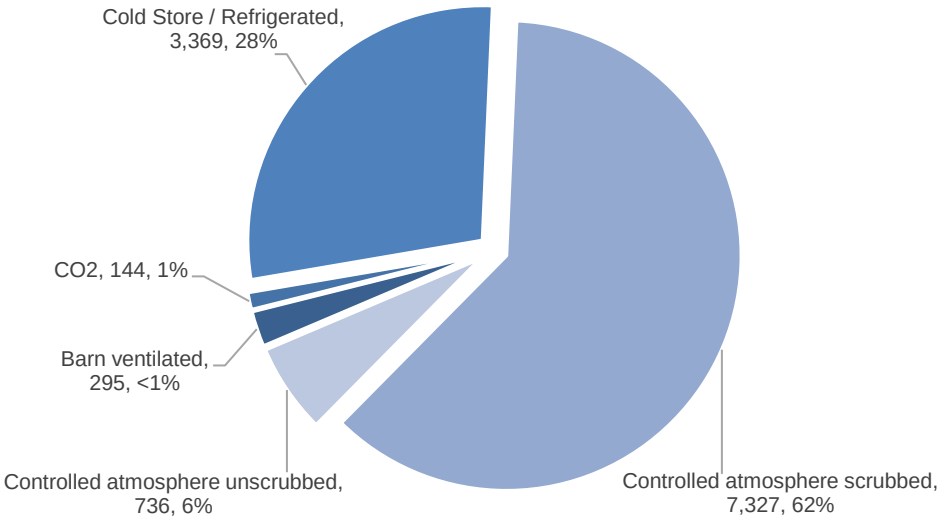


Figure 16 **Storage methods used for Bramley apples showing quantity (tonnes) and proportion (%) in Northern Ireland, 2022.**

PESTICIDE USAGE ON BRAMLEY APPLE CROPS

- Total area grown: 1,247 hectares
- Basic area treated: 1,247 hectares
- Total pesticide-treated area: 24,656 spray hectares
- Weight of active substances applied: 16,255 kilogrammes
- 21 different fungicide substances, 5 insecticide/acaricides, 5 herbicides and 2 growth regulators were applied to Bramley apple crops

Fungicides – Bramley apples

- Basic area treated: 1,144 hectares
- Total fungicide treated area: 21,655 spray hectares
- Weight of active substances applied: 15,077 kilogrammes
- Fungicides accounted for 87% of total area of Bramley apples treated and 93% of total weight applied
- The most commonly used fungicides were captan, dodine, pyrimethanil, fluxapyroxad, and boscalid/pyraclostrobin being applied to 14,585 spray hectares of Bramley apple crops

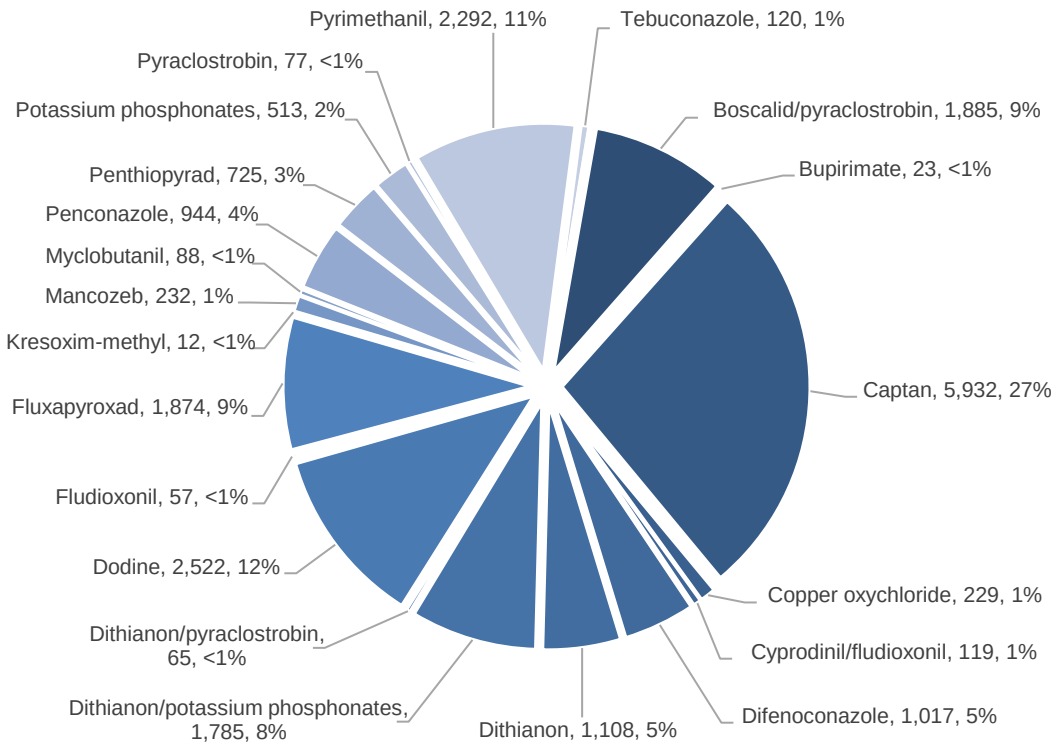


Figure 17 **Fungicide active ingredients applied to Bramley apple crops showing treated area (spha) and proportion (%) applied in Northern Ireland, 2022.**

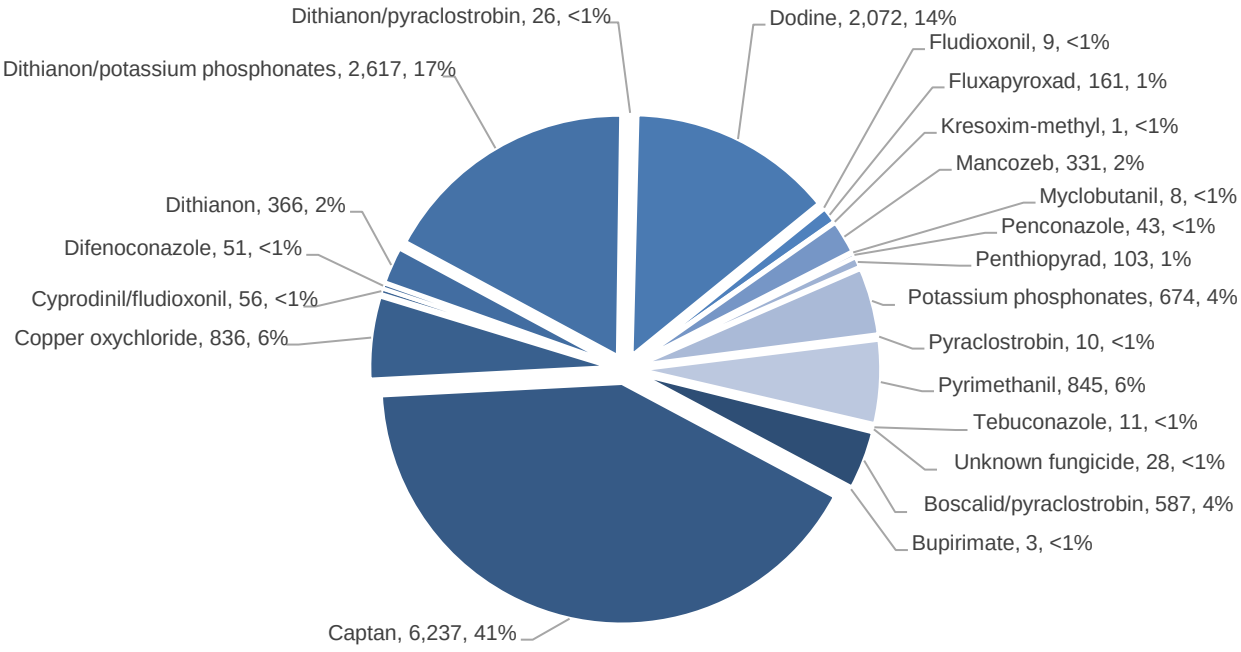


Figure 18 **Fungicide active ingredients applied to Bramley apple crops showing quantity applied (kg) and proportion (%) applied in Northern Ireland, 2022.**

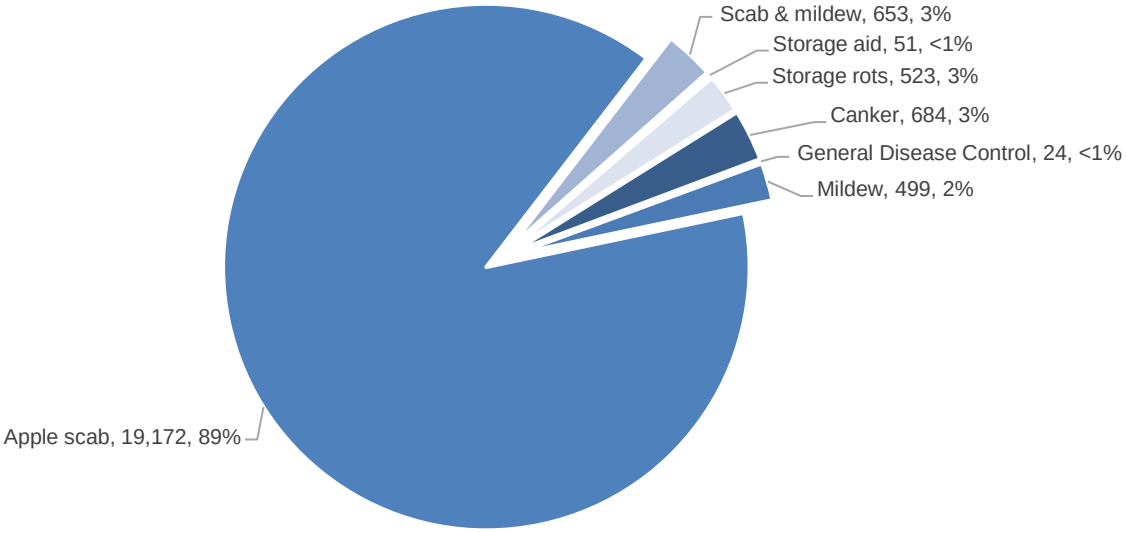


Figure 19 **Bramley apples: Reasons for fungicide treatment showing area treated (spha) and proportion (%), 2022.**

Herbicides –Bramley apples

- Basic area treated: 584 hectares
- Total herbicide treated area: 761 spray hectares
- Weight of active substances applied: 1,093 kilogrammes
- Herbicides accounted for 3% of the total area of Bramley apples treated and 7% of the total weight applied
- The most frequently used herbicide was the formulation 2, 4-D/glyphosate, applied to 489 spray hectares of Bramley orchard floor areas, accounting for 72% of the total weight of herbicides applied
- The only reason for herbicide use was general weed control

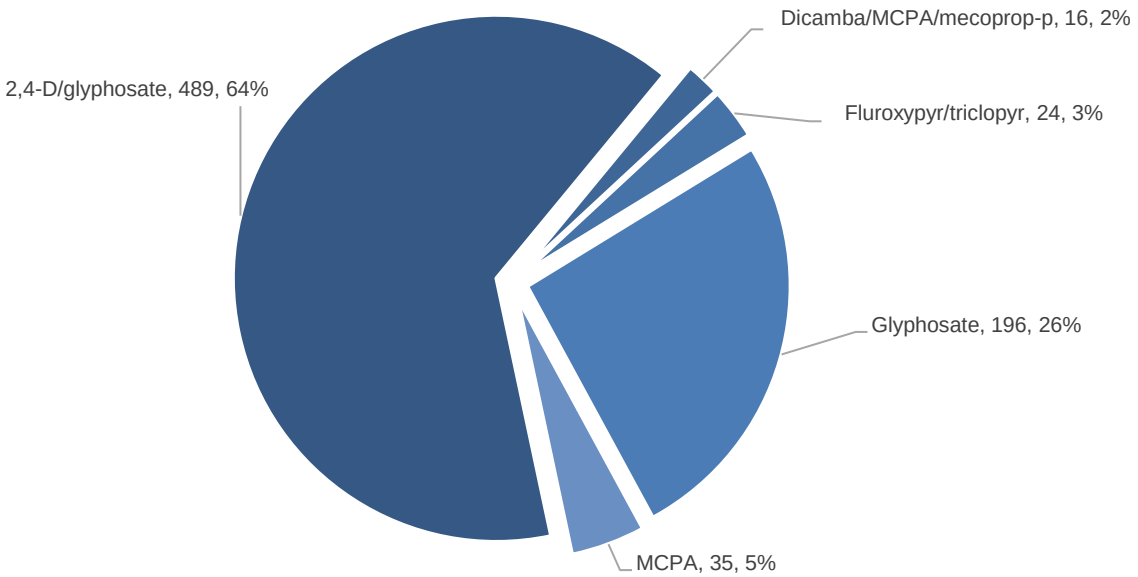


Figure 20 **Herbicide active ingredients applied to Bramley apple crops showing treated area (spha) and proportion (%) applied in Northern Ireland, 2022.**

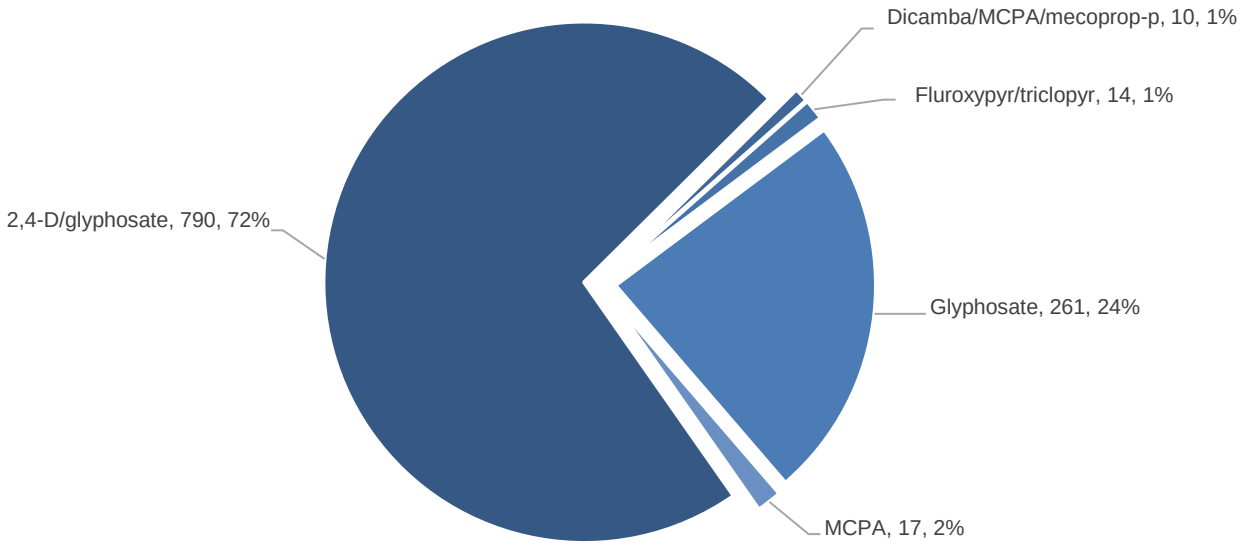


Figure 21 **Herbicide active ingredients applied to Bramley apple crops showing quantity applied (kg) and proportion (%) applied in Northern Ireland, 2022.**

Insecticide/acaricides – Bramley apples

- Basic area treated: 944 hectares
- Total area treated: 1,609 spray hectares
- Weight of active substances applied: 35 kilogrammes
- Insecticide/acaricides accounted for 6% of the total area treated and less than 1% of the total weight applied
- The most commonly used insecticides/acaracides used were deltamethrin, chlorantraniliprole and flonicamid being applied to 1,518 spray hectares of Bramley apple crops

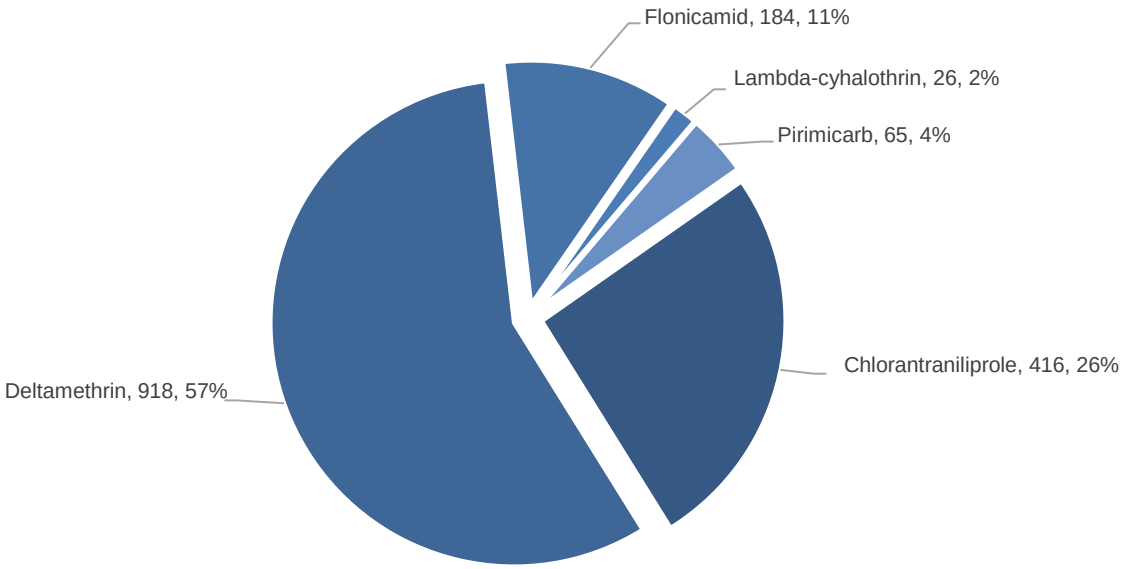


Figure 22 **Insecticide/acaricide active ingredients applied to Bramley apple crops, showing treated area (spha) and proportion (%) applied in Northern Ireland, 2022.**

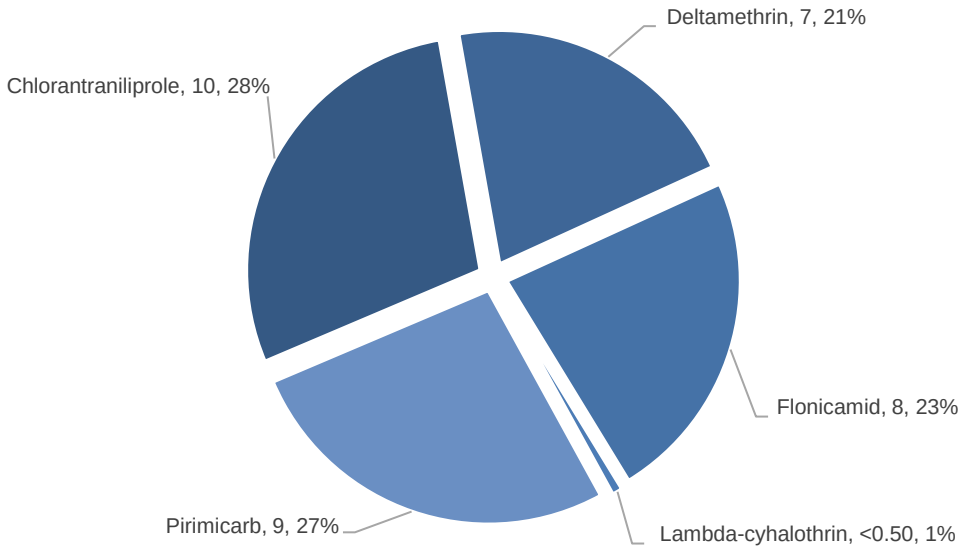


Figure 23 **Insecticide/acaricide active ingredients applied to Bramley apple crops, showing quantity applied (kg) and proportion (%) applied in Northern Ireland, 2022.**

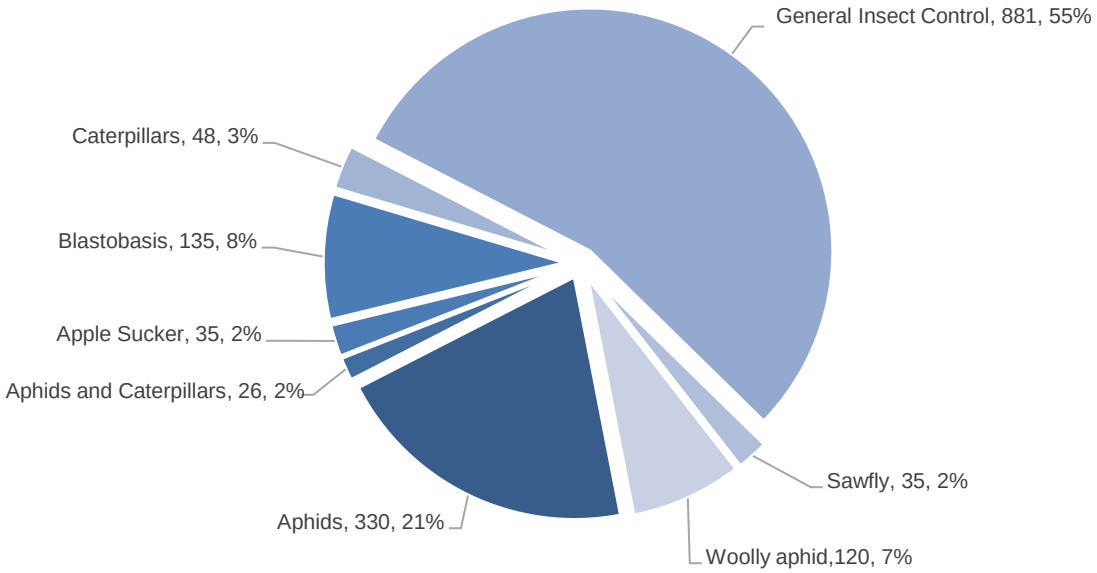


Figure 24 **Bramley apples: Reasons for insecticide/acaricide treatment showing area treated (spha) and proportion (%), 2022.**

Growth regulators – Bramley apples

- Basic area treated: 380 hectares
- Total growth regulator treated area: 631 spray hectares
- Weight of active substances applied: 50 kilogrammes
- Growth regulators accounted for 3% of the total area of Bramley apples treated and less than 1% of the total weight applied
- Growth regulation was the reason for all growth regulator applications

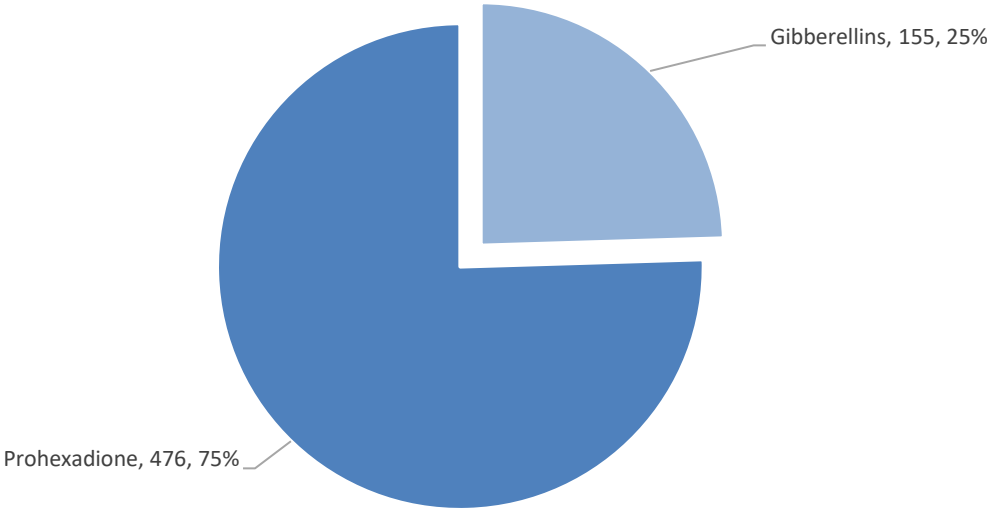


Figure 25 **Growth regulator active ingredients applied to Bramley apple crops, showing treated area (spha) and proportion (%) applied in Northern Ireland, 2022.**

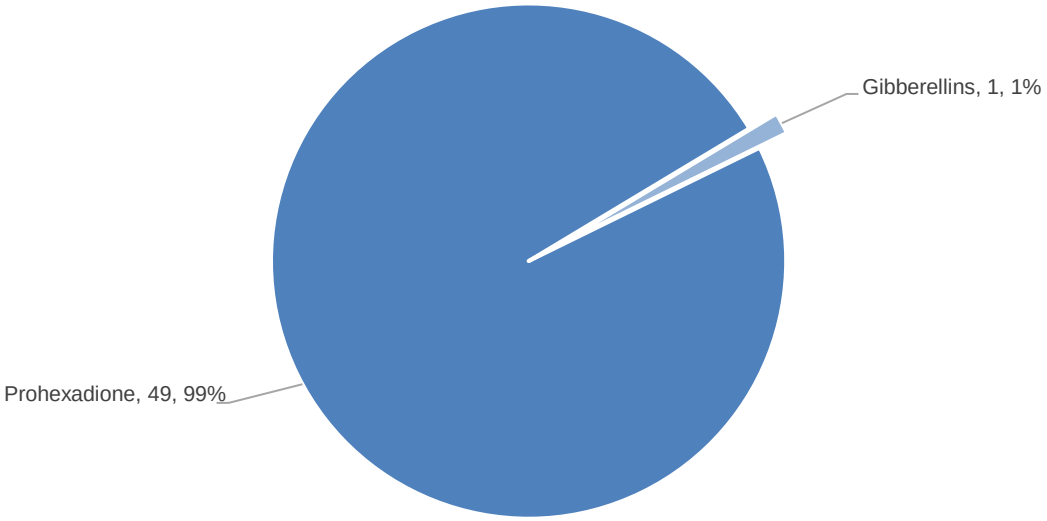


Figure 26 **Growth regulator active ingredients applied to Bramley apple crops, showing quantity applied (kg) and proportion (%) applied in Northern Ireland, 2022.**

'Other products' – Bramley apples

- Basic area treated: 602 hectares
- Total area treated: 5,914 spray hectares
- Weight of 'other products' applied: 5,491 kilogrammes

Figure 27 **'Other products'* applied to Bramley apple crops, showing treated area (spha) and proportion (%) applied in Northern Ireland, 2022.**

'Other products' included foliar feeds, trace elements and calcium-based products of which the majority were used to treat potential nutritional disorders.

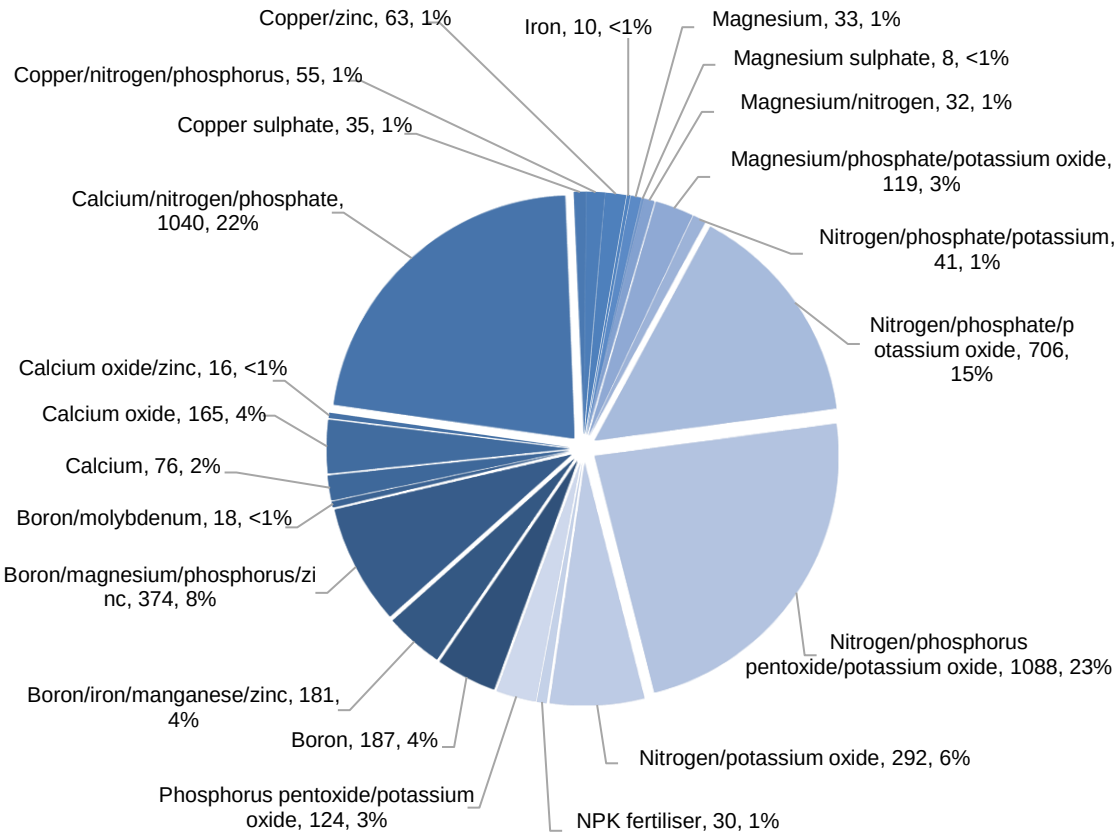


Figure 28 **'Other products'* applied to Bramley apple crops, showing quantity applied (kg) and proportion (%) applied in Northern Ireland, 2022.**

'Other products' included foliar feeds, trace elements and calcium-based products of which the majority were used to treat potential nutritional disorders.

PESTICIDE USAGE ON 'OTHER' TOP FRUIT CROPS

- Total basic area treated: 9 hectares
- Total pesticide-treated area: 175 spray hectares
- Total weight of active substances applied: 99 kilogrammes
- Only fungicides, herbicides and insecticides were applied to 'other' top fruit crops
- Fungicides accounted for 90% of the total area of other top fruit treated and 82% of weight applied

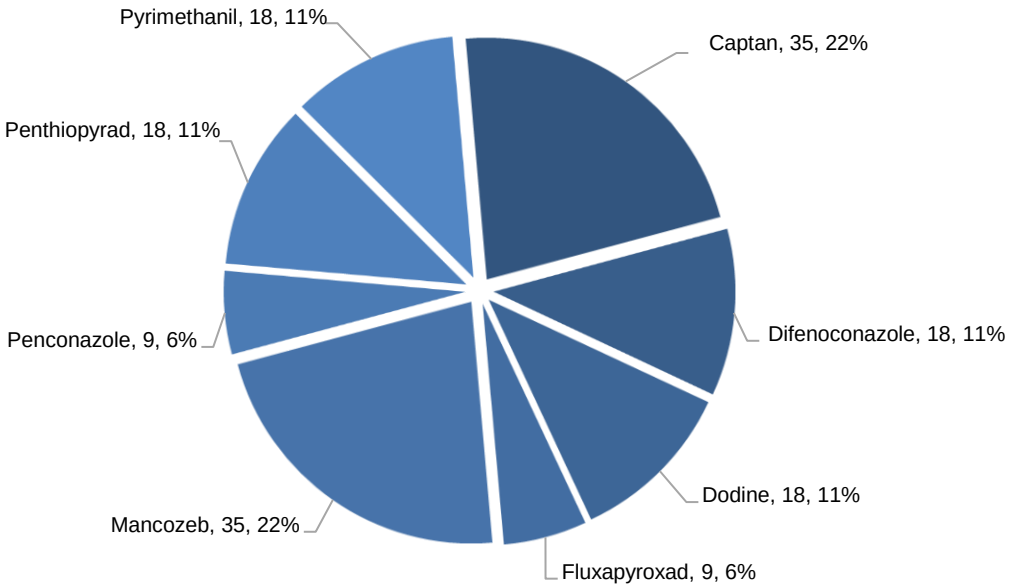


Figure 29 **Fungicide active ingredients applied to 'other' crops, showing treated area (spha) and proportion (%) applied in Northern Ireland, 2022.**

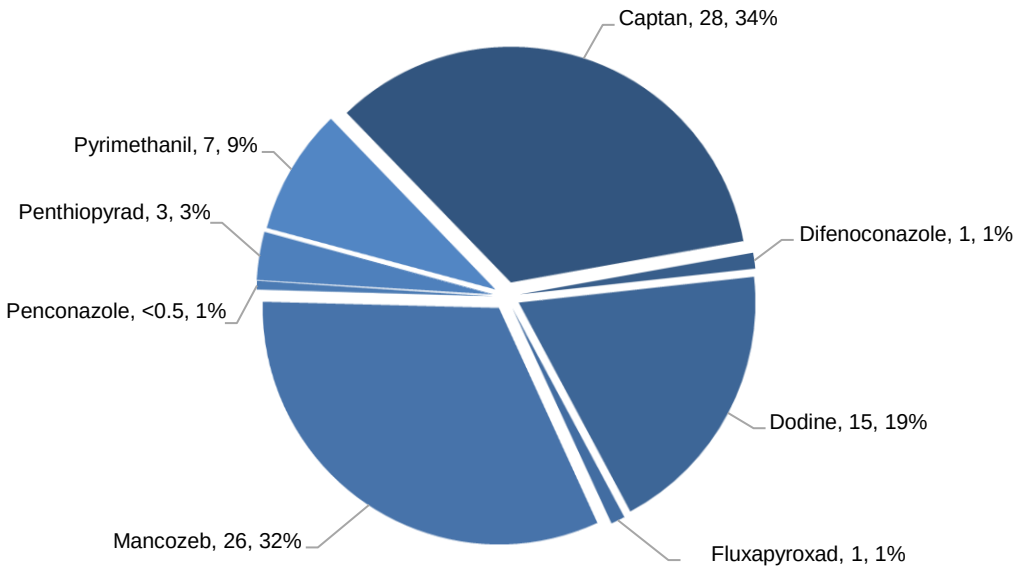


Figure 30 **Fungicide active ingredients applied to 'other' crops showing quantity applied (kg) and proportion (%) applied in Northern Ireland, 2022**.**

*****A further 18 spha. Of "Other" top fruit crops were treated with herbicides and insecticides (see Tables 9, 10 and 14).***

TABLES

Table 1 **The total number of holdings in strata (A) and the number of holdings surveyed (B) from each size group in Northern Ireland, 2022.**

	Size Group (hectares)													
County	<2		2<4		4<6		6<9		9<14		14+		Total	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Armagh	50	**5**	25	**7**	22	**8**	15	**10**	15	**10**	27	**12**	154	**52**
All other counties	49	**0**	1	**0**	2	**0**	1	**0**	0	**0**	1	**1**	54	**1**
Northern Ireland	99	**5**	26	**7**	24	**8**	16	**10**	15	**10**	28	**13**	208	**53**

Table 2 **Estimated grown area of crops (ha), total surveyed area of crops (ha) and proportion (%) of the total area of top fruit crops surveyed in Northern Ireland, 2022.**

Crop type	Grown area	Surveyed area	Proportion of crop surveyed
Bramely apples	1,247	537	43%
Other top fruit	9	5	63%
All crops	**1,256**	**543**	**N/A**

Table 3 **Estimated area (ha) of top fruit crops grown regionally in Northern Ireland, 2022.**

	County		
Crop type	Armagh	All other counties	Northern Ireland
Bramley apples	1,192	55	1,247
Other top fruit	9	0	9
All crops	**1,201**	**55**	**1,256**

Table 4 **Estimated area (spha) of top fruit crops receiving treatments, categorised by pesticide type and region in Northern Ireland, 2022.**

	Pesticide Type					
County	Fungicides	Herbicides	Insecticides and acaricides	Growth regulators	Other	Northern Ireland
Armagh	20,929	747	1,508	465	5,306	28,954
All other counties	884	23	111	166	608	1,791
Total	**21,813**	**769**	**1,618**	**631**	**5,914**	**30,745**

Table 5 **Estimated quantity (kg) of pesticide active ingredients applied to top fruit crops, categorised by pesticide type and region in Northern Ireland, 2022.**

	Pesticide Type					
County	**Fungicides**	**Herbicides**	**Insecticides and acaricides**	**Growth regulators**	**Other**	**Northern Ireland**
Armagh	14,465	1,075	34	33	4,939	20,545
All other counties	693	36	2	17	552	1,300
All pesticides	**15,159**	**1,111**	**35**	**50**	**5,491**	**21,845**

Table 6 **Estimated quantity (kg) of pesticide active ingredients applied to top fruit crops, categorised by pesticide type and crop type in Northern Ireland, 2022.**

	Pesticide Type					
Crop Type	**Fungicides**	**Herbicides**	**Insecticides and acaricides**	**Growth regulators**	**Other**	**Total quantity (kg)**
Bramley apples	15,077	1,093	34	50	5,491	21,746
Other top fruit	81	18	<0.1	.	.	99
All Crops	**15,159**	**1,111**	**35**	**50**	**5,491**	**21,845**

Table 7 **The basic area (ha) and the total area (spha) of top fruit crops treated with each pesticide type in Northern Ireland, 2022.**

Crop Type	Pesticide Type											
	Fungicides		Herbicides		Insecticides and acaricides		Growth regulators		Other products		All pesticides	
	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)	(ha)	(spha)
Bramley apples	1,144	21,655	584	761	944	1,609	380	631	602	5,914	1,247	30,570
Other top fruit	9	158	4	9	9	9	.	.	.	.	9	175
All Crops	**1,152**	**21,813**	**588**	**769**	**953**	**1,618**	**380**	**631**	**602**	**5,914**	**1,256**	**30,745**

Table 8 **Number of spray applications by pesticide type, applied to top fruit crops in Northern Ireland, 2022: (A) The mean number of spray applications and (B) the mean number of applications, accounting for tank mixes.**

Crop Type	*Pesticide Type*											
	Fungicides		Herbicides		Insecticides and acaricides		Growth regulators		Other products		All crops	
	A	B	A	B	A	B	A	B	A	B	A	B
Bramley apples	19.4	12.9	1.4	1.3	1.7	1.7	1.5	1.5	7.3	6.1	7.0	5.0
Other top fruit	18.0	8.0	2.0	1.0	1.0	1.0	0.0	0.0	0.0	0.0	7.0	3.3
All crops average	**19.4**	**12.9**	**1.4**	**1.3**	**1.7**	**1.7**	**1.5**	**1.5**	**7.3**	**6.1**	**7.0**	**5.0**

Table 9 **Estimated area (spha) of top fruit crops treated with pesticide formulations in Northern Ireland, 2022.**

	Crop type		
Pesticide group and active ingredient	**Bramley apples**	**Other top fruit**	**Total area**
Fungicides			
Boscalid/pyraclostrobin	1,885	.	1,885
Bupirimate	23	.	23
Captan	5,932	35	5,967
Copper oxychloride	229	.	229
Cyprodinil/fludioxonil	119	.	119
Difenoconazole	1,017	18	1,034
Dithianon	1,108	.	1,108
Dithianon/potassium phosphonates	1,785	.	1,785
Dithianon/pyraclostrobin	65	.	65
Dodine	2,522	18	2,540
Fludioxonil	57	.	57
Fluxapyroxad	1,874	9	1,883
Kresoxim-methyl	12	.	12
Mancozeb	232	35	267
Myclobutanil	88	.	88
Penconazole	944	9	953
Penthiopyrad	725	18	743
Potassium phosphonates	513	.	513
Pyraclostrobin	77	.	77
Pyrimethanil	2,292	18	2,310
Tebuconazole	120	.	120
Unknown fungicide	35	.	35
All fungicides	**21,655**	**158**	**21,813**
Growth Regulators			
Gibberellins	155	.	155
Prohexadione	476	.	476
All growth regulators	**631**	**.**	**631**
Herbicides			
2,4-D/glyphosate	489	9	498
Dicamba/MCPA/mecoprop-p	16	.	16
Fluroxypyr/triclopyr	24	.	24
Glyphosate	196	.	196
MCPA	35	.	35
All herbicides	**761**	**9**	**769**

Table 9 (cont) **Estimated area (spha) of top fruit crops treated with pesticide formulations in Northern Ireland, 2022.**

	Crop type		
Pesticide group and active ingredient	**Bramley apples**	**Other top fruit**	**Total area**
Insecticides and acaracides			
Chlorantraniliprole	416	.	416
Deltamethrin	918	9	926
Flonicamid	184	.	184
Lambda-cyhalothrin	26	.	26
Pirimicarb	65	.	65
All insecticides and acaracides	**1,609**	**9**	**1,618**
Others			
Boron	801	.	801
Boron/iron/manganese/zinc	456	.	456
Boron/magnesium/phosphorus/zinc	115	.	115
Boron/molybdenum	139	.	139
Calcium	130	.	130
Calcium oxide	841	.	841
Calcium oxide/zinc	66	.	66
Calcium/nitrogen/phosphate	544	.	544
Copper sulphate	16	.	16
Copper/nitrogen/phosphorus	134	.	134
Copper/zinc	578	.	578
Iron	100	.	100
Magnesium	55	.	55
Magnesium sulphate	18	.	18
Magnesium/nitrogen	139	.	139
Magnesium/phosphate/potassium oxide	70	.	70
Nitrogen/phosphate/potassium	51	.	51
Nitrogen/phosphate/potassium oxide	577	.	577
Nitrogen/phosphorus pentoxide/potassium oxi	306	.	306
Nitrogen/potassium oxide	70	.	70
NPK fertiliser	18	.	18
Phosphorus pentoxide/potassium oxide	71	.	71
Seaweed extract	382	.	382
Unknown foliar feed	141	.	141
Zinc	97	.	97
All others	**5,914**	**.**	**5,914**
All pesticides	***30,570***	***175***	***30,745***

Table 10 **Estimated quantities (kg) of top fruit crops treated with pesticide formulations in Northern Ireland, 2022.**

	Crop type		
Pesticide group and active ingredient	**Bramley apples**	**Other top fruit**	**Total Quantity**
Fungicides			
Boscalid/pyraclostrobin	587	.	587
Bupirimate	3	.	3
Captan	6,237	28	6,265
Copper oxychloride	836	.	836
Cyprodinil/fludioxonil	56	.	56
Difenoconazole	51	1	52
Dithianon	366	.	366
Dithianon/potassium phosphonates	2,617	.	2,617
Dithianon/pyraclostrobin	26	.	26
Dodine	2,072	15	2,087
Fludioxonil	9	.	9
Fluxapyroxad	161	1	162
Kresoxim-methyl	1	.	1
Mancozeb	331	26	357
Myclobutanil	8	.	8
Penconazole	43	<0.5	44
Penthiopyrad	103	3	106
Potassium phosphonates	674	.	674
Pyraclostrobin	10	.	10
Pyrimethanil	845	7	852
Tebuconazole	11	.	11
Unknown fungicide	28	.	28
All fungicides	**15,077**	**81**	**15,159**
Growth Regulators			
Gibberellins	1	.	1
Prohexadione	49	.	49
All growth regulators	**50**	**.**	**50**
Herbicides			
2,4-D/glyphosate	790	18	808
Dicamba/MCPA/mecoprop-p	10	.	10
Fluroxypyr/triclopyr	14	.	14
Glyphosate	261	.	261
MCPA	17	.	17
All herbicides	**1,093**	**18**	**1,111**

Table 10 (cont) **Estimated quantities (kg) of top fruit crops treated with pesticide formulations in Northern Ireland, 2022.**

	Crop type		
Pesticide group and active ingredient	**Bramley apples**	**Other top fruit**	**Total Quantity**
Insecticides and acaracides			
Chlorantraniliprole	10	.	10
Deltamethrin	7	<0.05	7
Flonicamid	8	.	8
Lambda-cyhalothrin	<0.5	.	<0.5
Pirimicarb	9	.	9
All insecticides and acaracides	**35**	**<0.05**	**35**
Others			
Boron	187	.	187
Boron/iron/manganese/zinc	181	.	181
Boron/magnesium/phosphorus/zinc	374	.	374
Boron/molybdenum	18	.	18
Calcium	76	.	76
Calcium oxide	165	.	165
Calcium oxide/zinc	16	.	16
Calcium/nitrogen/phosphate	1,040	.	1,040
Copper sulphate	35	.	35
Copper/nitrogen/phosphorus	55	.	55
Copper/zinc	63	.	63
Iron	10	.	10
Magnesium	33	.	33
Magnesium sulphate	8	.	8
Magnesium/nitrogen	32	.	32
Magnesium/phosphate/potassium oxide	119	.	119
Nitrogen/phosphate/potassium	41	.	41
Nitrogen/phosphate/potassium oxide	706	.	706
Nitrogen/phosphorus pentoxide/potassium oxi	1,088	.	1,088
Nitrogen/potassium oxide	292	.	292
NPK fertiliser	30	.	30
Phosphorus pentoxide/potassium oxide	124	.	124
Seaweed extract	522	.	522
Unknown foliar feed	248	.	248
Zinc	26	.	26
All others	**5,491**	**.**	**5,491**
All pesticides	***21,747***	***99***	***21,846***

Table 11 **The active ingredients* most extensively used on top fruit crops ranked by treated area (spha) in Northern Ireland, 2022.**

No.	Active ingredient	Treated area (sp.ha)
1	Captan	5,967
2	Dithianon	2,958
3	Dodine	2,540
4	Pyrimethanil	2,310
5	Potassium phosphonates	2,298
6	Pyraclostrobin	2,027
7	Boscalid	1,885
8	Fluxapyroxad	1,883
9	Difenoconazole	1,034
10	Penconazole	953
11	Deltamethrin	926
12	Penthiopyrad	743
13	Glyphosate	694
14	2,4-D	498
15	Prohexadione	476
16	Chlorantraniliprole	416
17	Mancozeb	267
18	Copper oxychloride	229
19	Flonicamid	184
20	Fludioxonil	176
21	Gibberellins	155
22	Tebuconazole	120
23	Cyprodinil	119
24	Myclobutanil	88
25	Pirimicarb	65
26	MCPA	51
27	Unknown fungicide	35
28	Lambda-cyhalothrin	26
29	Triclopyr	24
30	Fluroxypyr	24
31	Bupirimate	23
32	Mecoprop-P	16
33	Dicamba	16
34	Kresoxim-methyl	12

**** Active ingredients not always sprayed as separate actives but also in formulated mixture***

Table 12 **The active ingredients* most extensively used on top fruit crops ranked by weight (kg) in Northern Ireland, 2022.**

No.	Active ingredient	Quantity applied (kg)
1	Captan	6,265
2	Potassium phosphonates	2,815
3	Dodine	2,087
4	Dithianon	862
5	Pyrimethanil	852
6	Copper oxychloride	836
7	Glyphosate	746
8	Boscalid	390
9	Mancozeb	357
10	2,4-D	323
11	Pyraclostrobin	214
12	Fluxapyroxad	162
13	Penthiopyrad	106
14	Difenoconazole	52
15	Prohexadione	49
16	Penconazole	44
17	Cyprodinil	34
18	Fludioxonil	31
19	Unknown fungicide	28
20	MCPA	25
21	Tebuconazole	11
22	Chlorantraniliprole	10
23	Pirimicarb	9
24	Flonicamid	8
25	Myclobutanil	8
26	Deltamethrin	7
27	Triclopyr	7
28	Fluroxypyr	7
29	Bupirimate	3
30	Mecoprop-P	1
31	Kresoxim-methyl	1
32	Gibberellins	1
33	Dicamba	1
34	Lambda-cyhalothrin	<0.5

**** Active ingredients not always sprayed as separate actives but also in formulated mixture***

Table 13 **Bramley apples: Active ingredients used with reason for treatment and area treated (spha), total area treated (spha), basic area treated (ha) and total quantity applied (kg).**

	Reason for treatment									
Pesticide group and active ingredient	**Canker**	**General Disease Control**	**Mildew**	**Apple scab**	**Scab & mildew**	**Storage aid**	**Storage rots**	**Total area treated (spha)**	**Basic area treated (ha)**	**Total quantity applied (kg)**
Fungicides										
Boscalid/pyraclostrobin	416			989	66	16	399	1,885	811	587
Bupirimate			23					23	8	3
Captan	35			5,719	179			5,932	1,144	6,237
Copper oxychloride	168			62				229	104	836
Cyprodinil/fludioxonil				40		35	45	119	119	56
Difenoconazole	35			905	77			1,017	430	51
Dithianon				1,108				1,108	541	366
Dithianon/potassium phosphonates				1,785				1,785	638	2,617
Dithianon/pyraclostrobin				65				65	65	26
Dodine				2,522				2,522	1,091	2,072
Fludioxonil				12			45	57	57	9
Fluxapyroxad				1,823	51			1,874	860	161
Kresoxim-methyl				12				12	12	1
Mancozeb				232				232	170	331
Myclobutanil			34	54				88	49	8
Penconazole			426	394	77			944	602	43
Penthiopyrad	16	24		634	51			725	435	103
Potassium phosphonates				436	77			513	232	674
Pyraclostrobin					77			77	26	10
Pyrimethanil				2,292				2,292	924	845
Tebuconazole	16		17	87				120	71	11
Unknown fungicide							35	35	35	28
All fungicides	**684**	**24**	**499**	**19,172**	**653**	**51**	**523**	**21,655**	**.**	**15,077**

Table 13 (cont) **Bramley apples: Active ingredients used with reason for treatment and area treated (spha), total area treated (spha), basic area treated (ha) and total quantity applied (kg).**

	Reason for treatment				
Pesticide group and active ingredient	**General weed control**	**Growth regulation**	**Total area treated (spha)**	**Basic area treated (ha)**	**Total quantity applied (kg)**
Herbicides					
2,4-D/glyphosate	489	.	489	408	790
Dicamba/MCPA/mecoprop-p	16	.	16	16	10
Fluroxypyr/triclopyr	24	.	24	24	14
Glyphosate	196	.	196	172	261
MCPA	35	.	35	17	17
All herbicides	**761**		**761**	**.**	**1,093**
Growth regulators					
Gibberellins	.	155	155	155	1
Prohexadione	.	476	476	380	49
All growth regulators		**631**	**631**	**.**	**50**

Table 13 (cont) **Bramley apples: Active ingredients used with reason for treatment and area treated (spha), total area treated (spha), basic area treated (ha) and total quantity applied (kg).**

	Reason for treatment										
Pesticide group and active ingredient	**Aphids**	**Aphids and Caterpillars**	**Apple Sucker**	**Blastobasis**	**Caterpillars**	**General Insect Control**	**Sawfly**	**Woolly aphid**	**Total area treated (spha)**	**Basic area treated (ha)**	**Total quantity applied (kg)**
Insecticides and acaricides											
Chlorantraniliprole	55	.	.	135	.	226	.	.	416	416	10
Deltamethrin	184	26	35	.	48	579	35	12	918	662	7
Flonicamid	.	.	.	.	.	76	.	108	184	92	8
Lambda-cyhalothrin	26	.	.	.	.	.	.	.	26	26	<0.5
Pirimicarb	65		.	.	.	.	.	.	65	65	9
All insecticides and acaracides	**330**	**26**	**35**	**135**	**48**	**881**	**35**	**120**	**1,609**	**.**	**34**

Table 14 **'Other' top fruit: Active ingredients used with reason for treatment and area treated (spha), total area treated (spha), basic area treated (ha) and total quantity applied (kg).**

	Reason for treatment					
Pesticide type and formulation	**Apple scab**	**General Insect Control**	**General Weed Control**	**Total area treated (spha)**	**Basic area treated (ha)**	**Total quantity applied (kg)**
Fungicides						
Captan	35	.	.	35	9	28
Difenoconazole	18	.	.	18	9	1
Dodine	18	.	.	18	9	15
Fluxapyroxad	9	.	.	9	9	1
Mancozeb	35	.	.	35	9	26
Penconazole	9	.	.	9	9	<0.5
Penthiopyrad	18	.	.	18	9	3
Pyrimethanil	18	.	.	18	9	7
All fungicides	**158**	**.**	**.**	**158**	**.**	**81**
Herbicides						
2,4-D/glyphosate	.	.	9	9	4	18
All herbicides	**.**	**.**	**9**	**9**	**.**	**18**
Insecticides						
Deltamethrin	.	9	.	9	9	<0.05
All insecticides	**.**	**9**	**.**	**9**	**9**	**<0.05**

Table 15 **Estimated area treated (spha) and quantity of 'other' products applied (kg) to Bramley apple crops, 2022.**

Formulation	Bramley apples	
	spha	kg
Boron	801	187
Boron/iron/manganese/zinc	456	181
Boron/magnesium/phosphorus/zinc	115	374
Boron/molybdenum	139	18
Calcium	130	76
Calcium oxide	841	165
Calcium oxide/zinc	66	16
Calcium/nitrogen/phosphate	544	1,040
Copper sulphate	16	35
Copper/nitrogen/phosphorus	134	55
Copper/zinc	578	63
Iron	100	10
Magnesium	55	33
Magnesium sulphate	18	8
Magnesium/nitrogen	139	32
Magnesium/phosphate/potassium oxide	70	119
Nitrogen/phosphate/potassium	51	41
Nitrogen/phosphate/potassium oxide	577	706
Nitrogen/phosphorus pentoxide/potassium oxide	306	1,088
Nitrogen/potassium oxide	70	292
NPK fertiliser	18	30
Phosphorus pentoxide/potassium oxide	71	124
Seaweed extract	382	522
Unknown foliar feed	141	248
Zinc	97	26
Total	**5,914**	**5,491**

Table 16 **Total area (ha) of top fruit crops* grown in Northern Ireland, 1992-2022.**

	Survey year												
Crop Type	**1992**	**1996**	**2002**	**2006**	**2008***	**2010***	**2012***	**2014***	**2016***	**2018***	**2020***	**2022***	**% change in area grown 2020/2022**
Bramley apples													
Bramley apples (fruiting)	1,574	1,511	1,265	1,341	1,463	1,491	1,503	1,510	1,488	1,457	1,336	1,247	-6.6%
Bramley apples (non-fruiting)	158	189	197	74	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All Bramley apples	**1,732**	**1,701**	**1,462**	**1,415**	**1,463**	**1,491**	**1,503**	**1,510**	**1,488**	**1,457**	**1,336**	**1,247**	**-6.6%**
Other top fruit crops													
Other top fruit crops (fruiting)	57	13	20	21	19	25	3	9	38	41	26	9	-66.5%
Other top fruit crops (non-fruiting)	5	0.4	4	14	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
All other top fruit crops	**62**	**13**	**24**	**35**	**19**	**25**	**3**	**9**	**38**	**41**	**26**	**9**	**-66.5%**
Total crops	**1,794**	**1,714**	**1,486**	**1,450**	**1,482**	**1,516**	**1,506**	**1,519**	**1,526**	**1,498**	**1,362**	**1,256**	**-7.8%**

**** Note: From 2008, fruiting and non-fruiting crops were recorded together.***

Table 17a **Total area treated (A (spha)) and quantity of pesticides* applied (B (kg)) to top fruit crops in Northern Ireland, 1992-2010.**

	Survey year											
	1992		**1996**		**2002**		**2006**		**2008**		**2010**	
Pesticide Type	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
Fungicides	20,272	13,549	21,620	20,672	23,473	26,756	24,836	20,132	27,200	23,554	28,593	26,796
Herbicides	761	865	1,190	1,652	1,000	881	899	875	965	1,206	1,314	1,805
Growth regulators	134	69	713	137	610	107	990	126	2,066	219	2,313	226
Mixed activity a.i.'s	11	73	17	14	.	.	.	.	.	.	.	.
Insecticides (by classification)												
Acaricides	112	31	751	157	201	24	301	24	645	93	.	.
Biopesticides	.	.	.	.	.	.	13	2	.	.	.	.
Carbamates	33	56	32	7	88	10	104	17	152	33	139	33
Neonicotinoids	.	.	.	.	.	.	.	.	.	.	.	.
Organochlorines	153	101	30	19	.	.	.	.	.	.	.	.
Organophosphates	2,357	1,733	2,239	1,870	1,373	996	1,129	811	1,305	1,016	976	702
Pyrethroids	586	13	464	16	481	18	595	18	496	23	983	27
Unknown insecticides**	.	.	.	.	.	.	.	.	.	.	.	.
Other insecticides	524	465	182	60	115	139	47	6	.	.	445	81
All Insecticides	**3,765**	**2,399**	**3,698**	**2,129**	**2,258**	**1,186**	**2,189**	**878**	**2,598**	**1,165**	**2,543**	**843**
All pesticides	**24,943**	**16,955**	**27,238**	**24,604**	**27,341**	**28,930**	**28,914**	**22,011**	**32,831**	**26,125**	**34,763**	**29,669**

* Does not include 'other' pesticide types

** No weight available for unknown insecticides

Table 17b **Comparison of area treated (spha) and quantity of pesticides* applied (kg) to top fruit crops in Northern Ireland, 2012-2022.**

	Survey year											
	2012		2014		2016		2018		2020		2022	
Pesticide Type	**A**	**B**	**A**	**B**	A	B	A	B	A	B	A	B
Fungicides	32,505	32,604	28,597	23,748	31,386	23,438	25,535	20,911	23,594	16,794	21,813	15,159
Herbicides	1,020	1,142	1,953	1,651	1,895	1,340	1,286	1,354	1,112	1,434	769	1,111
Growth regulators	2,151	195	1,423	125	1,959	104	1,285	93	933	103	631	50
Mixed activity a.i.'s	.	.	.	.	.	.	.	.	.	.	.	.
Insecticides (by classification)												
Acaricides	96	35	.	.	2	<1	.	.	.	.	.	.
Biopesticides	.	.	.	.	.	.	.	.	.	.	.	.
Carbamates	86	23	248	31	67	14	.	.	.	.	65	9
Neonicotinoids	.	.	.	.	.	.	8	1	15	2	.	.
Organochlorines	.	.	.	.	.	.	.	.	.	.	.	.
Organophosphates	868	684	684	533	177	87	.	.	.	.	.	.
Pyrethroids	980	26	460	10	1,789	41	1,021	31	962	8	952	8
Unknown insecticides**	.	.	.	.	.	.	10	**	.	.	.	.
Other insecticides	126	14	411	61	725	64	1,358	113	738	50	601	18
All Insecticides	**2,156**	**782**	**1,811**	**637**	**2,761**	**206**	**2,397**	**146**	**1,716**	**60**	**1,618**	**34**
All pesticides	**37,832**	**34,723**	**33,784**	**26,161**	**38,001**	**25,088**	**30,503**	**22,504**	**27,355**	**18,391**	**24,831**	**16,354**

* Does not include 'other' pesticide types

** No weight available for unknown insecticides

Table 18 **Application ratios (kg/ha) of the active ingredients most extensively used on top fruit crops in Northern Ireland, 1992-2022.**

	Survey year											
Active Ingredient	**1992**	**1996**	**2002**	**2006**	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2020**	**2022**
2,4-D	.	.	.	.	.	.	.	.	.	0.9	1.1	0.8
Boscalid	.	.	.	<0.1	0.1	0.1	0.1	0.1	0.4	0.3	0.4	0.5
Bupirimate	.	.	.	.	.	.	.	.	.	.	.	0.4
Captan	1.9	1.9	1.3	1.4	1.7	3.8	4.3	4.2	4.3	4.2	5.5	5.4
Chlorantraniliprole	.	.	.	.	.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyrifos	0.3	0.3	0.4	0.6	0.7	0.5	0.5	0.3	0.5	.	.	.
Clofentezine	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	.	.	.
Clopyralid	.	.	.	.	.	.	.	<0.7	.	.	.	.
Copper oxychloride	0.7	0.4	0.7	0.4	0.7	0.5	0.1	0.2	2.5	2.7	4.2	8.1
Copper sulphate	0.3	0.1	0.2	.	.	<0.1	0.1	.	.	.	.	.
Cypermethrin	.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	.
Cyprodinil	.	.	.	.	<0.1	<0.1	<0.1	<0.1	0.7	0.3	<0.1	0.3
Deltamethrin	<0.1	.	<0.1	.	.	<0.1	<0.1	<0.8	<0.1	<0.1	<0.01	<0.1
Dicamba	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.8	0.1	<0.01	<0.1
Difenoconazole	.	.	<0.1	.	<0.1	<0.1	<0.1	<0.1	<0.01	0.2	0.1	0.1
Dimethoate	.	.	.	.	.	.	.	<0.3	.	.	.	.
Dithianon	1.4	2.4	3.3	2.5	4.0	3.3	2.6	1.4	1.7	1.3	0.7	1.0
Dodine	0.1	0.5	0.3	0.7	0.6	0.7	1.0	1.5	1.4	1.4	1.6	1.9
Esfenvalerate	.	.	.	.	.	.	.	.	.	<0.1	<0.01	.
Fenbuconazole	.	<0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1	.	.
Flonicamid	.	.	.	.	.	.	.	.	.	0.1	0.1	0.1
Florasulam	.	.	.	.	.	.	.	.	.	<0.01	.	.
Fludioxonil	.	.	.	.	<0.1	<0.1	<0.1	<0.1	0.1	0.3	0.3	0.3
Fluroxypyr	.	.	.	.	.	.	.	.	.	.	.	0.3
Flutriafol	.	.	.	.	.	.	.	<0.5	.	.	.	.
Fluxapyroxad	.	.	.	.	.	.	.	.	.	0.2	0.1	0.2
Gibberellins	.	.	.	<0.1	<0.1	<0.1	<0.1	<0.6	.	<0.01	<0.01	<0.1
Glufosinate-ammonium	<0.1	<0.1	<0.1	.	<0.1	<0.1	<0.1	.	.	.	.	.
Glyphosate	0.1	0.4	0.3	0.3	0.6	0.8	0.5	0.6	1.3	1.6	1.6	1.3
Halauxifen-methyl	.	.	.	.	.	.	.	.	.	<0.01	.	.
Kresoxim-methyl	.	.	.	<0.1	<0.1	<0.1	<0.1	<0.1	.	<0.01	0.1	0.1
Lambda-cyhalothrin												<0.1
Lime	.	.	.	.	.	.	0.1	.	.	.	.	.

Table 18 (cont) **Application ratios (kg/ha) of the active ingredients most extensively used on top fruit crops in Northern Ireland, 1992-2022.**

	Survey year											
Active Ingredient	**1992**	**1996**	**2002**	**2006**	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2020**	**2022**
Lime sulphur	0.2	.	.	.	.	<0.1	0.1	.	3.7	.	.	.
Mancozeb	2.2	5.9	11.4	7.2	6.7	6.8	7.8	6.0	6.9	5.0	4.5	2.0
MCPA	<0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.4	1.2	1.1	1.0	0.8
Mecoprop-P	.	.	<0.1	0.1	<0.1	0.1	<0.1	0.1	0.8	0.5	0.3	0.1
Methoxyfenozide	.	.	.	.	.	.	<0.1	<0.1	0.1	0.1	0.1	.
Myclobutanil	0.3	0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2
Paclobutrazol	<0.1	0.1	.	0.1	<0.1	0.1	0.1	<0.1	0.1	.	.	.
Paraffin oil	.	.	.	.	.	.	.	<0.1	.	.	.	.
Penconazole	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1
Penthiopyrad	.	.	.	.	.	.	.	.	.	0.3	0.3	0.2
Pirimicarb	.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	.	.	0.1
Potassium phosphonates	.	.	.	.	.	.	.	.	.	3.6	3.8	4.2
Prohexadione	.	.	.	.	.	.	.	.	.	0.1	0.2	0.1
Prohexadione-calcium	.	.	.	<0.1	0.1	0.1	0.1	<0.1	<0.1	0.1	.	.
Proquinazid	.	.	.	.	.	.	.	.	.	0.2	<0.05	.
Pyraclostrobin	.	.	.	<0.1	0.1	0.1	0.1	0.1	0.5	0.2	0.2	0.2
Pyrimethanil	.	<0.1	0.3	0.6	1.1	0.9	1.1	0.7	0.7	0.8	0.9	0.9
Spirodiclofen	.	.	.	.	.	.	<0.1	<0.1	.	.	.	.
Spirotetramat	.	.	.	.	.	.	.	.	.	.	0.1	.
Sulphur	.	<0.1	0.2	0.1	0.7	0.9	4.2	1.1	3.7	3.9	4.8	.
Tebuconazole	.	.	.	.	.	.	<0.1	.	0.4	0.3	0.2	.
Tebufenpyrad	.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.4	<0.1	0.1	.	0.2
Thiacloprid	.	.	.	.	.	.	.	.	.	0.1	0.1	.
Triclopyr	.	.	.	.	.	.	.	<0.2	.	.	.	0.3

Table 19 **Estimated quantities (tonnes) of stored apples receiving treatment, the total amount of active ingredients applied (kg) and reason for treatment in Northern Ireland, 2022.**

Pesticide formulation	Quantity treated	Quantity applied	Reason for use
1-methylcyclopropene	13,390	*N/A	Storage aid
All treatments	**13,390**	***N/A**	**Storage aid**

*Due to the application method it was impossible to calculate the weight of active ingredient applied

Table 20a **Estimated quantities (tonnes) of Bramley apples stored and the total weight of active ingredients applied (kg) in Northern Ireland, 1992-2010.**

	Survey year											
	1992		**1996**		**2002**		**2006**		**2008**		**2010**	
Pesticide formulation	**Stored**	**Applied**	**Stored**	**Applied**	**Stored**	**Applied**	**Stored**	**Applied**	**Stored**	**Applied**	**Stored**	**Applied**
Antioxidants												
Diphenylamine	2,154	71	10,496	611	7,778	195	13,216	307	16,630	435	15,966	433
Ethoxyquin	8,350	378	1,381	50	750	15	.	.	.	.	.	.
All antioxidants	**10,504**	**449**	**11,877**	**661**	**8,528**	**210**	**13,216**	**307**	**16,630**	**435**	**15,966**	**433**
Fungicides												
Benomyl	4,166	124	.	.		4	332	2	.	.	.	.
Carbendazim	1,789	39	6,372	87	5,384	44	830	4	.	.	.	.
Carbendazim/metalaxyl	4,299	115	3,901	90	.	.	.	.	.	.	.	.
Captan	.	.	.	.	117	64	477	195	.	.	.	.
Cyprodinil/fludioxonil	.	.	.	.	.	.	.	.	214	1	256	1
Thiophanate-methyl	436	5	1,146	40	.	.	129	1	.	.	.	.
Metalaxyl-M	.	.	.	.	.	.	4,207	5	.	.	.	.
All fungicides	**10,690**	**283**	**11,419**	**217**	**5,886**	**112**	**5,975**	**207**	**214**	**1**	**256**	**1**
Other products												
1-methylcyclopropene	.	.	.	.	.	.	.	.	.	.	345	1
All other products	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**345**	**1**
All treatments	**21,194**	**732**	**23,296**	**878**	**14,414**	**322**	**19,191**	**514**	**16,844**	**436**	**16,567**	**435**
Stored without treatment	***2,322***	***.***	***384***	***.***	***17***	***.***	***408***	***.***	***689***	***.***	***670***	***.***
Total stored	**23,516**	**.**	**23,680**	**.**	**14,431**	**.**	**19,599**	**.**	**17,533**	**.**	**17,237**	**.**

Table 20b **Estimated quantities (tonnes) of Bramley apples stored and the total weight of active ingredients applied (kg) in Northern Ireland, 2012-2022.**

	Survey year											
	2012		2014		2016		2018		2020		2022	
Pesticide formulation	Stored	Applied	Stored	Applied	Stored	Applied	Stored	Applied	Stored	Applied	Stored	Applied
Antioxidants												
Diphenylamine	.	.	.	.	.	.	.	.	.	.	.	.
Ethoxyquin	.	.	.	.	.	.	.	.	.	.	.	.
All antioxidants	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**	**.**
Fungicides												
Benomyl	.	.	.	.	.	.	.	.	.	.	.	.
Carbendazim	.	.	.	.	.	.	.	.	.	.	.	.
Carbendazim/metalaxyl	.	.	.	.	.	.	.	.	.	.	.	.
Captan	.	.	.	.	.	.	.	.	.	.	.	.
Cyprodinil/fludioxonil	490	3	.	.	629	6	.	.	.	.	.	.
Thiophanate-methyl	.	.	.	.	.	.	.	.	.	.	.	.
Metalaxyl-M	.	.	.	.	.	.	.	.	.	.	.	.
All fungicides	**490**	**3**	**.**	**.**	**629**	**6**	**.**	**.**	**.**	**.**	**.**	**.**
Other products												
1-methylcyclopropene	8,502	<1	9,706	N/A	20,625	N/A	12,395	N/A	13,390	N/A	10,635	N/A
All other products	**8,502**	**<1**	**9,706**	**N/A**	**20,265**	**N/A**	**12,395**	**N/A**	**13,390**	**N/A**	**10,635**	**N/A**
All treatments	**8,992**	**3**	**9,706**	**N/A**	**21,254**	**6**	**12,395**	**.**	**13,390**	**N/A**	**10,635**	**N/A**
Stored without treatment	***1,167***	***.***	***1,366***	**N/A**	***3,131***	**N/A**	***2,079***	**N/A**	***2,633***	**N/A**	***1,238***	**N/A**
Total stored	**10,159**	**.**	**11,072**	**N/A**	**24,385**	**.**	**14,474**	**.**	**16,023**	**.**	**11,873**	**.**

Table 21 **Total grown area (ha), total quantity harvested (tonnes) and total yield (tonnes/ha) of Bramley apple crops by age of orchard, in Northern Ireland, 2022.**

Age of orchard (years)	Total grown area (ha)	Total quantity harvested (tonnes)	Yield (tonnes/ha)
Bramley apples			
< 5	76	1,822	24
5 to 9	94	2,767	29
10 to 14	112	2,390	21
15 to 24	272	15,496	57
25 to 34	161	8,623	54
> 35	533	16,882	32
Total Bramley apples	**1,247**	**47,980**	**217**

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
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

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

Report No.	Report title	ISBN
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
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	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	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	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
307	Edible Protected Crops 2021	1-908471-27-7

308	Grassland & Fodder Crops 2021	1-908471-25-3
313	Arable Crops 2022	1-908471-29-1
314	Soft Fruit Crops 2022	1-908471-30-7

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