

# PESTICIDE USAGE IN NORTHERN IRELAND

**Survey Report 277**

## **Northern Ireland Top Fruit Crops 2016**

A National Statistics Publication





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# PESTICIDE USAGE SURVEY REPORT 277

## NORTHERN IRELAND TOP FRUIT CROPS 2016

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## The County Regions of Northern Ireland

(An estimated 95% 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 2016. This is the ninth pesticide survey to be conducted on top fruit crops in the region since 1992. In contrast with previous surveys, top fruit holdings comprising less than 2 hectares were excluded as it was considered that they were not commercially viable and did not contribute to overall pesticide usage data. There were an estimated total of 215 top fruit holdings in Northern Ireland in 2016, but only 138 were above 2 hectares, providing the survey population. Since the previous survey, there was a marginal increase in the total area of top fruit crops grown to 1526 hectares, suggesting consolidation within the industry, although the area of Bramley apples grown decreased by 1%. A sample of 53 growers was selected to provide information on crop applications, storage treatments and orchard floor treatments. An estimated 95% of all top fruit crops were grown in County Armagh, with Bramley apple orchards accounting for 97% of the total top fruit grown in Northern Ireland. There were an estimated 44,824 tonnes of Bramley apples harvested in 2016, a 17% increase compared to 2014.

Overall, an estimated 35.5 tonnes of pesticide active ingredients were applied to 46,770 spray hectares. The pesticide-treated area increased by 14% compared with 2014, and the weight of active ingredients applied decreased by 3%.

Fungicide application accounted for more than 65% of total pesticide use (including 'other' products) by area treated and weight applied. When compared with 2014, the area treated with fungicides increased by 10%, but the weight of fungicides applied decreased by 1%. Mancozeb (21%), captan (15%), dithianon (11%), pyrimethanil (10%) fenbuconazole (9%) and dodine (8%) were the fungicide active ingredients most commonly used on top fruit crops, collectively accounting for 74% of fungicide-treated area. An estimated 80% of all fungicide applications were applied to control apple scab (*Venturia inaequalis*).

Insecticide and acaricide application represented 6% and <1% of total pesticide use by area treated and weight of active substance applied, respectively. The area treated with insecticides and acaricides increased by 52% when compared with 2014. There was a notable decline in the use of the organophosphate insecticide chlorpyrifos (-63%) and the carbamate, pirimicarb (-73%). It should be noted that, from 31<sup>st</sup> March 2016, all uses of chlorpyrifos were revoked except for treatment of brassica crops in peat blocks via gantry-mounted sprayers. The use of the pyrethroid insecticide cypermethrin increased almost 4-fold, representing 63% of total insecticide application. A two-fold increase in the use of the moulting accelerator, methoxyfenozide since 2014, was also recorded. Aphid control accounted for 34% of insecticide application and a further 51% was attributed to 'general insect control'. No insecticides containing neonicotinoid active ingredients were recorded in use on top fruit orchards in 2016.

Herbicide application represented 4% of total pesticide use by area treated and weight applied. Overall, the area treated with herbicide decreased by 3%, and the weight of

herbicides applied decreased by 19%, when compared with 2014. Glyphosate and the formulation dicamba/MCPA/mecoprop-P were the herbicides most frequently used accounting for 77% of total herbicide application. 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 96% of growers using this method. The remaining 4% of growers either mowed or grazed the strips under the tree canopy in addition to the inter-row area.

Growth regulators accounted for 4% of the pesticide-treated area and less than 1% of the total weight of pesticide applied. Paclobutrazol, prohexadione, prohexadione-calcium and gibberellins were the only growth regulator active ingredients applied. Prohexadione and prohexadione-calcium accounted for 67% of the area treated with a growth regulator and 78% of the total weight of growth regulator applied. In 2016, orchard growth was advanced over typical spring seasons, by between seven and ten days, which initiated earlier flowering and fruit set occurred over a protracted period.

An estimated 10 tonnes of 'other products', which included foliar feeds, trace elements and calcium-based products, were applied to the crops during this survey period, a similar figure compared to 2014. The majority of applications were to treat potential nutritional disorders.

Data were also collected on post-harvest storage treatments applied to top fruit crops. An estimated 24,475 tonnes of apples were stored, of which only Bramley apples were treated accounting for 21,254 tonnes. A total of two pesticide active ingredients were recorded in use on stored top fruit crops in 2016, the fungicide cyprodinil/fludioxinil and 1-Methylcyclopropene being the most common accounting for 97% of apples treated. Bramley apples represented 99% of all stored apples.

## 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 and Rural Development for Northern Ireland (DARDNI), 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 Advisory 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 ninth 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) 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.

## METHODS

Using the Northern Ireland Agricultural Census, June 2014 (Anon., 2015) and also single farm payment 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 period for survey comprises the end of the 2015 harvest to the end of the 2016 harvest. The purpose of the survey was explained to selected growers in preliminary correspondence. A total of 53 holdings (representing 38% of all top fruit growers) were visited and data collected by personal interview. 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. In keeping with previous surveys, the less than 2 hectare size group, was included with the less than 4 hectare size group. Many of the top fruit crops grown on these smaller holdings were for personal use and were not treated with pesticides.

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).
- 'Treated area' refers to the total area treated with a pesticide, 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.
- 'Reasons for use'; the reasons reported for the use of pesticides are the growers' stated reasons for use 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.
- In all tables 'red spider mite' refers to 'fruit-tree red spider mite' (*Panonychus ulmi*).

## 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 95% of the total area of top fruit crops was grown in County Armagh, with Bramley apples accounting for 97% of the total area of top fruit crops grown. Other top fruit crops, comprising dessert apples, pears and plums, accounted for the remaining 3%. (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 95% of the total pesticide-treated area and 96% of the weight of pesticides applied. A very limited quantity of top fruit is produced in the other 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 98% of both 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 20 fungicide applications from 11 spray rounds. On average these crops also received 3 herbicide applications, 2 insecticide/acaricide applications and 2 applications of growth regulators. Bramley apples also received on average 8 applications of 'Other products' from 6 spray rounds.

'Other' top fruit crops received a mean of 19 fungicide applications from 11 spray rounds, 2 herbicide applications, 2 insecticide/acaricides applications, 3 applications of growth regulators and 7 applications of 'Other products'.

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

Approximately 35.5 tonnes of pesticide active ingredients were applied to 46,770 spray hectares of top fruit crops grown in Northern Ireland in 2016 (Tables 4 & 5, Figures 4 & 5).

Fungicides were applied to 67% of the pesticide-treated area, representing 66% of the weight of pesticides applied. Insecticides/acaricides, applied to 6% of the pesticide-treated area, represented less than 1% of the total weight of pesticides used. Herbicides accounted for 4% of the area treated and the total weight of pesticides used. Growth regulators represented 4% and less than 1% of the total pesticide-treated area and weight of active ingredients applied, respectively. The pesticide groups, comprising the active ingredients and formulations applied are shown in Tables 9 and 10.

Mancozeb was applied to 21% of the fungicide-treated area, representing 38% of the weight of fungicides applied. Captan accounted for a further 15% of the fungicide-treated area and 21% of the weight of fungicides applied. Dithianon was applied to 11% of the fungicide-treated area, accounting for 7% of the weight of fungicides applied, while Pyrimethanil was applied to 10% of the fungicide-treated area, accounting for 4% of the weight of fungicides applied. Fenbuconazole, applied to 9% of the fungicide-treated area, represented less than 1% of the weight of fungicides applied. Fungicide applications to orchards for the control of apple scab (*Venturia inaequalis*) accounted for 80% of all fungicides used. A further 10% of fungicide applications were to provide disease prevention, general disease control and general fungal control. In total, 19 fungicide active ingredients were applied to Bramley apple crops.

Glyphosate (applied to 53% of the herbicide-treated area) was the most commonly applied herbicide active ingredient accounting for 59% of the weight of herbicide active ingredients applied. A formulation of dicamba/MCPA/mecoprop-P was used to selectively control broadleaved weeds and accounted for a further 25% of herbicide-treated area and 21% of the weight of herbicide active ingredients applied. Other herbicides containing these active ingredients in different formulations and including 2,4-D accounted for the remaining herbicide application.

The pyrethroid active ingredient cypermethrin represented 63% of the insecticide/acaricide-treated area, but only 20% of the weight of insecticides applied. Methoxyfenozide was applied to 14% of the insecticide-treated area, accounting for 22% of the weight of insecticides applied. Chlorantraniliprole represented a further 9% of the insecticide/acaricide-treated area, but accounted for only 3% of the weight of insecticides applied. The use of the organophosphorus insecticide chlorpyrifos reduced significantly from previous years, comprising 6% of the insecticide/acaricide-treated area. General insect control accounted for 51% of insecticide application, with a further 34% applied to control aphids. Control of *Blastobasis* spp. accounted for only 4% of insecticide application to top fruit in Northern Ireland.

The use of growth regulators increased by 38% and they were applied to an estimated 1,959 spray hectares of top fruit crops. The cyclohexanecarboxylate growth regulator prohexadione-calcium represented 42% of the area treated and the weight of growth regulators applied. Prohexadione accounted for a further 25% of the area treated and 36% of the weight of growth regulators applied. The use of paclobutrazol, a triazole plant growth regulator, decreased to 10% of the treated area, accounting for 20% of the weight of growth regulators applied. Gibberellins, the only other active ingredient recorded in this group, accounted for 23% of the treated area but only 2% 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 10.4 tonnes of 'other products' were applied to 8,769 spray hectares of Bramley apples (Table 15, Figures 31 & 32). A total of 30 '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 56% of the treated area of 'Other products' used on Bramley apple orchards, primarily as foliar feeds and trace elements. Nitrogen-based products were applied to 12% of the area treated, representing 19% of the weight of 'Other products' applied. Manganese application represented a further 5% and 1% of "other product" use by application area and weight applied, respectively. Products containing boron, magnesium, phosphorus, potassium and zinc were also applied to top fruit crops.

#### **'OTHER' TOP FRUIT CROPS (TABLE 14)**

Dessert apples were the principal other top fruit grown in Northern Ireland, but only 29 ha were recorded representing less than 2% of the total area of top fruit grown. There may be other small holdings of top fruit which were not recorded on the Northern Ireland Agricultural Census (2014) and therefore not selected for this survey. This made it extremely difficult to estimate the amount of 'other' top fruit being grown. On average, pesticide usage trends for dessert apples and pears were similar to those associated with Bramley apple crops. 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 in 1992, 1996, 2002, 2006, 2008, 2010 and 2012, 2014 and 2016 is included in Tables 16, 17a, 17b, 20 and Figures 6 to 15.

### Area of top fruit crops grown (Table 16)

Despite a 37% reduction in the number of orchard holdings in Northern Ireland since 2014, the area of top fruit grown in Northern Ireland in 2016 increased marginally (<1%) during the period, with the area of Bramley apple crops increasing to 1526 ha. This would suggest that some consolidation has taken place within the industry since 2014. The survey also recorded a four-fold increase in the overall area of 'other' top fruit crops grown (including dessert apple, pear and plum orchards), from 9ha to 38ha. As in all previous surveys, a majority of the total top fruit area in Northern Ireland was associated with Bramley apple production (97%).

### Comparison of pesticide usage (Tables 17a & 17b, Figures 6 to 14)

There was a 12% increase in the total area of pesticide application to top fruit crops between 2014 and 2016. However the weight of pesticides applied in 2016 decreased by 4% when compared to 2014. 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 increased by 10% since 2014, and the weight of fungicides applied decreased by 1%. Herbicide applications decreased by 3% for the total area treated and 19% for the total weight of active ingredients applied.

The area of top fruit crops treated with insecticide/acaricide increased by 52% however the weight of active ingredients applied decreased by 68% since 2014 (Figures 10 & 11). Applications of carbamate active ingredients decreased almost four fold for the total area treated and total weight applied decreased by 55% since 2014. The area treated with organophosphates fell by 74%, with an 84% reduction in weight of active ingredients being applied compared with 2014. Pyrethroid applications increased almost 4 fold in area treated and quantity applied with 460 spray hectares in 2014 to 1,789 spray hectares in 2016 and quantity applied from 10 kg to 41 kg for the same period. No insecticides containing neonicotinoid active ingredients were recorded in use during this survey.

An estimated 1,959 spray hectares were treated with growth regulators in 2016, an increase of 38% since 2014. However the weight of growth regulators applied decreased by 17% between 2014 and 2016.

The active ingredients most extensively used in 2016 are shown in Table 17b, which also provides the trend in application from 1992 -2016.

### **Storage of top fruit crops (Tables 18 - 20, Figures 15 to 18)**

An estimated 24,385 tonnes of Bramley apples were stored in 2016, of which 87% (21,254 tonnes) received a post-harvest treatment. There was just over a 2 fold increase in the weight of apples stored in 2016 when compared with 2014 (Figure 15).

In 2016, orchard growth was advanced over typical spring seasons, by between seven and ten days, which initiated earlier flowering. Weather conditions during blossom time were cool and somewhat variable. The extended blossom period allowed reasonable to good initial pollination, but a major consequence was that fruit set occurred over a protracted period.

As the crop developed in subsequent weeks, orchard yields spanned a wide range of fruit sizes, which complicated the field grading operations by pickers, as they transferred fruit into bins for market or storage.

In parallel with this, the 2016 Bramley crop across the rest of the British Isles was fair to good. This inevitably depressed the then projected value per tonne. Additionally, the EU trade sanctions against Russia caused an inevitable 'backflow' of fruit from eastern European countries, while the Bulmers Ireland ('Magners') cider producer in County Tipperary was contracted to its local cider orchard producers as a priority and thus were unable to receive the same volumes of Bramley as previously from NI growers. Bulmers Ireland 'capped' their 2016 NI Bramley requirement at 16 000 tonnes, which is normally 22 000 tonnes annually.

All of these factors contributed to a significant drop in the 2016 unit price, with major uncertainty for growers as to the quantities required across available markets. Exceptionally, an estimated 10% of Bramley orchard area remained un-harvested and, inevitably, some tonnage of harvested fruit did not find an outlet and had to be disposed of at the growers' loss, after a period of weeks standing in box bins in ambient conditions. Consequently, the quantity of apples stored or at least retained on orchard premises was greater than normal.

Seven different storage methods were identified during this survey. Controlled atmosphere scrubbed stores, representing 35% of stored apples, are refrigerated un-vented stores which use a method to remove and expel carbon dioxide and other gasses from the atmosphere. Unscrubbed controlled atmosphere stores, which are refrigerated and use vents to reduce carbon dioxide levels, accounted for 32% of stored apples. Cold/refrigerated stores, which have no modified atmosphere and use cooled, forced air ventilation, accounted for 7% of stored apples. 13% of stored apples were in carbon dioxide

stores and ethylene stores accounted for 8%. Approximately 1% were stored in ventilated barn stores, 1% in unventilated barn stores.

The ethylene inhibitor, 1-methylcyclopropene, was the most common product recorded in use on stored apples, accounting for 97% of stored apples treated. Due to the increase in tonnes of bramley apples stored this would indicate an increase in the usage of 1-methylcyclopropene as a storage treatment. However, due to its application method, it was impossible to calculate the weight of active ingredient applied. The fungicide cyprodnil/fludioxinil was recorded in use on stored apples accounting for 3% of treated Bramley apples.

The active ingredients recorded in use on stored apples are shown in tables 18 to 21.

## ACKNOWLEDGEMENTS

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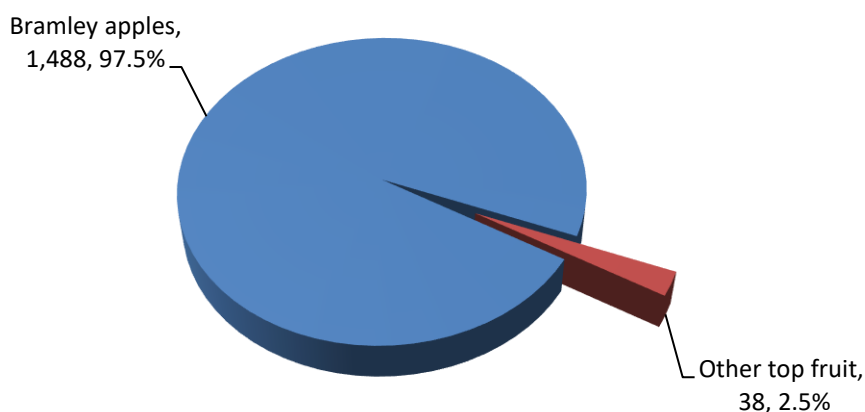
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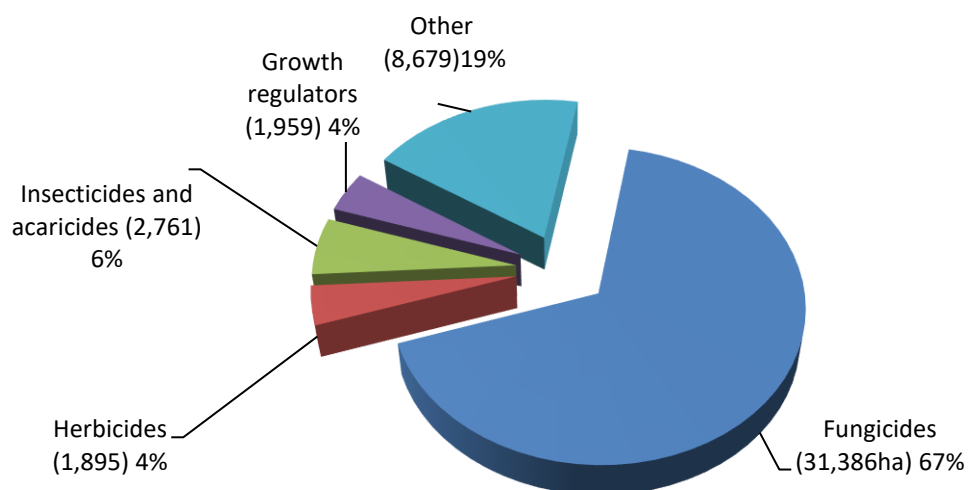
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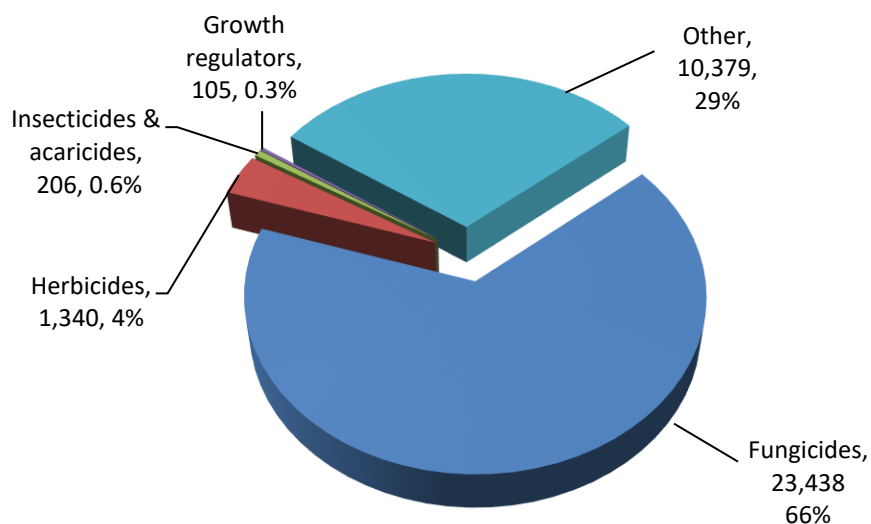
**Figure 1** Utilisation of top fruit production area in Northern Ireland, 2016.



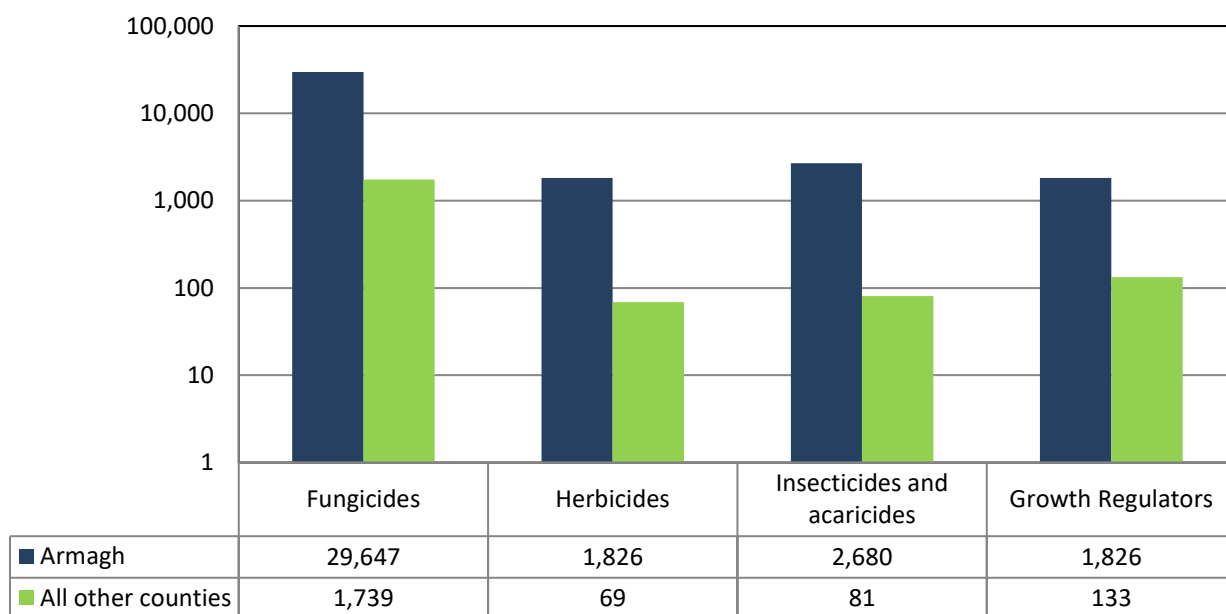
**Figure 2** Proportional area (spha) of top fruit crops treated with each pesticide type in Northern Ireland, 2016.



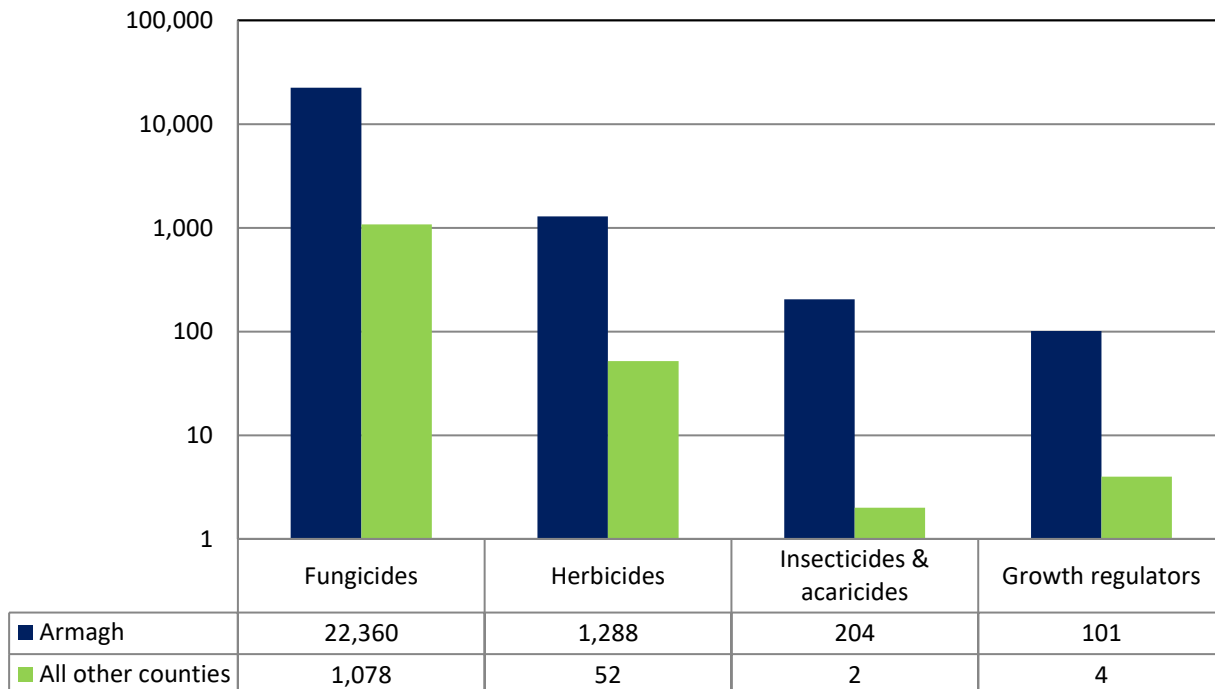
**Figure 3** Proportion of top fruit crops treated with each pesticide type by weight (kg) in Northern Ireland, 2016.



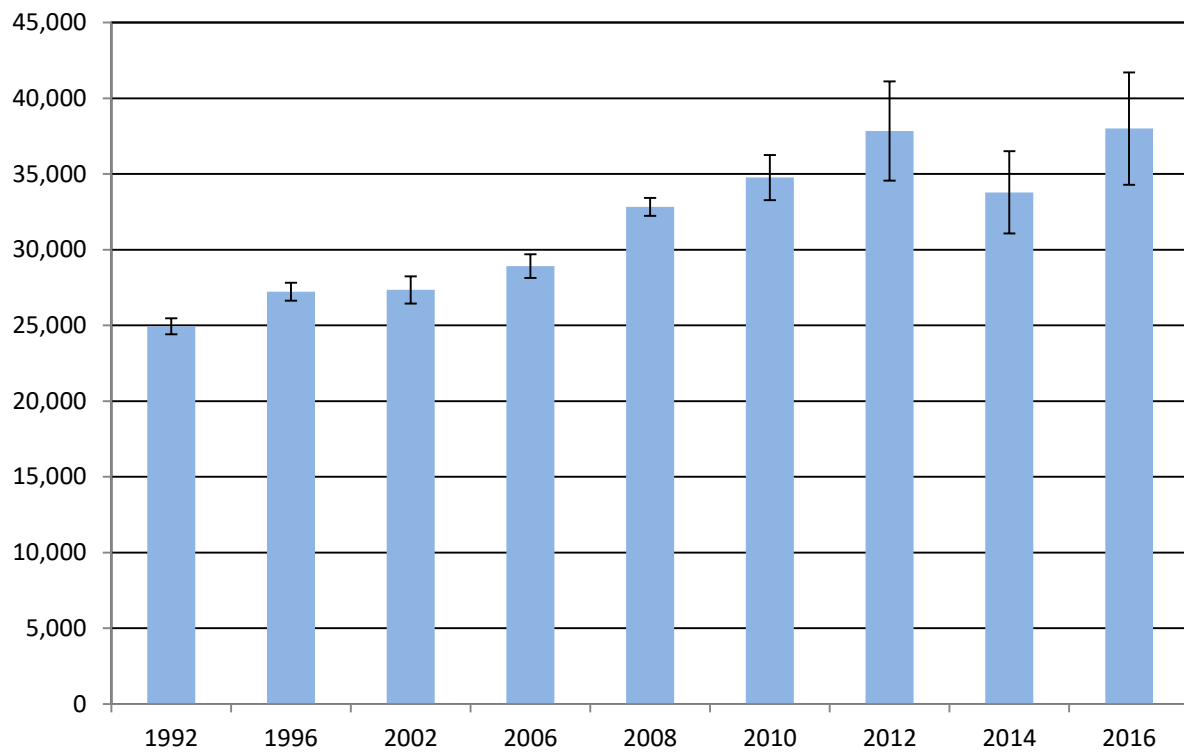
**Figure 4** Area (spha ( $\log_{10}$ )) of top fruit crops treated with each pesticide type in the county regions of Northern Ireland, 2016.



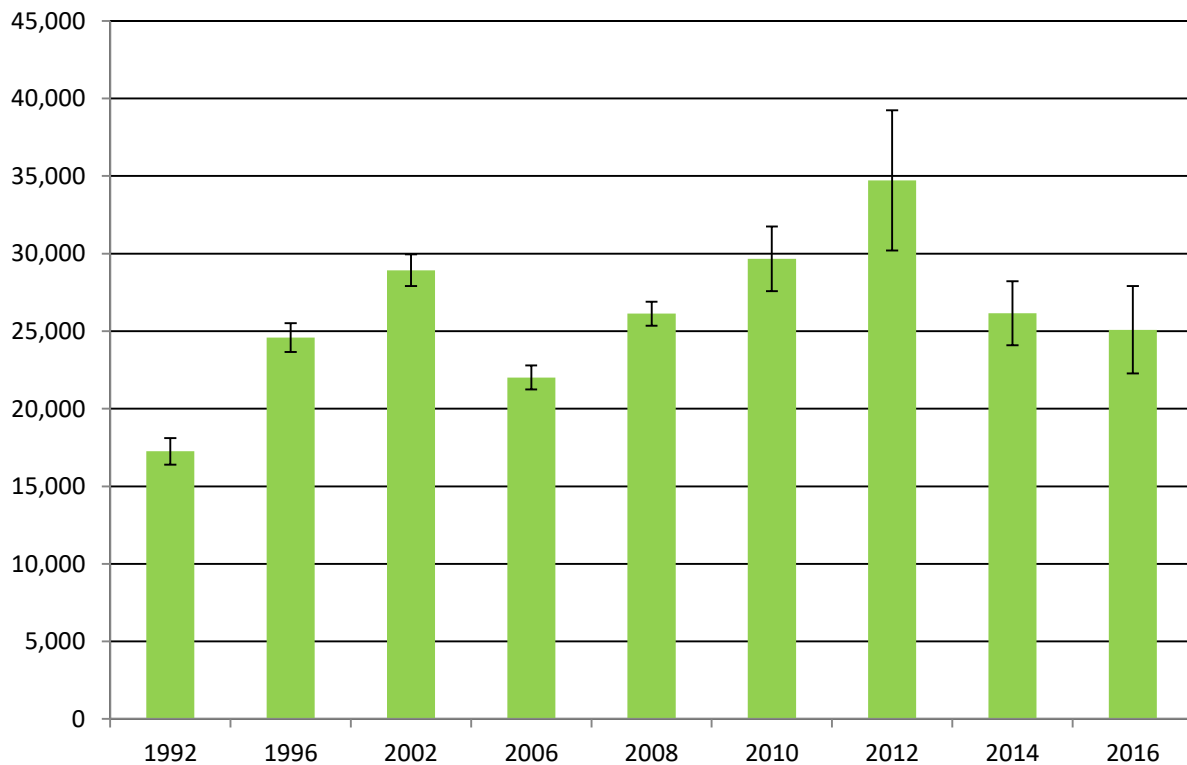
**Figure 5** Quantity (kg ( $\log_{10}$ )) of each pesticide type applied to top fruit crops in the county regions of Northern Ireland, 2016.



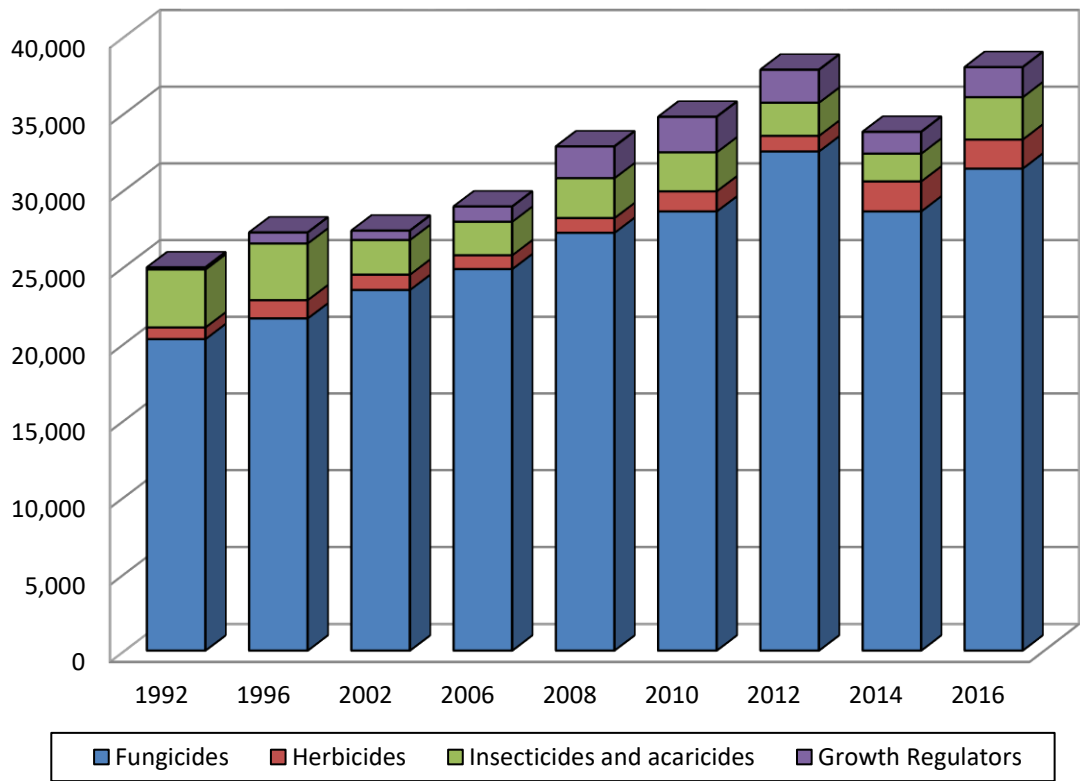
**Figure 6** Comparison of pesticide usage on top fruit crops by area treated (spha) in Northern Ireland, 1992-2016 (*Bars are Standard Error*).



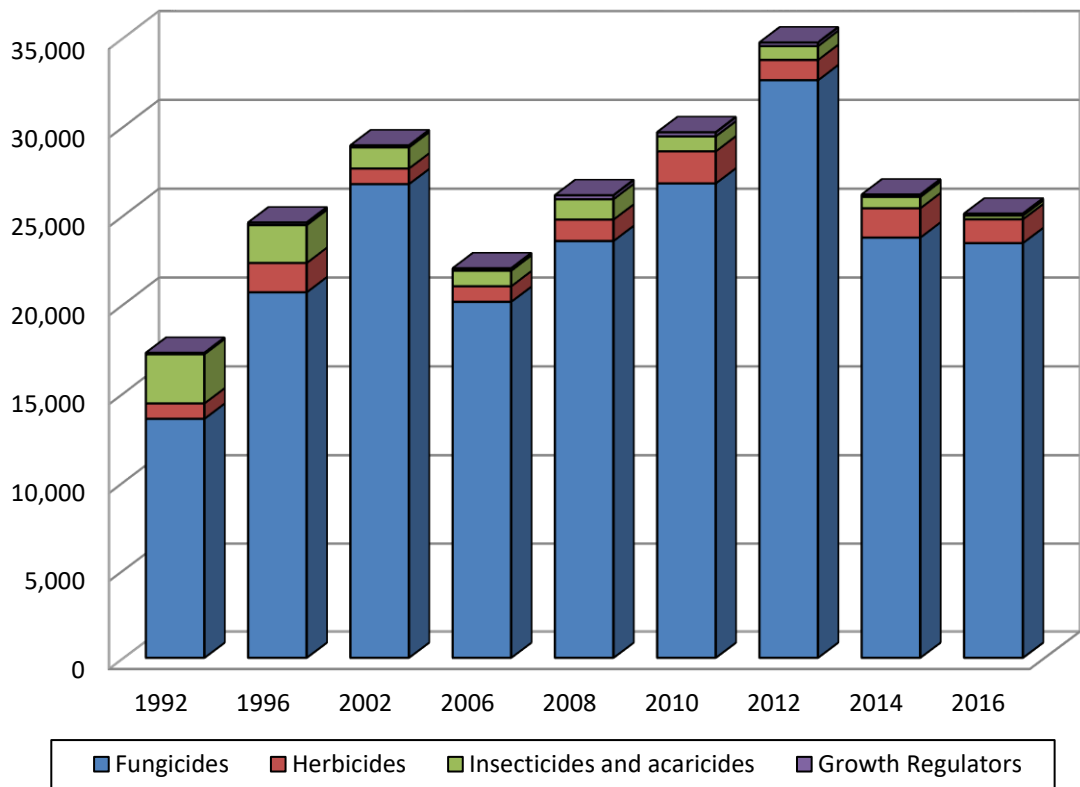
**Figure 7** Comparison of pesticide usage on top fruit crops by total weight applied (kg) in Northern Ireland, 1992-2016 (*Bars are Standard Error*).



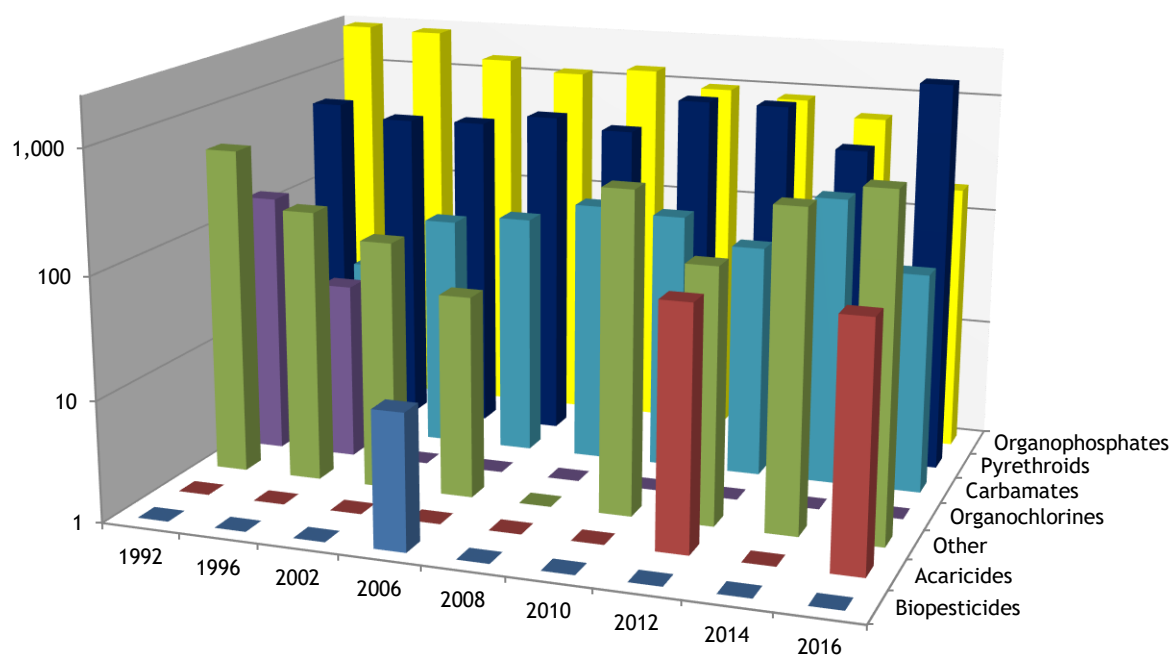
**Figure 8** Comparison of area treated (spha) with different pesticide groups in Northern Ireland, 1992-2016.



**Figure 9** Comparison of quantity (kg) of different pesticide groups applied to top fruit crops in Northern Ireland, 1992-2016.

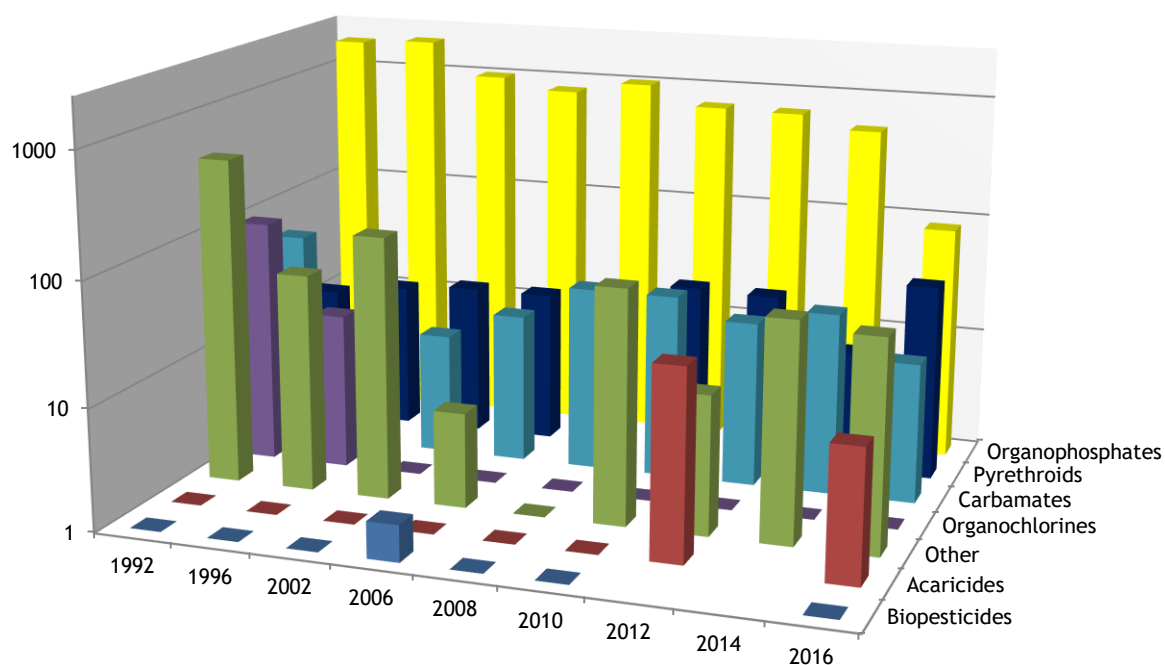


**Figure 10** Comparison of area (spha ( $\log_{10}$ )) of top fruit crops treated with different insecticide types in Northern Ireland, 1992-2016.



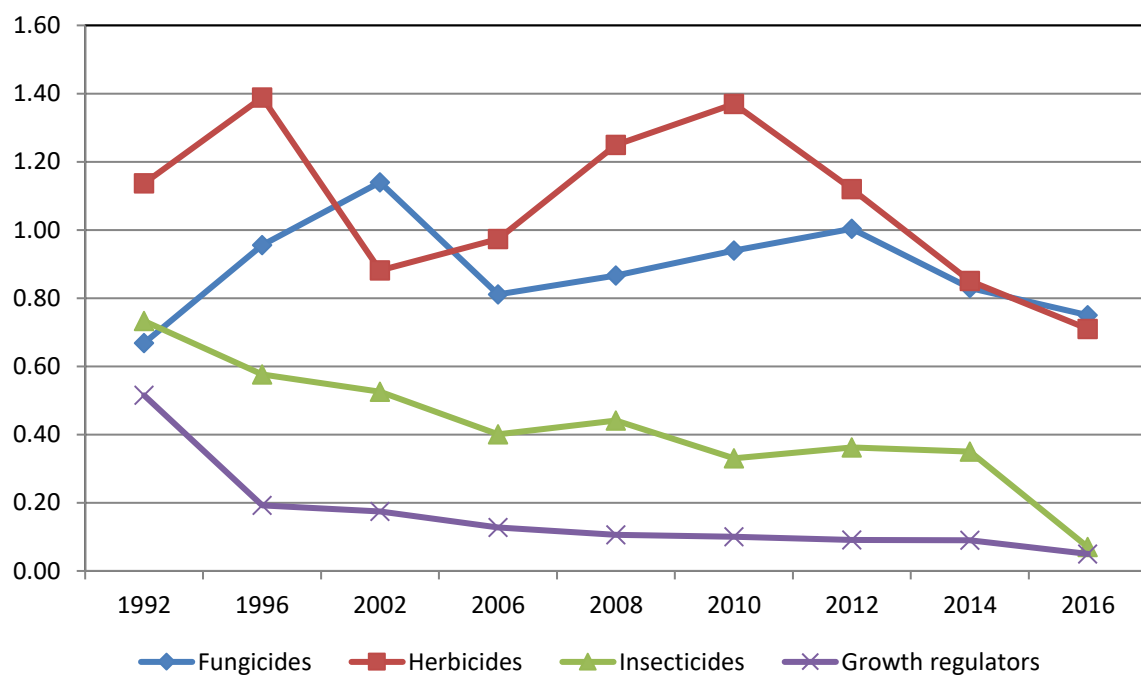
*\*Acaricides previously included with 'Other'*

**Figure 11** Comparison of quantity (kg ( $\log_{10}$ )) of different insecticide types applied to top fruit crops in Northern Ireland, 1992-2016.

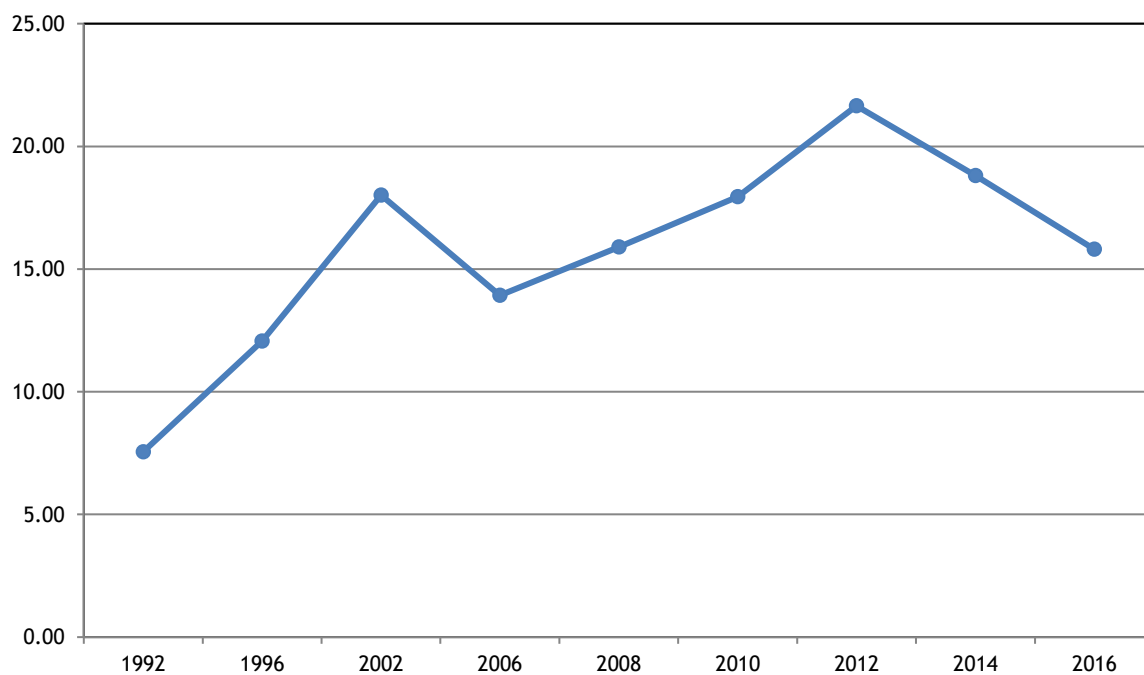


*\*Acaricides previously included with 'Other'*

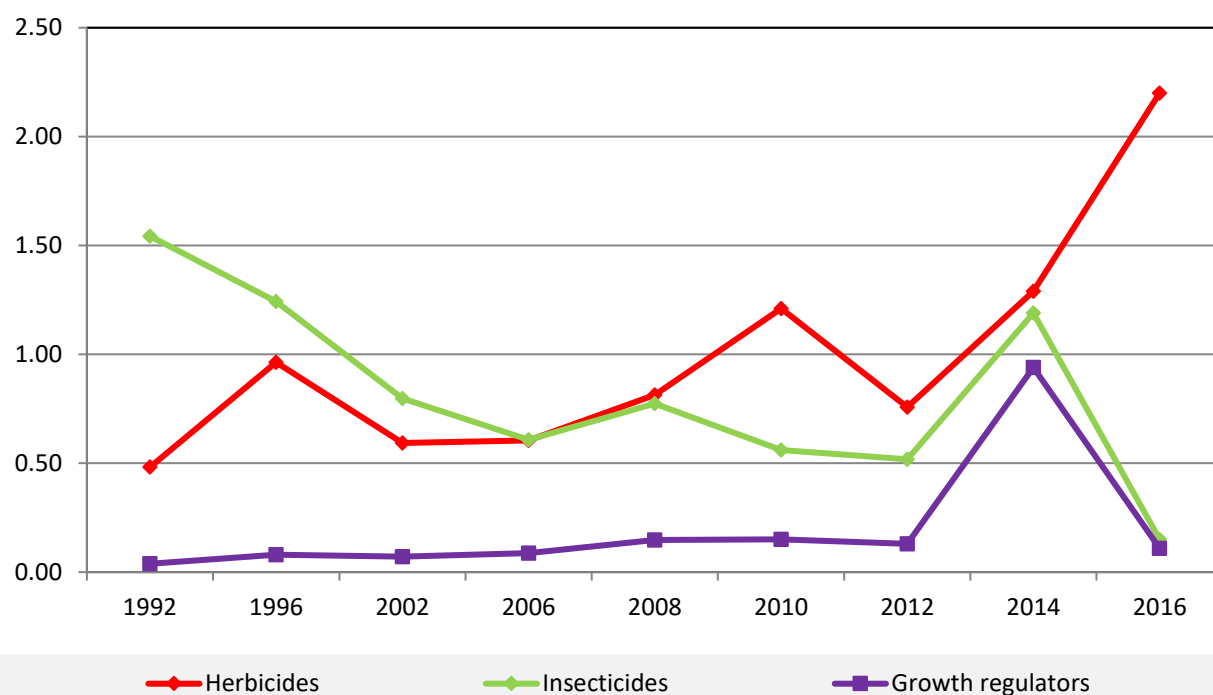
**Figure 12** Comparison of application rates (kg/spha) for pesticide types used on top fruit crops in Northern Ireland, 1992-2016.



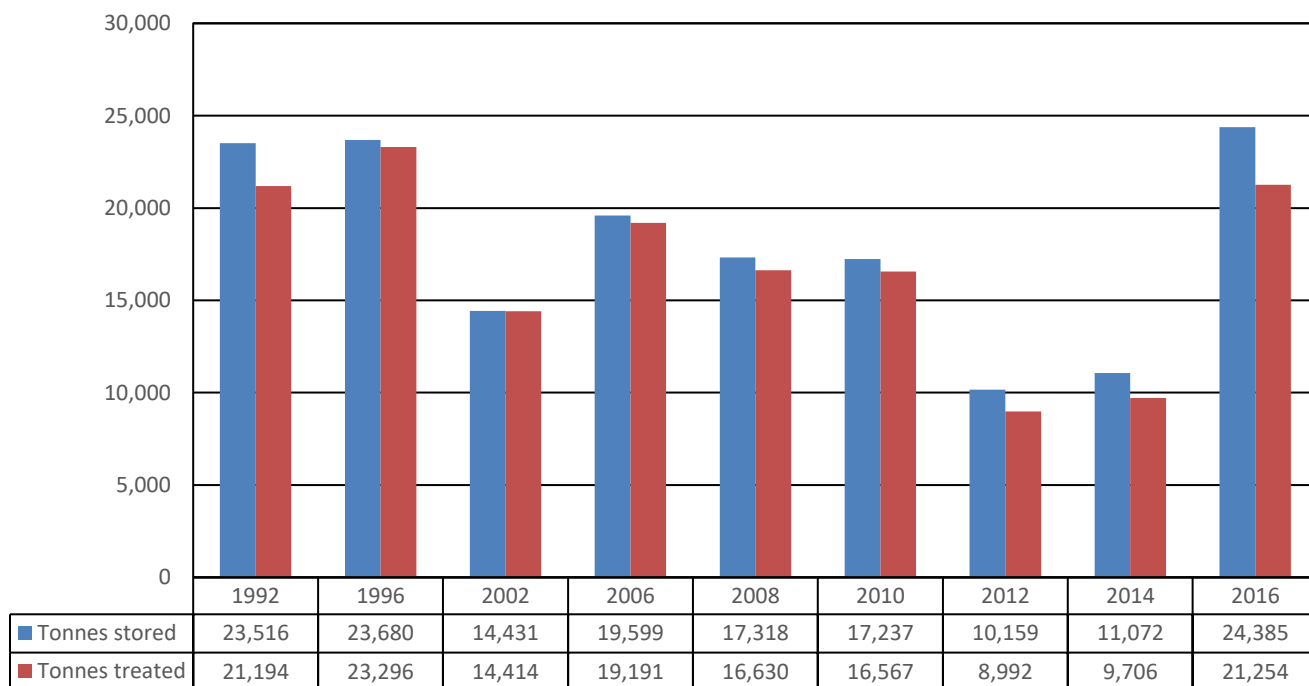
**Figure 13** Quantity of fungicides applied (kg/ha) per hectare of total top fruit crop in Northern Ireland, 1992-2016.



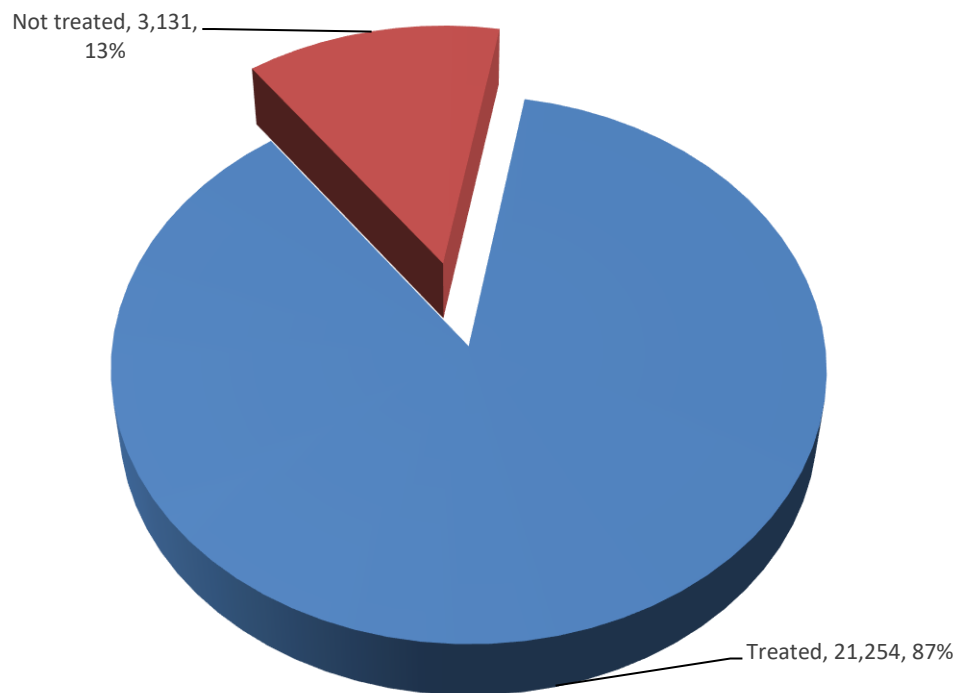
**Figure 14** Quantity of herbicides, insecticides and growth regulators applied per hectare of total top fruit crop (kg/ha) in Northern Ireland, 1992-2016.



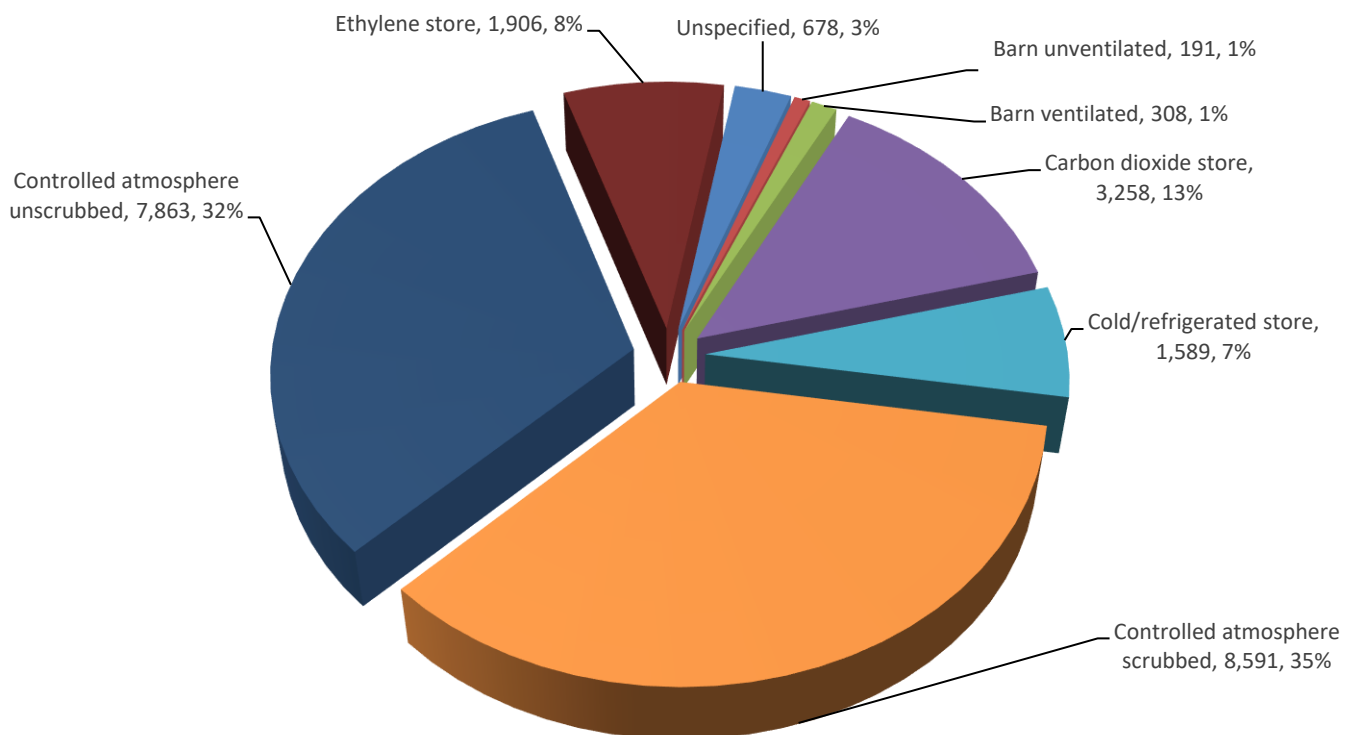
**Figure 15** Quantity of Bramley apples stored and quantity receiving a post-harvest treatment (tonnes) in Northern Ireland, 1992-2016.



**Figure 16** Quantity (tonnes) of stored Bramley apples receiving post-harvest treatments in Northern Ireland, 2016.



**Figure 17** Quantity of Bramley apples stored (tonnes) and the storage methods used in Northern Ireland, 2016.





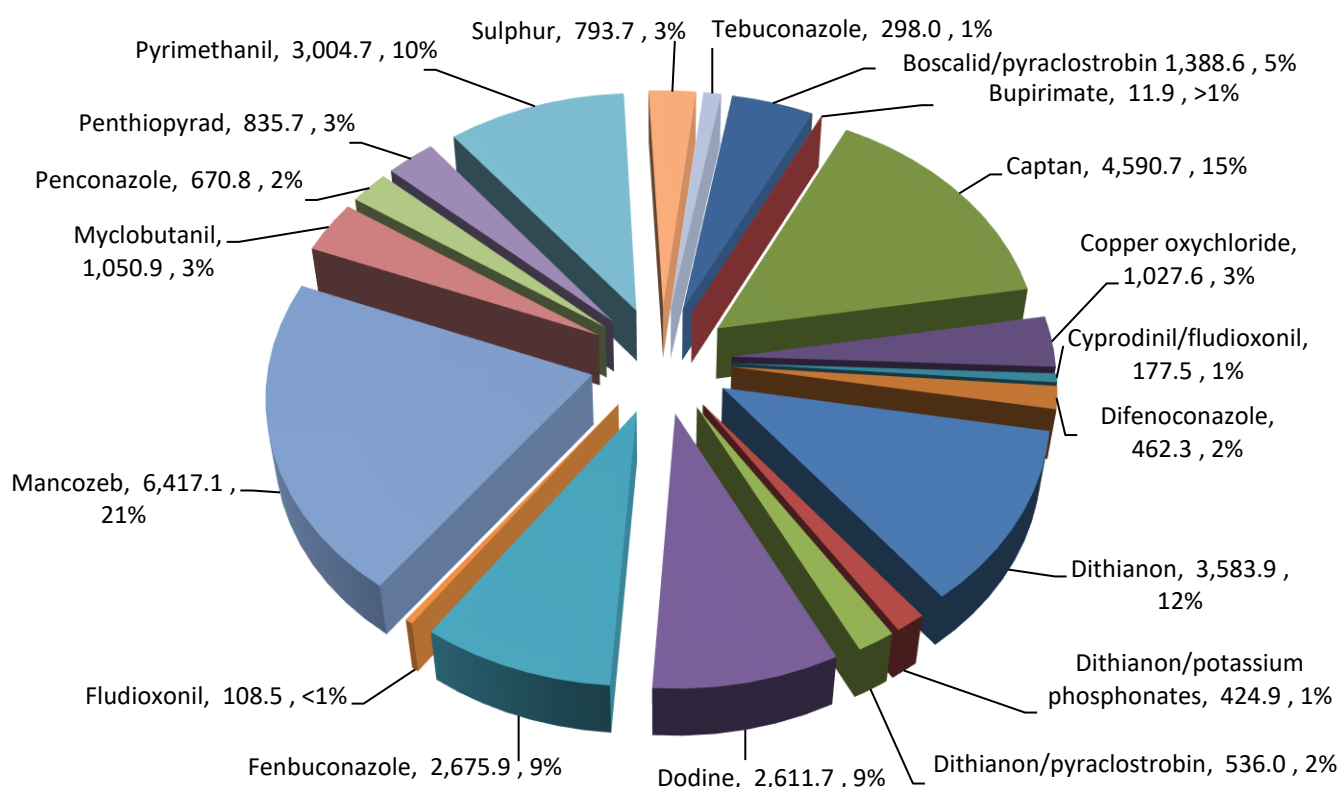
## PESTICIDE USAGE ON BRAMLEY APPLE CROPS

- Total area grown: 1,488 hectares
- Basic area treated: 1,404 hectares
- Total area treated: 45,804 spray hectares
- Weight of active substances applied: 34,860 kilogrammes
- 19 different fungicide substances, 8 insecticide/acaricides, 7 herbicides and 4 growth regulators were applied to Bramley apple crops

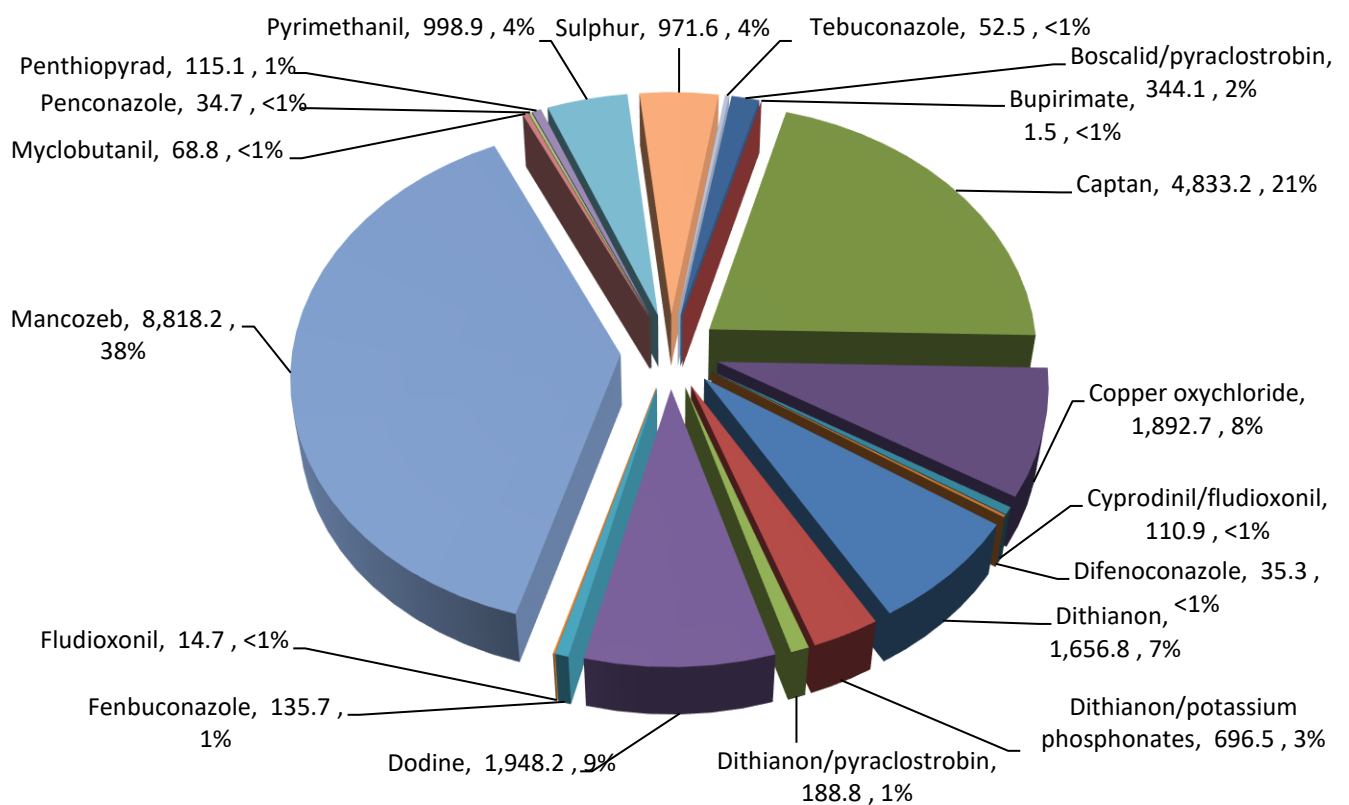
### Fungicides – Bramley apples

- Basic area treated: 1,484 hectares
- Total area treated: 30,670 spray hectares
- Weight of active substances applied: 22,918 kilogrammes
- Fungicides accounted for 67% of total area treated and 66% of total weight applied
- The most commonly used fungicides were mancozeb, captan, dithianon, pyrimethanil and fenbuconazole, being applied to 20,273 spray hectares of Bramley apple crops

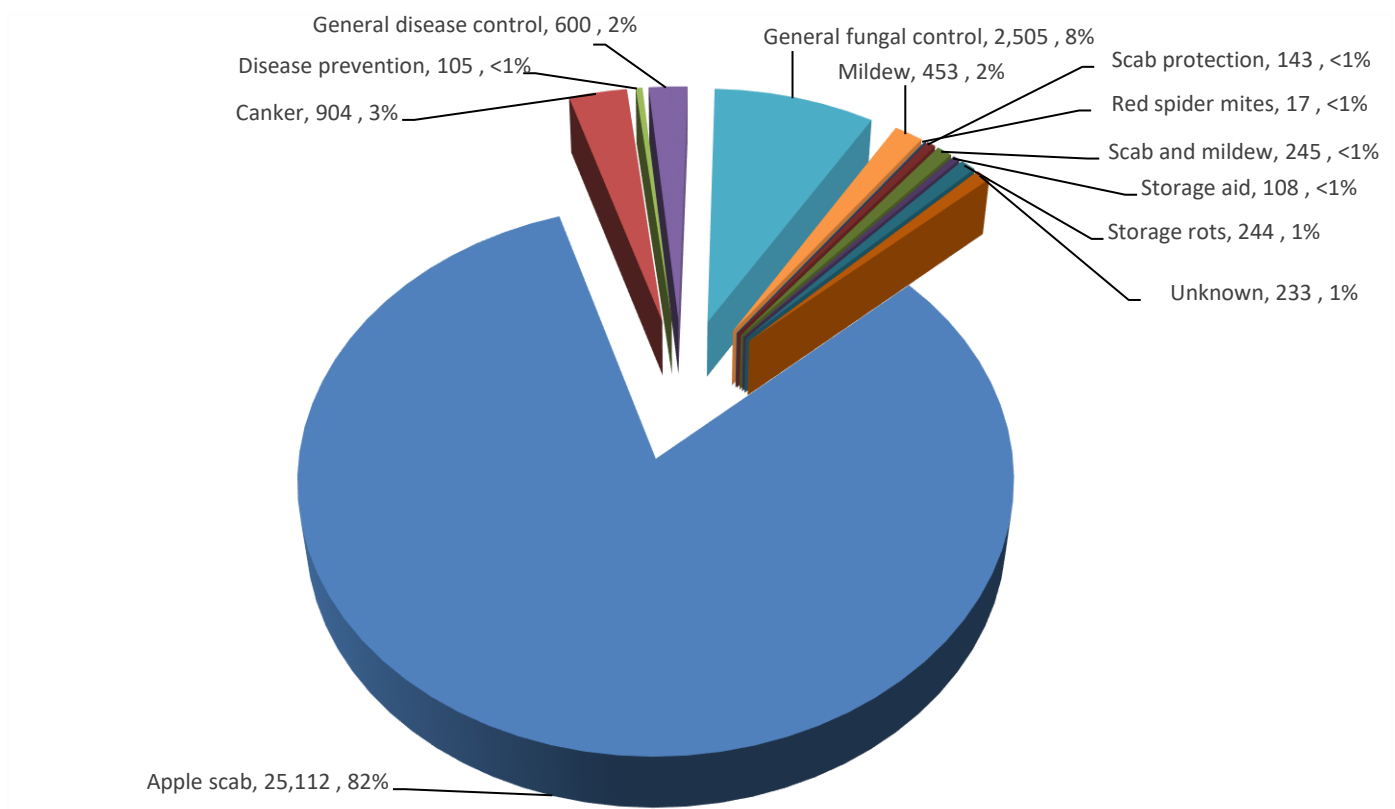
**Figure 18** Total area (spha) of Bramley apple crops treated with fungicide active ingredients in Northern Ireland, 2016.



**Figure 19** Total quantity (kg) of fungicide active ingredients applied to Bramley apple crops in Northern Ireland, 2016.



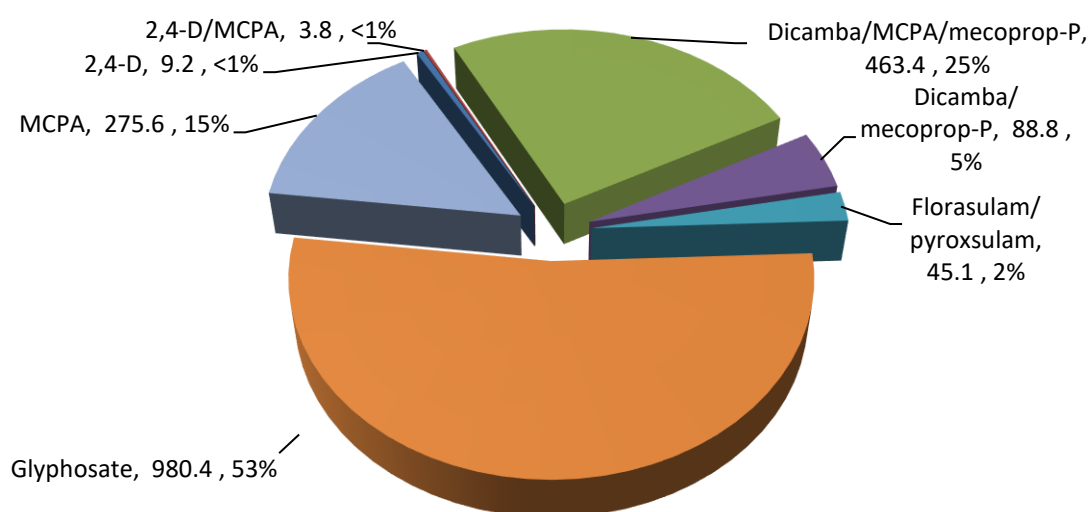
**Figure 20** Bramley apples: Reasons for fungicide use (spha), 2016.



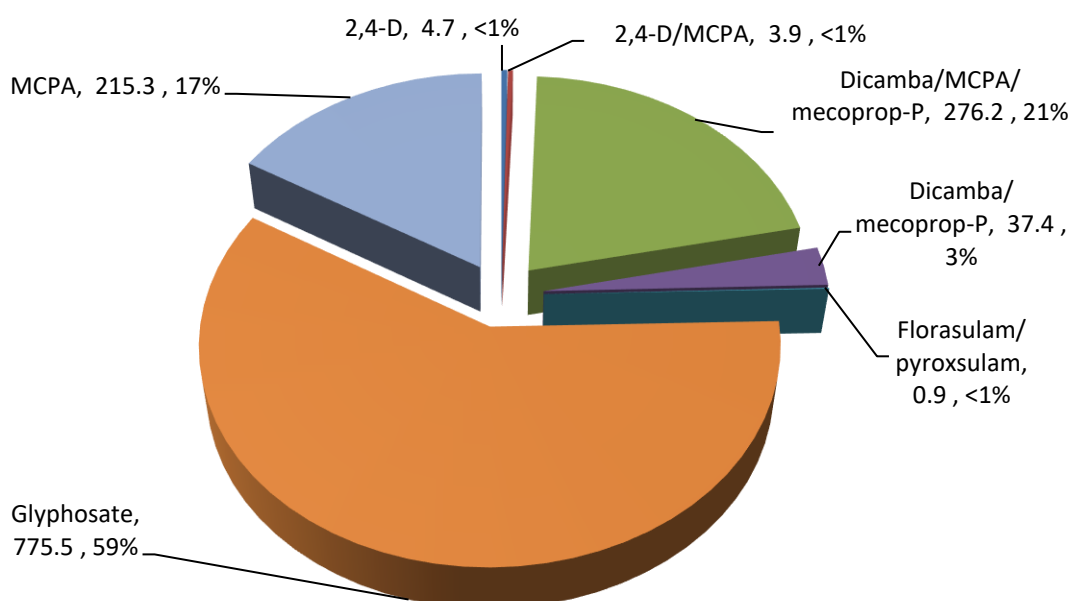
## Herbicides – Bramley apples

- Basic area treated: 610 hectares
- Total area treated: 1,866 spray hectares
- Weight of active substances applied: 1,314 kilogrammes
- Herbicides accounted for 4% of both the total area treated and total weight applied
- The most frequently used herbicide was glyphosate, applied to 980 spray hectares of Bramley orchard floor areas, accounting for 59% of the total weight of herbicides applied

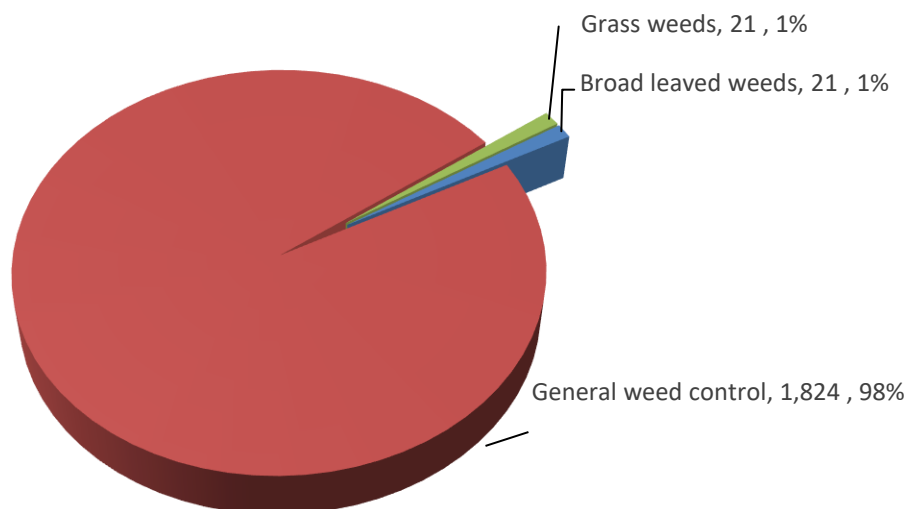
**Figure 21** Total area (spha) of Bramley apple crops treated with herbicide active ingredients in Northern Ireland, 2016.



**Figure 22** Total quantity (kg) of herbicide active ingredients applied to Bramley apple crops in Northern Ireland, 2016.



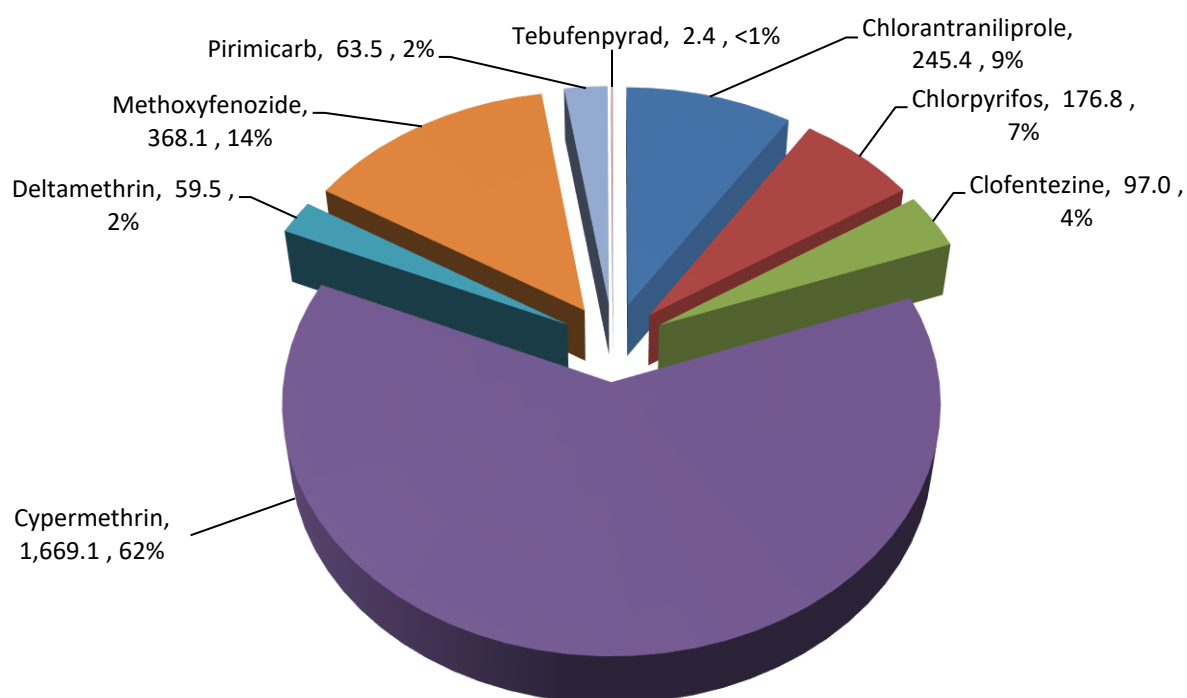
**Figure 23** Bramley apples: Reasons for herbicide use (spha), 2016.



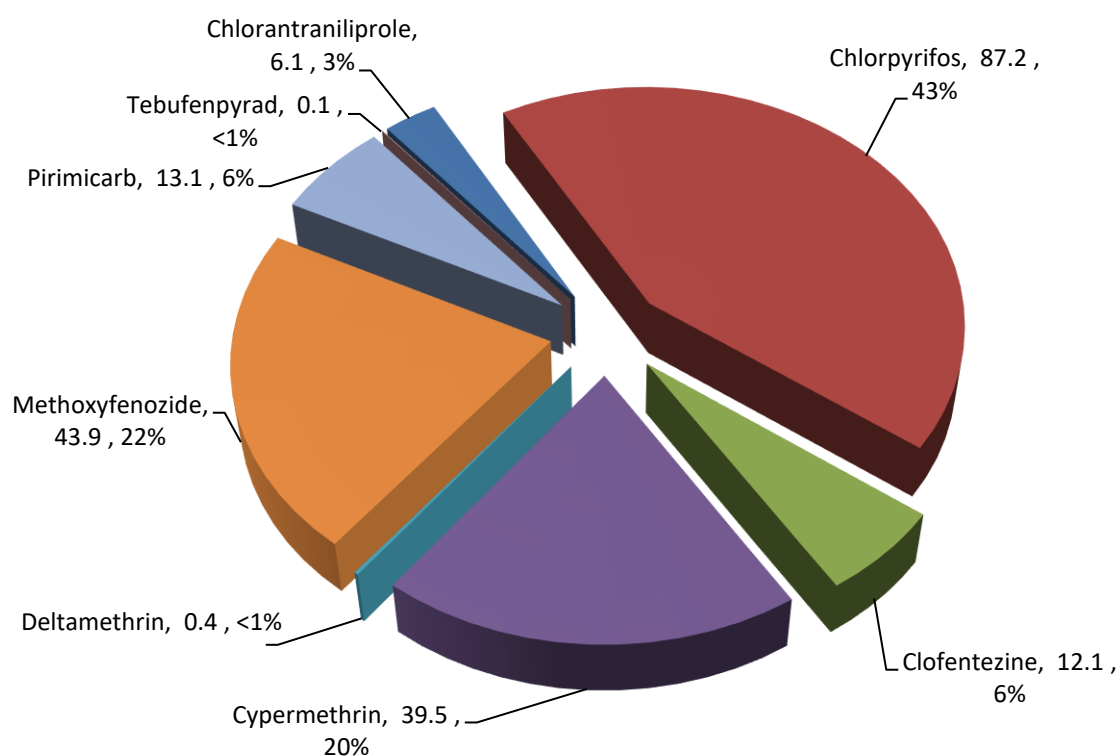
### ***Insecticide/acaricides – Bramley apples***

- Basic area treated: 1,364 hectares
- Total area treated: 2,682 spray hectares
- Weight of active substances applied: 202 kilogrammes
- Insecticide/acaricides accounted for 6% of the total area treated and 1% of the total weight applied

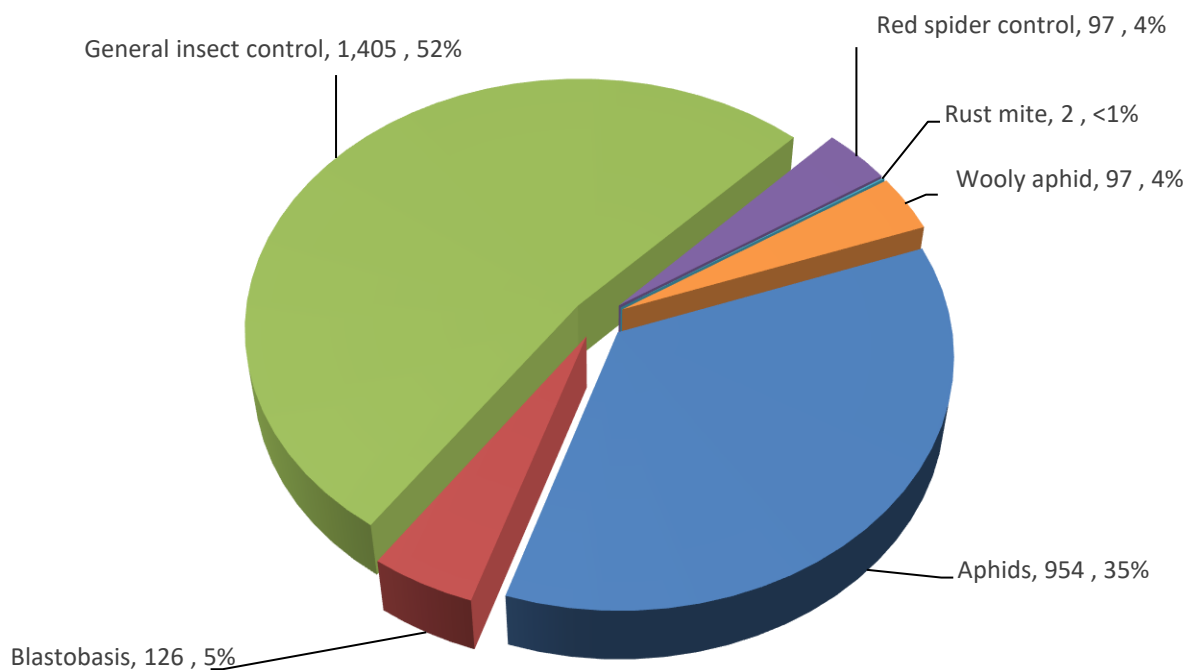
**Figure 24** Total area (spha) of Bramley apple crops treated with insecticide/acaricide active ingredients in Northern Ireland, 2016.



**Figure 25** Total quantity (kg) of insecticide/acaricide active ingredients applied to Bramley apple crops in Northern Ireland, 2016.



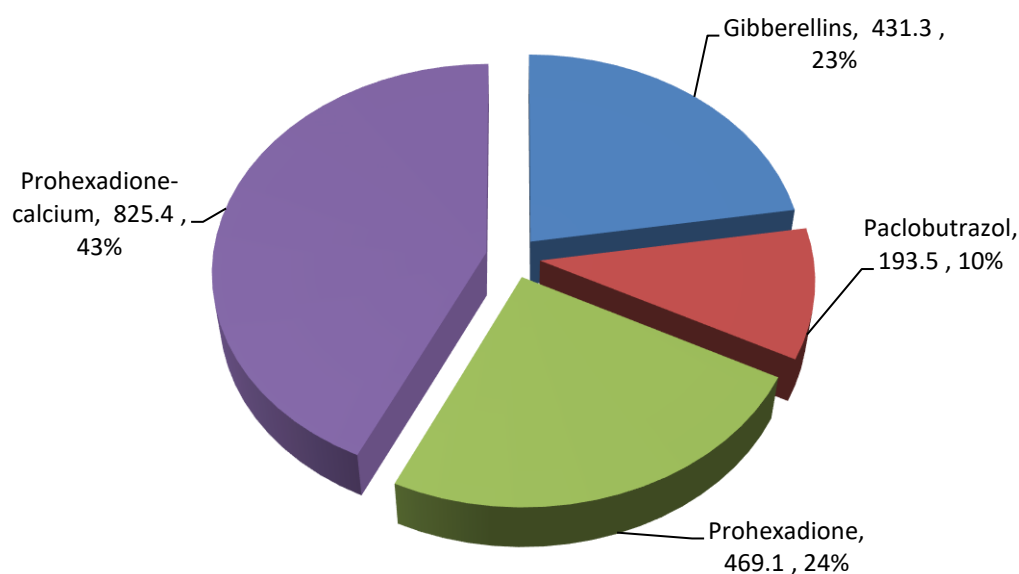
**Figure 26** Bramley apples: Reasons for insecticide/acaricide use (spha), 2016.



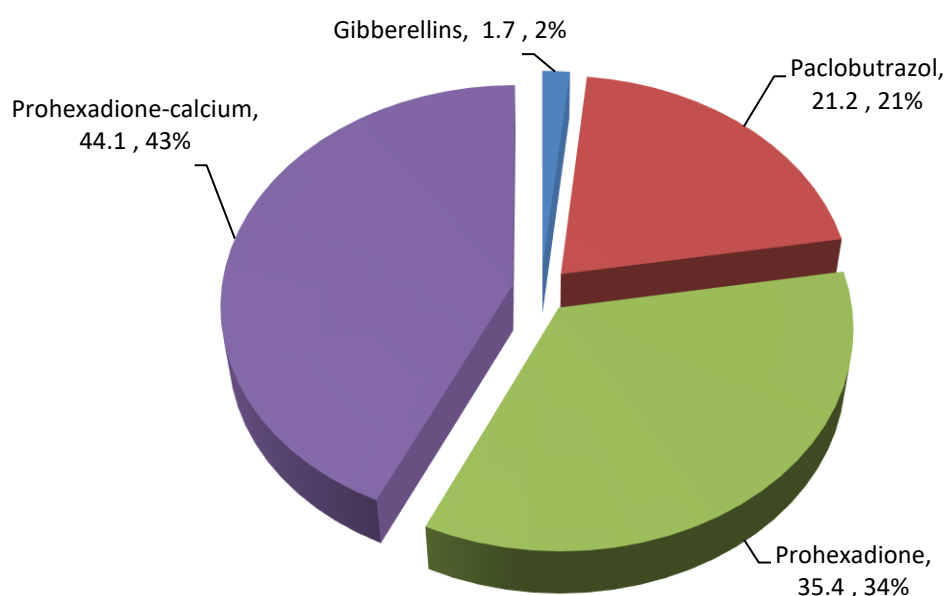
## Growth regulators – Bramley apples

- Basic area treated: 926 hectares
- Total area treated: 1,919 spray hectares
- Weight of active substances applied: 102 kilogrammes
- Growth regulators accounted for 4% of the total area treated and 0.3% of the total weight applied
- All applications were for growth regulation

**Figure 27** Total area (spha) of Bramley apple crops treated with growth regulator active ingredients in Northern Ireland, 2016.



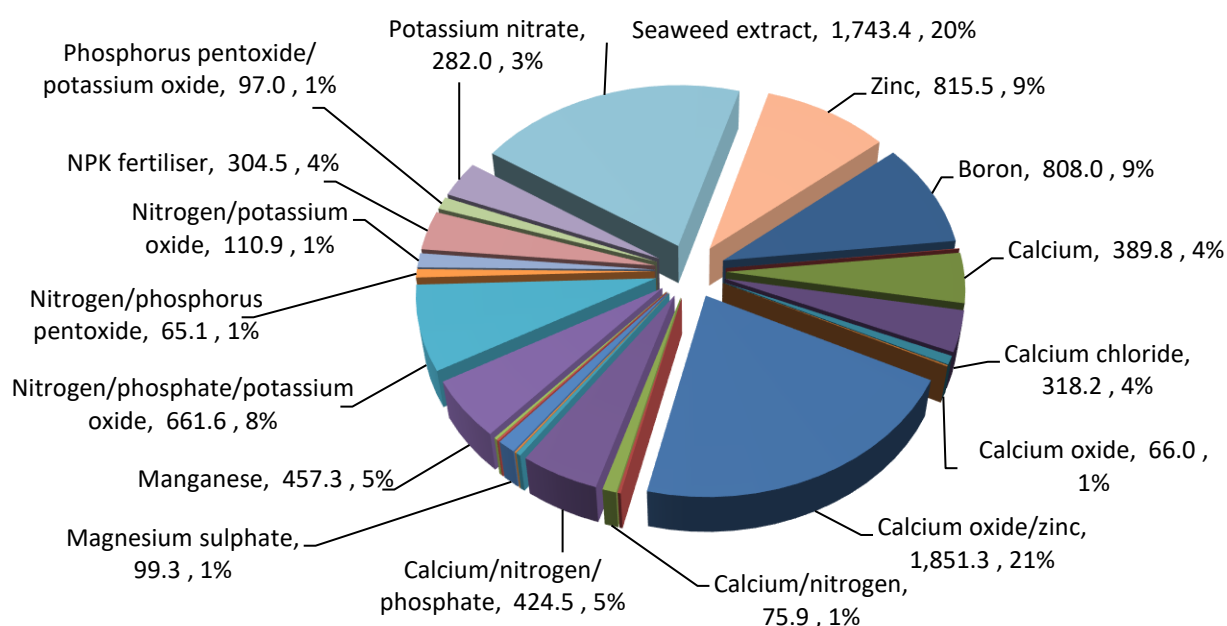
**Figure 28** Total quantity (kg) of growth regulator active ingredients applied to Bramley apple crops in Northern Ireland, 2016.



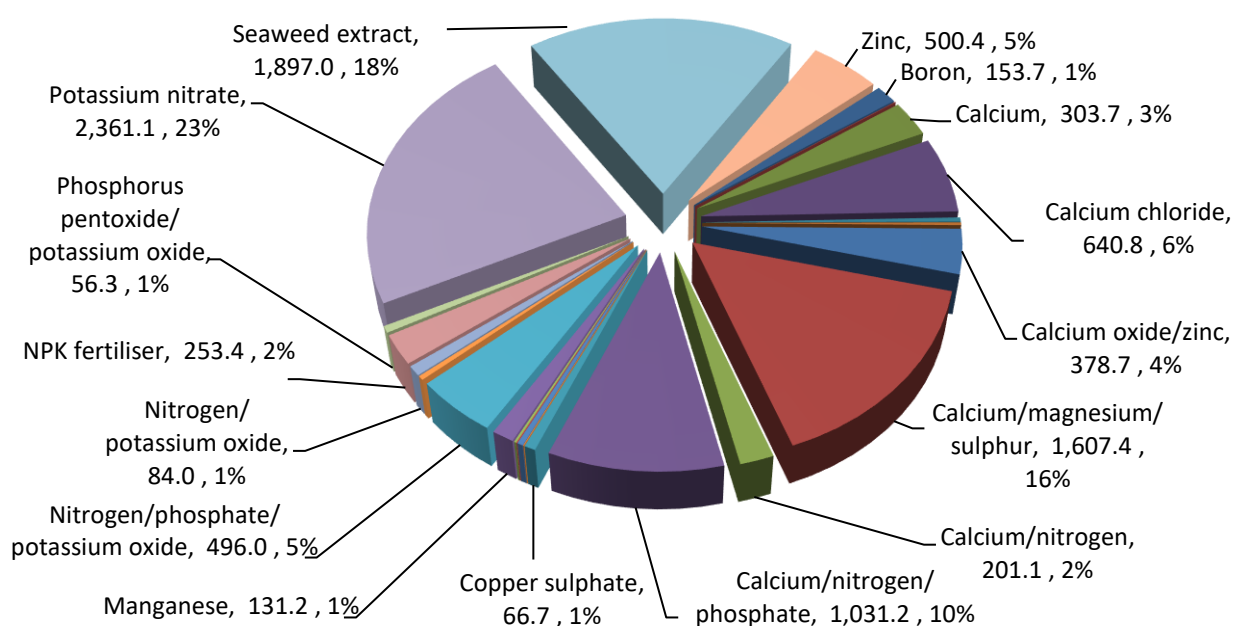
### **'Other products' – Bramley apples**

- Total area treated: 8,667 spray hectares
- Weight of 'other products' applied: 10,323 kilogrammes
- 'Other products' accounted for 19% of total area treated and 30% of the total weight applied

**Figure 29** Total area (spha) of Bramley apple crops treated with 'other products' in Northern Ireland, 2016.



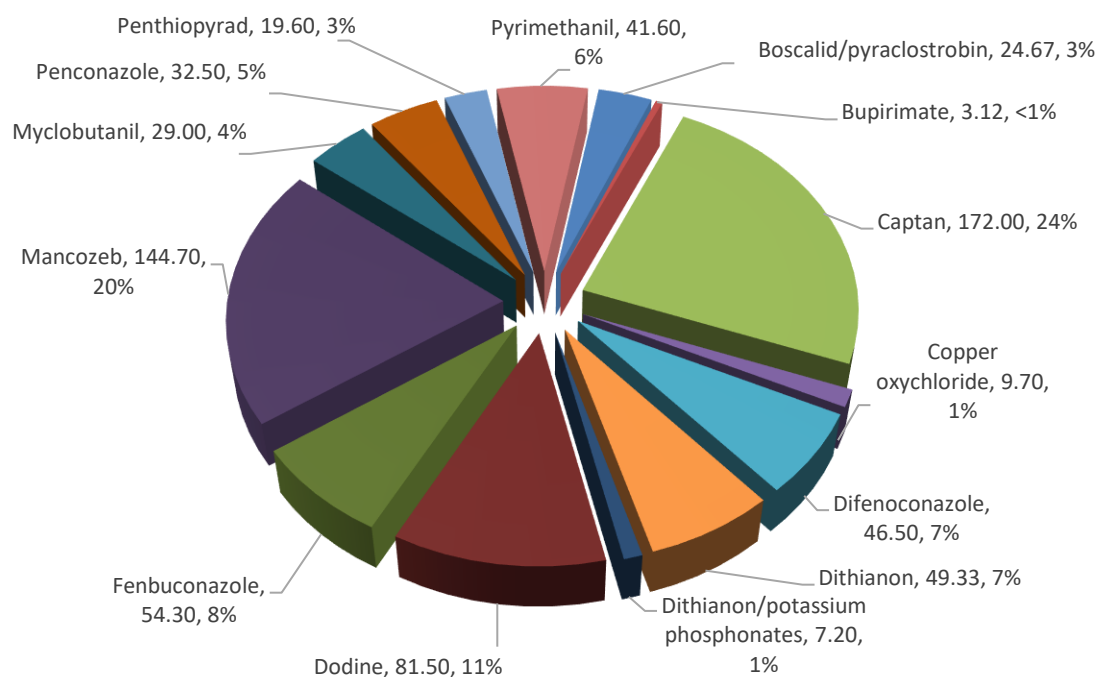
**Figure 30** Total quantity (kg) of 'other' products applied to Bramley apple crops in Northern Ireland, 2016.



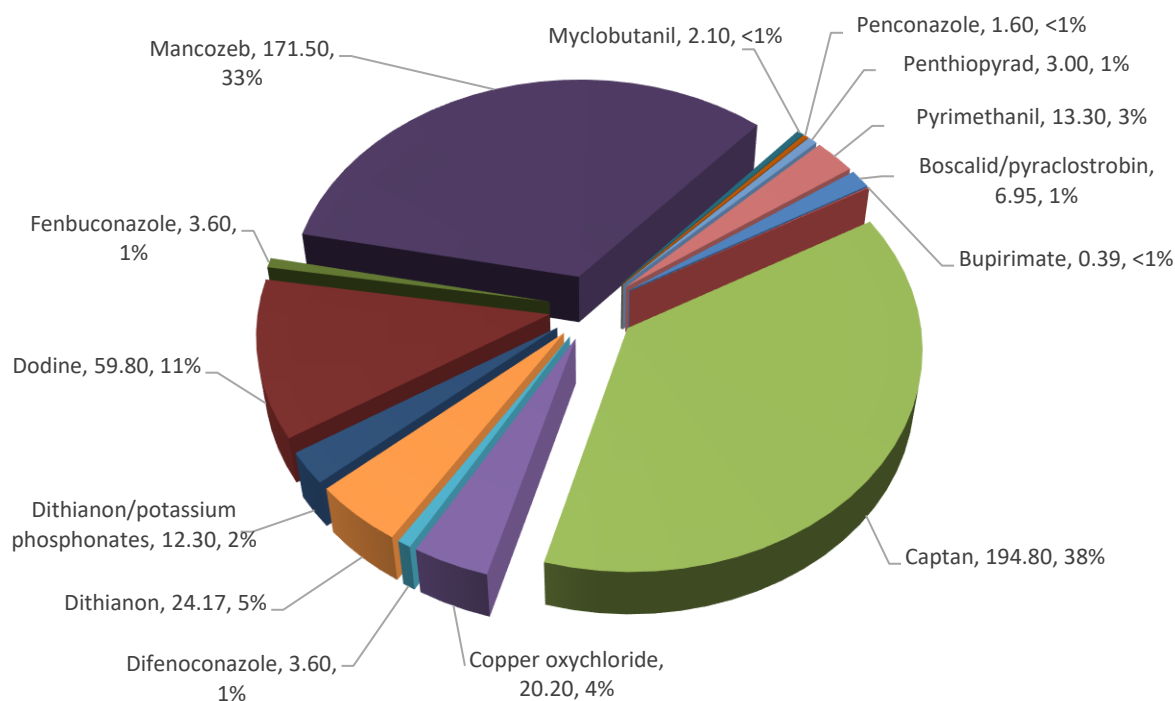
**'Other products' included foliar feeds, trace elements and calcium-based products of which the majority were used to treat potential nutritional disorders.**

## PESTICIDE USAGE ON 'OTHER' TOP FRUIT CROPS

**Figure 31** Total area (spha) of 'other' top fruit crops treated with fungicide active ingredients in Northern Ireland, 2016.



**Figure 32** Total quantity (kg) of fungicides applied to 'other' top fruit crops in Northern Ireland, 2016.



**A further 249 sp ha. Of "Other" top fruit crops were treated with growth regulators, herbicides, insecticides and other pesticides (see Tables 9, 10 and 14).**



**Table 1** The total number of farms and the number of holdings surveyed from each size group in Northern Ireland, 2016.

County	Size Group (hectares)											
	2<4		4<6		6<9		9<14		14+		Total	
	A	B	A	B	A	B	A	B	A	B	A	B
Armagh	32	6	28	8	17	12	17	14	34	11	128	51
All other counties	1	0	4	1	1	0	1	0	3	1	10	2
<b>Northern Ireland</b>	<b>33</b>	<b>6</b>	<b>32</b>	<b>9</b>	<b>18</b>	<b>12</b>	<b>18</b>	<b>14</b>	<b>37</b>	<b>12</b>	<b>138</b>	<b>53</b>

**Legend**

A = Total number of holdings in strata

B = Number of holdings surveyed

**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, 2016.

Crop type	Grown area	Surveyed area	Proportion of crop surveyed
Bramley apples	1,488	644	43%
Other top fruit	38	14	37%

**Table 3** Estimated area (ha) of top fruit crops grown regionally in Northern Ireland, 2016.

	County		
	Armagh	All other counties	Northern Ireland
Bramley apples	1,409	79	1,488
Other top fruit	37	1	38
<b>All Crops</b>	<b>1,446</b>	<b>80</b>	<b>1,526</b>

**Table 4** Estimated area (spha) of top fruit crops receiving treatments, categorised by pesticide type and region in Northern Ireland, 2016.

County	Pesticide Type					Northern Ireland
	Fungicides	Herbicides	Insecticides and acaricides	Growth regulators	Other	
Armagh	29,647	1,826	2,680	1,826	8,438	44,416
All other counties	1,739	69	81	133	331	2,353
<b>Total</b>	<b>31,386</b>	<b>1,895</b>	<b>2,761</b>	<b>1,959</b>	<b>8,769</b>	<b>46,770</b>

**Table 5** Estimated quantity (kg) of pesticide active ingredients applied to top fruit crops, categorised by pesticide type and region in Northern Ireland, 2016.

<i>Pesticide Type</i>						<b>Northern Ireland</b>
<i>County</i>	<b>Fungicides</b>	<b>Herbicides</b>	<b>Insecticides and acaricides</b>	<b>Growth regulators</b>	<b>Other</b>	
Armagh	22,360	1,288	204	100	10,251	34,204
All other counties	1,078	52	2	4	128	1,264
<b>All pesticides</b>	<b>23,438</b>	<b>1,340</b>	<b>204</b>	<b>104</b>	<b>10,380</b>	<b>35,468</b>

**Table 6** Estimated quantity (kg) of pesticide active ingredients applied to top fruit crops, categorised by pesticide type and crop type in Northern Ireland, 2016.

<i>Pesticide Type</i>						<b>Total quantity (kg)</b>
<i>Crop Type</i>	<b>Fungicides</b>	<b>Herbicides</b>	<b>Insecticides and acaricides</b>	<b>Growth regulators</b>	<b>Other</b>	
Bramley apples	22,918	1,314	202	102	10,323	34,860
Other top fruit	519	26	4	2	57	220
<b>All Crops</b>	<b>23,438</b>	<b>1,340</b>	<b>206</b>	<b>104</b>	<b>10,380</b>	<b>35,468</b>

**Table 7** The basic area (ha) and the total area (spha) of top fruit crops treated with each pesticide type in Northern Ireland, 2016.

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	1,484	30,670	610	1,866	1,364	2,682	926	1,919	1,061	8,667	1404	45,804
Other top fruit	35	715	13	29	28	80	13	39	17	102	34	965
<b>All Crops</b>	<b>1,519</b>	<b>31,385</b>	<b>623</b>	<b>1,895</b>	<b>1,392</b>	<b>2,762</b>	<b>939</b>	<b>1,958</b>	<b>1,078</b>	<b>8,769</b>	<b>1,438</b>	<b>46,770</b>

**Table 8** The mean number of spray applications of pesticides applied to top Fruit crops in Northern Ireland, 2016.

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	19.5	10.9	2.8	1.5	1.8	1.7	1.9	1.9	7.9	5.7	7.4	4.7
Other top fruit	19.4	11.3	2.0	1.8	2.4	2.7	2.5	2.5	6.8	5.9	7.6	5.4
<b>All crops average</b>	<b>19.5</b>	<b>10.9</b>	<b>2.7</b>	<b>1.5</b>	<b>1.8</b>	<b>1.7</b>	<b>1.9</b>	<b>1.9</b>	<b>7.9</b>	<b>5.7</b>	<b>7.4</b>	<b>4.7</b>

**Legend**

A = Number of applications of treatment type.

B = Number of Spray applications accounting for tank mixes.

**Table 9** Estimated area (spha) of top fruit crops treated with pesticide formulations in Northern Ireland, 2016.

Pesticide group and active ingredient	Crop type			
	Bramley apples	Dessert apples	Dessert pears	Total area
<b>Fungicides</b>				
Boscalid/pyraclostrobin	1,389	25	.	1,413
Bupirimate	12	3	.	15
Captan	4,591	157	15	4,763
Copper oxychloride	1,028	7	3	1,037
Cyprodinil/fludioxonil	177	.	.	177
Difenoconazole	462	35	12	508
Dithianon	3,584	49	.	3,633
Dithianon/potassium phosphonates	425	4	3	432
Dithianon/pyraclostrobin	536	.	.	536
Dodine	2,612	67	15	2,693
Fenbuconazole	2,676	39	15	2,730
Fludioxonil	108	.	.	108
Mancozeb	6,417	131	14	6,562
Myclobutanil	1,051	26	3	1,080
Penconazole	671	29	3	703
Penthiopyrad	836	17	3	855
Pyrimethanil	3,005	33	9	3,046
Sulphur	794	.	.	794
Tebuconazole	298	.	.	298
<b>All fungicides</b>	<b>30,670</b>	<b>621</b>	<b>94</b>	<b>31,386</b>
<b>Growth Regulators</b>				
Gibberellins	431	14	.	445
Paclobutrazol	194	.	.	194
Prohexadione	469	26	.	495
Prohexadione-calcium	825	.	.	825
<b>All growth regulators</b>	<b>1,919</b>	<b>39</b>	<b>.</b>	<b>1,959</b>
<b>Herbicides</b>				
2,4-D	9	.	.	9
2,4-D/MCPA	4	.	.	4
Dicamba/MCPA/mecoprop-P	463	4	.	468
Dicamba/mecoprop-P	89	.	.	89
Florasulam/pyroxsulam	45	.	.	45
Glyphosate	980	15	5	1001
MCPA	276	4	.	280
<b>All herbicides</b>	<b>1,866</b>	<b>24</b>	<b>5</b>	<b>1,895</b>

**Table 9 (cont)** Estimated area (spha) of top fruit crops treated with pesticide formulations in Northern Ireland, 2016.

Pesticide group and active ingredient	Crop type			
	Bramley apples	Dessert apples	Dessert Pears	Total area
<b><i>Insecticides and acaracides</i></b>				
Chlorantraniliprole	245	.	.	245
Chlorpyrifos	177	.	.	177
Clofentezine	97	.	.	97
Cypermethrin	1,669	52	9	1,730
Deltamethrin	59	.	.	59
Methoxyfenozide	368	15	.	384
Pirimicarb	63	3	.	67
Tebufenpyrad	2	.	.	2
<b><i>All insecticides and acaracides</i></b>	<b>2,682</b>	<b>70</b>	<b>9</b>	<b>2,761</b>
<b><i>Others</i></b>				
Boron	808	2	.	810
Boron/magnesium/phosphorus/zinc	5	.	.	5
Calcium	390	12	.	402
Calcium chloride	318	2	.	321
Calcium oxide	66	.	.	66
Calcium oxide/nitrogen	10	.	.	10
Calcium oxide/zinc	1,851	49	.	1,901
Calcium/magnesium/sulphur	17	.	.	17
Calcium/nitrogen	76	.	.	76
Calcium/nitrogen/phosphate	425	6	.	431
Copper sulphate	27	.	.	27
Magnesium	9	.	.	9
Magnesium sulphate	99	.	.	99
Magnesium/manganese/nitrogen/sulphur	11	.	.	11
Magnesium/nitrogen/sulphur	17	.	.	17
Manganese	457	12	.	470
Nitrogen/phosphate/potassium oxide	662	16	.	677
Nitrogen/phosphorus pentoxide	65	1	.	66
Nitrogen/potassium oxide	111	.	.	111
NPK fertiliser	304	.	.	304
Phosphorus pentoxide/potassium oxide	97	.	.	97
Potassium nitrate	282	.	.	282
Seaweed extract	1,743	.	.	1,743
Zinc	816	.	.	816
<b><i>All others</i></b>	<b>8,667</b>	<b>102</b>	<b>.</b>	<b>8,769</b>
<b><i>All pesticides</i></b>	<b>45,805</b>	<b>857</b>	<b>108</b>	<b>46,770</b>

**Table 10** Estimated quantities (kg) of pesticide active ingredients applied to top fruit crops in Northern Ireland, 2016.

	Crop type			
Pesticide group and active ingredient	Bramley apples	Dessert apples	Dessert pears	Total quantity
Fungicides				
Boscalid/pyraclostrobin	344	7	.	351
Bupirimate	1	0	.	2
Captan	4,833	173	22	5,028
Copper oxychloride	1,893	12	8	1,912
Cyprodinil/fludioxonil	111	.	.	111
Difenoconazole	35	3	1	39
Dithianon	1,657	24	.	1,681
Dithianon/potassium phosphonates	696	7	5	709
Dithianon/pyraclostrobin	189	.	.	189
Dodine	1,948	49	11	2,008
Fenbuconazole	136	3	1	139
Fludioxonil	15	.	.	15
Mancozeb	8,818	160	12	8,989
Myclobutanil	69	2	<1	71
Penconazole	35	1	<1	36
Penthiopyrad	115	2	<1	118
Pyrimethanil	999	13	4	1,015
Sulphur	972	.	.	972
Tebuconazole	53	.	.	53
All fungicides	22,918	456	64	23,438
Growth Regulators				
Gibberellins	2	<1	.	2
Paclobutrazol	21	.	.	21
Prohexadione	35	2	.	37
Prohexadione-calcium	44	.	.	44
All growth regulators	102	2	.	104
Herbicides				
2,4-D	5	.	.	5
2,4-D/MCPA	4	.	.	4
Dicamba/MCPA/mecoprop-P	276	3	.	279
Dicamba/mecoprop-P	37	.	.	37
Florasulam/pyroxsulam	1	.	.	1
Glyphosate	776	15	5	796
MCPA	215	3	.	218
All herbicides	1,314	21	5	1,340

**Table 10 (cont)** Estimated quantities (kg) of pesticide active ingredients applied to top fruit crops in Northern Ireland, 2016.

Crop type				
Pesticide group and active ingredient	Bramley apples	Dessert apples	Dessert pears	Total quantity
Insecticides and acaricides				
Chlorantraniliprole	6	.	.	6
Chlorpyrifos	87	.	.	87
Clofentezine	12	.	.	12
Cypermethrin	39	1	<1	41
Deltamethrin	<1	.	.	<1
Methoxyfenozide	44	2	.	46
Pirimicarb	13	1	.	14
Tebufenpyrad	<1	.	.	<1
All insecticides and acaricides	202	4	<1	206
Others				
Boron	154	<1	.	154
Boron/magnesium/phosphorus/zinc	7	.	.	7
Calcium	304	8	.	312
Calcium chloride	641	1	.	642
Calcium oxide	37	.	.	37
Calcium oxide/nitrogen	24	.	.	24
Calcium oxide/zinc	379	11	.	390
Calcium/magnesium/sulphur	1,607	.	.	1,607
Calcium/nitrogen	201	.	.	201
Calcium/nitrogen/phosphate	1,031	12	.	1,043
Copper sulphate	67	.	.	67
Magnesium	5	.	.	5
Magnesium sulphate	34	.	.	34
Magnesium/manganese/nitrogen/sulphur	5	.	.	5
Magnesium/nitrogen/sulphur	13	.	.	13
Manganese	131	4	.	135
Nitrogen/phosphate/potassium oxide	496	19	.	515
Nitrogen/phosphorus pentoxide	35	1	.	36
Nitrogen/potassium oxide	84	.	.	84
NPK fertiliser	253	.	.	253
Phosphorus pentoxide/potassium oxide	56	.	.	56
Potassium nitrate	2,361	.	.	2,361
Seaweed extract	1,897	.	.	1,897
Zinc	500	.	.	500
All others	10,323	57	.	10,380
All pesticides	34,860	539	69	35,468

**Table 11** The active ingredients most extensively used on top fruit crops ranked by treated area (spha) in Northern Ireland, 2016.

No.	Active ingredient	Treated area (sp.ha)
1	Mancozeb	6,562
2	Captan	4,763
3	Dithianon	4,601
4	Pyrimethanil	3,046
5	Fenbuconazole	2,730
6	Zinc	2,721
7	Dodine	2,693
8	Calcium oxide	1,977
9	Pyraclostrobin	1,949
10	Seaweed extract	1,743
11	Cypermethrin	1,730
12	Boscalid	1,413
13	Nitrogen	1,400
14	Phosphate	1,108
15	Myclobutanil	1,080
16	Copper oxychloride	1,037
17	Glyphosate	1,001
18	Calcium	926
19	Potassium oxide	885
20	Penthiopyrad	855
21	Prohexadione-calcium	825
22	Boron	815
23	Sulphur	794
24	MCPA	751
25	Penconazole	703
26	Mecoprop-P	557
27	Dicamba	557
28	Difenoconazole	508
29	Prohexadione	495
30	Manganese	481
31	Gibberellins	445
32	Potassium phosphonates	432
33	Methoxyfenozide	384
34	Calcium chloride	321
35	NPK fertiliser	304
36	Tebuconazole	298
37	Fludioxonil	286



**Table 12** The active ingredients most extensively used on top fruit crops ranked by weight (kg) in Northern Ireland, 2016.

No.	Active ingredient	Quantity applied (kg)
1	Mancozeb	8,989
2	Captan	5,028
3	Potassium nitrate	2,361
4	Dodine	2,008
5	Dithianon	1,952
6	Copper oxychloride	1,912
7	Seaweed extract	1,897
8	Calcium	1,388
9	Pyrimethanil	1,015
10	Phosphate	1,001
11	Sulphur	972
12	Glyphosate	796
13	Sulphur	742
14	Calcium chloride	642
15	Potassium phosphonates	580
16	Zinc	525
17	MCPA	441
18	Nitrogen	418
19	Calcium oxide	418
20	Potassium oxide	285
21	NPK fertiliser	253
22	Boscalid	233
23	Pyraclostrobin	165
24	Boron	154
25	Fenbuconazole	139
26	Manganese	135
27	Penthiopyrad	118
28	Chlorpyrifos	87
29	Mecoprop-P	78
30	Myclobutanil	71
31	Copper sulphate	67
32	Cyprodinil	67
33	Fludioxonil	59
34	Tebuconazole	53
35	Methoxyfenozide	46
36	Prohexadione-calcium	44
37	Cypermethrin	41

*\* Active ingredients not always sprayed as separate actives but also in formulated mixtures.*

**Table 13** Bramley apples: Reasons for use, total area treated (spha), basic area treated (ha) and total quantity applied (kg).

	Reason for use													
Pesticide group and active ingredient	Scab	Canker	Disease prevention	General disease control	General fungal control	Mildew	Red spider mites	Scab protection	Storage aid	Storage rots	Unknown	Total area treated (spha)	Basic area treated (ha)	Total quantity applied (kg)
Fungicides														
Boscalid/pyraclostrobin	602	48	13	.	301	.	.	137	.	79	.	1,181	869	344
Bupirimate	12	.	.	.	.	.	.	.	.	.	.	12	12	1
Captan	3,449	.	13	.	1,128	.	.	.	.	.	.	4,591	1,113	4,833
Copper oxychloride	420	419	66	69	14	.	.	6	.	.	34	1,028	762	1,893
Cyprodinil/fludioxonil	.	.	.	.	78	.	.	.	.	99	.	177	148	111
Difenoconazole	365	.	13	.	84	.	.	.	.	.	.	462	410	35
Dithianon	3,161	423	.	.	.	.	.	.	.	.	.	3,584	949	1,657
Dithianon/potassium phosphonates	425	.	.	.	.	.	.	.	.	.	.	425	235	696
Dithianon/pyraclostrobin	470	.	.	.	.	.	.	.	.	66	.	536	336	189
Dodine	2,542	.	.	.	69	.	.	.	.	.	.	2,612	1,355	1,948
Fenbuconazole	2,512	.	.	.	150	.	.	.	.	.	.	2,662	921	136
Fludioxonil	.	.	.	.	.	.	.	.	108	.	.	108	108	15
Mancozeb	6,317	.	.	.	100	.	.	.	.	.	.	6,417	1,286	8,818
Myclobutanil	816	.	.	.	85	141	.	.	.	.	.	1,041	715	69
Penconazole	217	.	.	.	141	312	.	.	.	.	.	671	399	35
Penthiopyrad	640	.	.	.	182	.	.	.	.	.	.	821	752	115
Pyrimethanil	2,924	.	.	.	81	.	.	.	.	.	.	3,005	1,421	999
Sulphur	24	.	.	532	22	.	17	.	.	.	199	794	262	972
Tebuconazole	216	13	.	.	68	.	.	.	.	.	.	298	135	53
All fungicides	25,112	904	105	600	2,505	453	17	143	108	244	233	30,425	.	22,918

**Table 13 (cont)** Bramley apples: Reasons for use, total area treated (spha), basic area treated (ha) and total quantity applied (kg).

Reason for use						
Pesticide group and active ingredient	Broad leaved weeds	General weed control	Grass weeds	Total area treated (spha)	Basic area treated (ha)	Total quantity applied (kg)
Herbicides						
2,4-D	.	9	.	9	9	5
2,4-D/MCPA	.	4	.	4	4	4
Dicamba/MCPA/mecoprop-P	21	442	.	463	298	276
Dicamba/mecoprop-P	.	89	.	89	50	37
Florasulam/pyroxsulam	.	45	.	45	45	1
Glyphosate	.	959	21	980	607	776
MCPA	.	276	.	276	184	215
All herbicides	21	1,824	21	1,866	.	1,314

**Table 13 (cont)** Bramley apples: Reasons for use, total area treated (spha), basic area treated (ha) and total quantity applied (kg).

Reason for use									
Pesticide group and active ingredient	Aphids	Blastobasis	General insect control	Red spider control	Rust mite	Wooly aphid	Total area treated (spha)	Basic area treated (ha)	Total quantity applied (kg)
<i>Insecticides and acaricides</i>									
Chlorantraniliprole	.	15	230	.	.	.	245	245	6
Chlorpyrifos	9	.	70	.	.	97	177	177	87
Clofentezine	.	.	.	97	.	.	97	97	12
Cypermethrin	867	.	802	.	.	.	1,669	1,162	39
Deltamethrin	.	.	59	.	.	.	59	59	0.4
Methoxyfenozide	26	111	231	.	.	.	368	355	44
Pirimicarb	52	.	12	.	.	.	63	63	13
Tebuufenpyrad	.	.	.	.	2	.	2	2	0.1
<i>All insecticides and acaricides</i>	954	126	1,405	97	2	97	2,682	.	202

**Table 13 (cont)** Bramley apples: Reasons for use, total area treated (spha), basic area treated (ha) and total quantity applied (kg).

<i>Reason for use</i>					
Pesticide group and active ingredient	Growth regulation	Growth suppressant	Total area treated (spha)	Basic area treated (ha)	Total quantity applied (kg)
<b><i>Growth regulators</i></b>					
Gibberellins	431	.	431	431	2
Paclobutrazol	97	96	194	145	21
Prohexadione	469	.	469	294	35
Prohexadione-calcium	796	30	825	515	44
<b><i>All growth regulators</i></b>	<b>1,155</b>	<b>126</b>	<b>1,919</b>	<b>.</b>	<b>102</b>

**Table 14** 'Other' top fruit: Reasons for use, total area treated (spha), basic area treated (ha) and total quantity applied (kg).

Pesticide type and formulation	Reason for use						
	Scab	Canker	General Fungal Control	Mildew	Total area treated (spha)	Basic area treated (ha)	Total quantity applied (kg)
<b>Fungicides</b>							
Boscalid/pyraclostrobin	.	.	25	.	25	12	7
Bupirimate	3	.	.	.	3	3	0.4
Captan	74	.	99	.	172	36	195
Copper oxychloride	10	.	.	.	10	9	20
Difenoconazole	46	.	.	.	47	12	4
Dithianon	12	37	.	.	49	12	24
Dithianon/potassium phosphonates	7	.	.	.	7	7	12
Dodine	81	.	.	.	82	36	60
Fenbuconazole	54	.	.	.	54	20	4
Mancozeb	145	.	.	.	145	25	172
Myclobutanil	17	.	.	12	29	23	2
Penconazole	20	.	12	.	33	28	2
Penthiopyrad	7	.	12	.	20	20	3
Pyrimethanil	42	.	.	.	42	24	13
<b>All fungicides</b>	<b>518</b>	<b>37</b>	<b>148</b>	<b>12</b>	<b>716</b>	<b>.</b>	<b>517</b>

**Table 14 (cont)** 'Other' top fruit: Reasons for use, total area treated (spha), basic area treated (ha) and total quantity applied (kg).

<i>Reason for use</i>							
<i>Pesticide type and formulation</i>	<b>Growth Regulator</b>	<b>General Weed Control</b>	<b>Aphids</b>	<b>General Insect Control</b>	<b>Total area treated (spha)</b>	<b>Basic area treated (ha)</b>	<b>Total quantity applied (kg)</b>
<b><i>Growth Regulators</i></b>							
Gibberellins	14	.	.	.	14	14	0.1
Prohexadione	26	.	.	.	26	14	2
<b><i>All growth regulators</i></b>	<b>39</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>39</b>	<b>.</b>	<b>2</b>
<b><i>Herbicides</i></b>							
Dicamba/MCPA/mecoprop-P	.	4	.	.	4	4	3
Glyphosate	.	25	.	.	25	12	20
MCPA	.	4	.	.	4	4	3
<b><i>All herbicides</i></b>	<b>.</b>	<b>34</b>	<b>.</b>	<b>.</b>	<b>34</b>	<b>.</b>	<b>26</b>
<b><i>Insecticides</i></b>							
Cypermethrin	.	.	70	.	70	25	1.1
Methoxyfenozide	.	.	.	15	15	15	2
Pirimicarb	.	.	.	3	3	3	0.8
<b><i>All insecticides</i></b>	<b>.</b>	<b>.</b>	<b>70</b>	<b>19</b>	<b>88</b>	<b>.</b>	<b>4</b>

**Table 15** Estimated area treated (spha) and quantity of 'other' products applied (kg) to Bramley apple crops, 2016.

Formulation	Crop type		Total	
	Bramley apples			
	spha	kg	spha	kg
Boron	808	154	810	154
Boron/magnesium/phosphorus/zinc	5	6	5	7
Calcium	390	304	402	312
Calcium chloride	318	641	321	642
Calcium oxide	66	37	66	37
Calcium oxide/nitrogen	10	24	10	24
Calcium oxide/zinc	1,851	379	1,901	390
Calcium/magnesium/sulphur	17	1,607	17	1,607
Calcium/nitrogen	76	201	76	201
Calcium/nitrogen/phosphate	424	1,031	431	1,043
Copper sulphate	27	67	27	67
Magnesium	9	4	9	4
Magnesium sulphate	99	34	99	34
Magnesium/manganese/nitrogen/sulphur	11	5	11	5
Magnesium/nitrogen/sulphur	17	13	17	13
Manganese	457	131	470	135
Nitrogen/phosphate/potassium oxide	662	496	677	515
Nitrogen/phosphorus pentoxide	65	35	66	36
Nitrogen/potassium oxide	111	84	111	84
NPK fertiliser	304	253	304	253
Phosphorus pentoxide/potassium oxide	97	56	97	56
Potassium nitrate	282	2,361	282	2,361
Seaweed extract	1,743	1,897	1,743	1,897
Zinc	815	500	815	500
Total	8,667	10,323	8,767	10,377



**Table 16** Comparison of area (ha) of top fruit crops grown in Northern Ireland, 1992-2016

	Survey year									
Crop Type	1992	1996	2002	2006	2008*	2010*	2012*	2014*	2016*	% change in area grown 2014/2016
Bramley apples										
Bramley apples (fruiting)	1,574	1,511	1,265	1,341	1,463	1,491	1,503	1,510	1,488	-1.40%
Bramley apples (non-fruiting)	158	189	197	74	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	-1.40%
Other top fruit crops										
Other top fruit crops (fruiting)	57	13	20	21	19	25	3	9	38	420%
Other top fruit crops (non-fruiting)	5	0.4	4	14	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	420%
Total crops	1,794	1,714	1,486	1,450	1,482	1,516	1,506	1,519	1,526	0.40%

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

**Table 17a** Comparison of area treated (spha) and quantity of pesticides applied (kg) to top fruit crops in Northern Ireland, 1992-2016.

Survey year																		
Pesticide Type	1992		1996		2002		2006		2008		2010		2012		2014		2016	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
<b>Fungicides</b>	20,272	13,549	21,620	20,672	23,473	26,756	24,836	20,132	27,200	23,554	28,593	26,796	32,505	32,604	28,597	23,748	31,386	23,438
<b>Herbicides</b>	761	865	1,190	1,652	1,000	881	899	875	965	1,206	1,314	1,805	1,020	1,142	1,953	1,651	1,895	1,340
<b>Growth regulators</b>	134	69	713	137	610	107	990	126	2,066	219	2,313	226	2,151	195	1,423	125	1,959	104
<b>Mixed activity a.i.'s</b>	11	73	17	14	.	.	.	.	.	.	.	.	.	.	.	.	.	.
<b>Insecticides (by classification)</b>																		
Carbamates	33	56	32	7	88	10	104	17	152	33	139	33	86	23	248	31	67	14
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	868	684	684	533	177	87
Pyrethroids	586	13	464	16	481	18	595	18	496	23	983	27	980	26	460	10	1,789	41
Acaricides	112	31	751	157	201	24	301	24	645	93	.	.	96	35	.	.	2	<1
Biopesticides	.	.	.	.	.	.	13	2	.	.	.	.	.	.	.	.	.	.
Other insecticides	524	465	182	60	115	139	47	6	.	.	445	81	126	14	411	61	725	64
<b>All Insecticides</b>	<b>3,765</b>	<b>2,399</b>	<b>3,698</b>	<b>2,129</b>	<b>2,258</b>	<b>1,186</b>	<b>2,189</b>	<b>878</b>	<b>2,598</b>	<b>1,165</b>	<b>2,543</b>	<b>843</b>	<b>2,156</b>	<b>782</b>	<b>1,811</b>	<b>637</b>	<b>2,761</b>	<b>206</b>
<b>All pesticides</b>	<b>24,943</b>	<b>16,955</b>	<b>27,238</b>	<b>24,604</b>	<b>27,341</b>	<b>28,930</b>	<b>28,914</b>	<b>22,011</b>	<b>32,831</b>	<b>26,125</b>	<b>34,763</b>	<b>29,669</b>	<b>37,832</b>	<b>34,723</b>	<b>33,784</b>	<b>26,161</b>	<b>38,001</b>	<b>25,088</b>

**Legend**

A = Area treated (spha)

B = Quantity of pesticides applied (kg)

\* does not include 'other' pesticide types

**Table 17b** Comparison of application ratios (kg/ha) of the active ingredients most extensively used on top fruit crops in Northern Ireland, 1992-2016.

No.	Active Ingredient	Survey year								
		1992	1996	2002	2006	2008	2010	2012	2014	2016
1	Mancozeb	2.2	5.9	11.4	7.2	6.7	6.8	7.8	6	6.9
2	Captan	1.9	1.9	1.3	1.4	1.7	3.8	4.3	4.2	4.3
3	Dodine	0.1	0.5	0.3	0.7	0.6	0.7	1	1.5	1.4
4	Dithianon	1.4	2.4	3.3	2.5	4	3.3	2.6	1.4	1.7
5	Sulphur	.	<0.1	0.2	0.1	0.7	0.9	4.2	1.1	3.7
6	Pyrimethanil	.	<0.1	0.3	0.6	1.1	0.9	1.1	0.7	0.7
7	Glyphosate	0.1	0.4	0.3	0.3	0.6	0.8	0.5	0.6	1.3
8	MCPA	<0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.4	1.2
9	Chlorpyrifos	0.3	0.3	0.4	0.6	0.7	0.5	0.5	0.3	0.5
10	Copper oxychloride	0.7	0.4	0.7	0.4	0.7	0.5	0.1	0.2	2.5
11	Pyraclostrobin	.	.	.	<0.1	0.1	0.1	0.1	0.1	0.5
12	Boscalid	.	.	.	<0.1	0.1	0.1	0.1	0.1	0.4
13	Fenbuconazole	.	<0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
14	Myclobutanil	0.3	0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.1
15	Mecoprop-P	.	.	<0.1	0.1	<0.1	0.1	<0.1	0.1	0.8
16	Paclobutrazol	<0.1	0.1	.	0.1	<0.1	0.1	0.1	<0.1	0.1
17	Cyprodinil	.	.	.	.	<0.1	<0.1	<0.1	<0.1	0.7
18	Prohexadione-calcium	.	.	.	<0.1	0.1	0.1	0.1	<0.1	<0.1
19	Fludioxonil	.	.	.	.	<0.1	<0.1	<0.1	<0.1	0.1
20	Penconazole	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
21	Difenoconazole	.	.	<0.1	.	<0.1	<0.1	<0.1	<0.1	<0.01
22	Pirimicarb	.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2
23	Methoxyfenozide	.	.	.	.	.	.	<0.1	<0.1	0.1
24	Dicamba	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.8
25	Paraffin oil	.	.	.	.	.	.	.	<0.1	.
26	Kresoxim-methyl	.	.	.	<0.1	<0.1	<0.1	<0.1	<0.1	.
27	Cypermethrin	.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
28	Clofentezine	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
29	Spirodiclofen	.	.	.	.	.	.	<0.1	<0.1	.
30	Chlorantraniliprole	.	.	.	.	.	<0.1	<0.1	<0.1	<0.1

**Table 17b (cont)** Comparison of application ratios (kg/ha) of the active ingredients most extensively used on top fruit crops in Northern Ireland, 1992-2016.

		Survey year								
No.	Active Ingredient	1992	1996	2002	2006	2008	2010	2012	2014	2016
31	Triclopyr	.	.	.	.	.	.	.	<0.1	.
32	Dimethoate	.	.	.	.	.	.	.	<0.1	.
33	Tebufenpyrad	.	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
34	Flutriafol	.	.	.	.	.	.	.	<0.1	.
35	Gibberellins	.	.	.	<0.1	<0.1	<0.1	<0.1	<0.1	.
36	Clopyralid	.	.	.	.	.	.	.	<0.1	.
37	Deltamethrin	<0.1	.	<0.1	.	.	<0.1	<0.1	<0.1	<0.1
38	Lime sulphur	0.2	.	.	.	.	<0.1	0.1	.	3.7
39	Copper sulphate	0.3	0.1	0.2	.	.	<0.1	0.1	.	.
40	Lime	.	.	.	.	.	.	0.1	.	.
41	Glufosinate-ammonium	<0.1	<0.1	<0.1	.	<0.1	<0.1	<0.1	.	.
42	Tebuconazole	.	.	.	.	.	.	<0.1	.	0.4

**Table 18** Estimated quantities (tonnes) of stored apples receiving treatment, and the total amount of active ingredients applied (kg) in Northern Ireland, 2016.

<i>Pesticide formulation</i>	Quantity treated	Quantity applied
<b><i>Fungicides</i></b>		
Cyprodinil/fludioxonil	629	6
<b><i>Other products</i></b>		
1-methylcyclopropene	20,625	*N/A
<b><i>All other products</i></b>	<b>21,254</b>	<b>*N/A</b>
<b>All treatments</b>	<b>21,254</b>	<b>*N/A</b>

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

**Table 19** Estimated quantities (tonnes) of Bramley apples treated in storage and reason for use of each active ingredient in Northern Ireland, 2016.

<i>Reason for use</i>			
Active ingredient	Ethylene inhibitor	Storage aid	Total
1-methylcyclopropene	2,658	17,966	20,625
Cyprodinil/fludioxonil	.	629	629
<b>All treatments</b>	<b>2,658</b>	<b>18,596</b>	<b>21,254</b>

**Table 20** Comparison of the estimated quantities (tonnes) of Bramley apples stored and the total weight of active ingredients applied (kg) in Northern Ireland, 1992-2016.

Survey year																		
Pesticide formulation	1992		1996		2002		2006		2008		2010		2012		2014		2016	
	Total quantity stored	Total quantity applied	Total quantity stored	Total quantity applied	Total quantity stored	Total quantity applied	Total quantity stored	Total quantity applied	Total quantity stored	Total quantity applied	Total quantity stored	Total quantity applied	Total quantity stored	Total quantity applied	Total quantity stored	Total quantity applied	Total quantity stored	Total quantity applied
<b>Antioxidants</b>																		
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	.	.	.	.	.	.	.	.	.	.	.	.
<b>All antioxidants</b>	<b>10,504</b>	<b>449</b>	<b>11,877</b>	<b>661</b>	<b>8,528</b>	<b>210</b>	<b>13,216</b>	<b>307</b>	<b>16,630</b>	<b>435</b>	<b>15,966</b>	<b>433</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>
<b>Fungicides</b>																		
Benomyl	4,166	124	.	.	385	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	490	3	.	.	629	6
Thiophanate-methyl	436	5	1,146	40	.	.	129	1	.	.	.	.	.	.	.	.	.	.
Metalaxyl-M	.	.	.	.	.	.	4,207	5	.	.	.	.	.	.	.	.	.	.
<b>All fungicides</b>	<b>10,690</b>	<b>283</b>	<b>11,419</b>	<b>217</b>	<b>5,886</b>	<b>112</b>	<b>5,975</b>	<b>207</b>	<b>214</b>	<b>1</b>	<b>256</b>	<b>1</b>	<b>490</b>	<b>3</b>	<b>.</b>	<b>.</b>	<b>629</b>	<b>6</b>
<b>Other products</b>																		
1-methylcyclopropene	.	.	.	.	.	.	.	.	.	.	345	1	8,502	<1	9,706	N/A	20,625	N/A
<b>All other products</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>.</b>	<b>345</b>	<b>1</b>	<b>8,502</b>	<b>&lt;1</b>	<b>9,706</b>	<b>N/A</b>	<b>20,265</b>	<b>N/A</b>
<b>All treatments</b>	<b>21,194</b>	<b>732</b>	<b>23,296</b>	<b>878</b>	<b>14,414</b>	<b>322</b>	<b>19,191</b>	<b>514</b>	<b>16,844</b>	<b>436</b>	<b>16,567</b>	<b>435</b>	<b>8,992</b>	<b>3</b>	<b>9,706</b>	<b>N/A</b>	<b>21,254</b>	<b>6</b>
<b>Stored without treatment</b>	<b>2,322</b>	<b>.</b>	<b>384</b>	<b>.</b>	<b>17</b>	<b>.</b>	<b>408</b>	<b>.</b>	<b>689</b>	<b>.</b>	<b>670</b>	<b>.</b>	<b>1,167</b>	<b>.</b>	<b>1,366</b>	<b>N/A</b>	<b>3,131</b>	<b>N/A</b>
<b>Total stored</b>	<b>23,516</b>	<b>.</b>	<b>23,680</b>	<b>.</b>	<b>14,431</b>	<b>.</b>	<b>19,599</b>	<b>.</b>	<b>17,533</b>	<b>.</b>	<b>17,237</b>	<b>.</b>	<b>10,159</b>	<b>.</b>	<b>11,072</b>	<b>N/A</b>	<b>24,385</b>	<b>.</b>

**Table 21** Total grown area (ha), total quantity harvested (tonnes) and total yield (tonnes/ha) of Bramley apple crops in Northern Ireland, 2016.

<i>Age of orchard (years)</i>	<b>Total grown area (ha)</b>	<b>Total quantity harvested (tonnes)</b>	<b>Yield (tonnes/ha)</b>
<b><i>Bramley apples</i></b>			
< 5	41	56	1.4
5 to 9	126	2,199	17.5
10 to 14	76	1,968	25.9
15 to 24	347	10,736	31.0
25 to 34	149	5,150	34.5
> 35	749	24,714	33.0
<b><i>Total Bramley apples</i></b>	<b>1,488</b>	<b>44,824</b>	<b>143.2</b>

## 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



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

Report No.	Report title	ISBN
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
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

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

Report No.	Report title	ISBN
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

**ISBN 978-1-84807-810-9**

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