Pesticide Usage in Scotland

Outdoor Vegetable Crops 2011

An Official Statistic Publication for Scotland

The Scottish Government

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Summary

This report presents information from a survey of pesticide use on outdoor vegetable crops grown for human consumption in Scotland during the 2011 growing season. Vegetable crops surveyed included vining peas, broad beans, Brussels sprouts, cabbages, calabrese, carrots, cauliflower, lettuce, turnips and swedes and other minor vegetable crops. Data were collected from a total of 100 holdings, representing 18% of the total vegetable crop area grown. The sampled data have been raised to give estimates of national pesticide usage.

The total area of outdoor vegetable crops grown in 2011 was 15,318 hectares. This represents a 30% increase from the previous survey in 2007. Vining peas, broad beans, cabbage and calabrese all had increases in the area of crop grown, while cauliflower and lettuce both showed a decrease. Peas and beans accounted for 47% of the outdoor vegetable crop area, leaf brassicas 20%, carrots 17% and turnips and swedes 11%.

The area of vegetable crops treated with a pesticide formulation has increased by 26% to 138,504 hectares since the previous survey, although this is mostly associated with the increase in crop area. Fungicides accounted for 34% of the total pesticide-treated area, herbicides 27%, insecticides 24%, molluscicides 6%, seed treatments 9% and biological agents less than 0.5%. There has been an overall increase in the area treated with fungicides (+52%), herbicides (+35%), insecticides (+23%) and biological agents (+22%), and a decrease in area treated with molluscicides (-17%) and seed treatments (-13%). When the increase in area grown is taken into account, there has been an increase in the total area treated with fungicides and herbicides, and a decrease of in the area treated with molluscicides, insecticides, biological agents and seed treatments.

In terms of weight of active ingredient applied, fungicides accounted for 43%, herbicides 46%, insecticides 5%, molluscicides 4% and seed treatments 2%. There has been an increase of 28% in the quantity of fungicides and 73% in the quantity of seed treatments applied, and a decrease in the quantity of herbicides (-8%), insecticides (-5%) and molluscicides (-47%) applied.

The total area treated with insecticide formulations was 32,701 hectares. The most extensively used insecticides were lambda-cyhalothrin and pirimicarb, applied to 13,908 and 10,544 hectares respectively. Molluscicides were applied to 8,692 hectares, with metaldehyde remaining as the most widely applied pesticide.

Fungicides were applied to 47,356 hectares with azoxystrobin the most widely used fungicide, applied to 10,669 hectares. Herbicides were applied to 37,124 hectares. Pendimethalin was the most extensively used herbicide, used on 9,771 hectares.

Introduction

The Scottish Government is required by legislation[1] to carry out post-approval surveillance of pesticide use. This is conducted by the Pesticide Survey Unit at Science and Advice for Scottish Agriculture (SASA), a division of the Scottish Government's Agriculture, Food and Rural Communities Directorate. As part of this programme a survey of pesticide usage in outdoor vegetable crops harvested in 2011 was conducted. This is the 9th survey of pesticide usage on outdoor vegetable crops in Scotland since 1977. Prior to 2011, this report series was only produced every 4 years. The survey covered all vegetable crops grown outdoors in Scotland for human consumption, including vining peas, broad beans, leaf brassicas, carrots, swedes, lettuce and other minor vegetable crops.

This survey is part of a series of reports which are produced to detail pesticide usage in Scotland for arable, vegetable, soft fruit and protected edible crops on a biennial basis and for fodder and forage crops every four years. The Scottish survey data are also incorporated with England, Wales and Northern Ireland data to provide estimates of annual UK-wide pesticide use. Information on all aspects of pesticide usage in the United Kingdom as a whole may be obtained from the Pesticide Usage Survey Team at the Food & Environment Research Agency, Sand Hutton, York. Also available at:

http://www.fera.defra.gov.uk/scienceResearch/science/lus/pesticideUsageFullReports.cfm

Definitions and Notes

'Pesticide' is used throughout this report to include commercial formulations containing active ingredients (a.i.) used as herbicides (weed killers), fungicides (mould & fungi killers), growth regulators, insecticides (insect killers), molluscicides (slug pellets) and biological control agents (natural predators, parasites or pathogens).

'Basic area' is the planted area of crop which was treated with a given pesticide or pesticide group, irrespective of the number of times it was applied to that area. Basic areas are not presented anywhere in the report, but their values are used to calculate the percentage of crop treated with a given pesticide or pesticide group.

'Area treated' (or hectares treated) is the basic area of a crop treated with a given pesticide multiplied by the number of treatments that area received. These terms are synonymous with "spray area" and "spray hectare" which have appeared in previous reports.

In this report the term 'formulation(s)' is used to describe the pesticide active ingredient or mixture of active ingredients in a product(s).

In this report each pesticide is reported in two formats as both a formulation (mixture of active ingredients in a product) and as individual active ingredients. See tables 5 to 16 for formulation data and tables 17 to 28 for active ingredient and quantity data.

It should be noted that some herbicides may not have been applied directly to the crop itself but either as land preparation treatments prior to sowing/planting the crop or to control weeds at the field margins.

Information about pesticides applied as seed treatments was only collected for field-sown crops, not for transplanted crops. Where the seed was known to be treated but the product unknown this was recorded as an 'unspecified seed treatment'.

Pesticides applied to transplants in nurseries before going to the grower are not recorded in this survey but are included in the Protected Edible Crops survey.

The areas of crop grown include successional sowings during the same growing season. This is referred to throughout the report as multi-cropping.

Due to rounding, there may be slight differences in totals both within and between tables.

Data from the 2007[2] and 2003[3] surveys are provided for comparison purposes in some of the tables and figures, although it should be noted that there may be minor differences in the range of crops surveyed, together with changes in areas of each of the crops grown.

When leaf brassicas are referred to in the text, this includes Brussels sprouts, cabbage, calabrese and cauliflower. Crops encountered in the 'other vegetable' category in the 2011 survey were celeriac, parsley, beetroot, parsnips and onions. For reporting purposes, the data for leeks and rhubarb have been amalgamated and presented under the 'other vegetable crops' category in the summary tables.

There has been a change in the method used to collect census area data between the 2007 and 2011 survey reports (see method section for use of census data). Prior to 2011 census areas were solely obtained from holdings collected through the June Census forms. However In 2011, this data was combined with data from holdings claiming single farm payments. This has led to an improvement in the quality of census crop area statistics. This means that trends in crop area between 2007 and 2011 may not solely represent genuine changes in land use but include differences in the way crop data has been reported.

Method

Using the June 2011 Agricultural Census[4] two samples were drawn representing vegetable cultivation in Scotland. The first sample was selected from holdings growing any vegetable crops excluding vining peas, and the second from holdings known to have grown vining peas. Two samples were taken to achieve a better representation of all vegetable crops, since most vining pea crops are grown on farms growing arable crops rather than other vegetable crops.

As in previous surveys, when selecting a sample of holdings the country was divided into 11 land-use regions[5] (Fig 1). The sample was stratified by land-use region and size group (based on the total area of either vegetable or vining pea crops grown). The sampling fractions used within both regions and size groups were based on the areas of the relevant crops grown rather than number of holdings, so that smaller size groups would not dominate the sample.

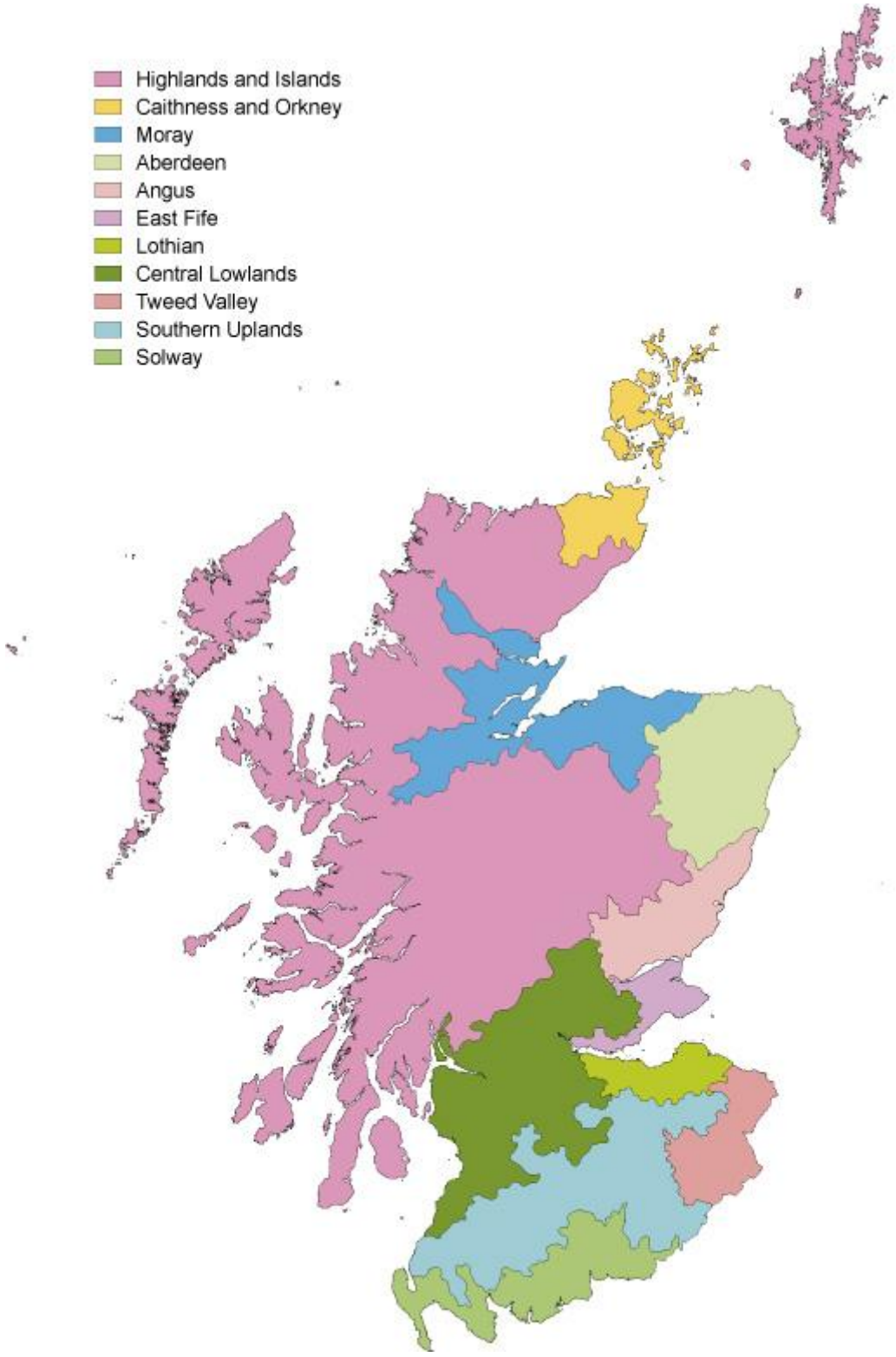
The survey covered pesticide applications to vegetable crops where all, or the majority, of the growing season was in 2011. As well as recording treatments applied directly to the crop, data was also collected on land preparation treatments prior to sowing/planting the crop.

Following an introductory letter and telephone call, each grower was either visited by a SASA surveyor or they provided the information via email or fax. A small number of growers in remote areas were interviewed by telephone. When necessary, data were also collected from consultant agronomists and contractors. In total, information was collected from 67 holdings growing vegetable crops, excluding peas, and from 33 holdings growing peas. Details of the numbers of holdings surveyed and their distribution are shown in Tables 2 and 3 and the areas of crops surveyed are shown in Tables 32 and 35.

For all crops, sample data were raised to give estimates of national pesticide usage using raising factors (Tables 34 and 37). These were based of the areas reported to have grown vegetable crops in the 2011 Agricultural Census[4] within regions and size groups (Tables 33 and 36). Adjustments (Table 38) were made for each crop within each region by applying raising factors to the sample area of each crop grown and comparing this with the area from the 2011 Agricultural Census. A second adjustment was made for crops where no holdings were sampled in one or more regions.

Standard errors associated with overall estimated pesticide use are included in the report for the first time (Table 39). Standard errors are estimated using the raising factors. An overall variance was calculated by summing the variance estimates for individual strata (region and size groups) multiplied by the square of their raising factors. These variance estimates include a finite population correction. The overall standard error is calculated from the overall variance by taking its square root. Implementation of this method of estimate is relatively straightforward and has advantages over ratio estimators when the within-strata sample sizes are smaller.

Figure 1: Land-use regions of Scotland



Trends

Figure 2: Area of vegetable crops grown in Scotland 2003-2011

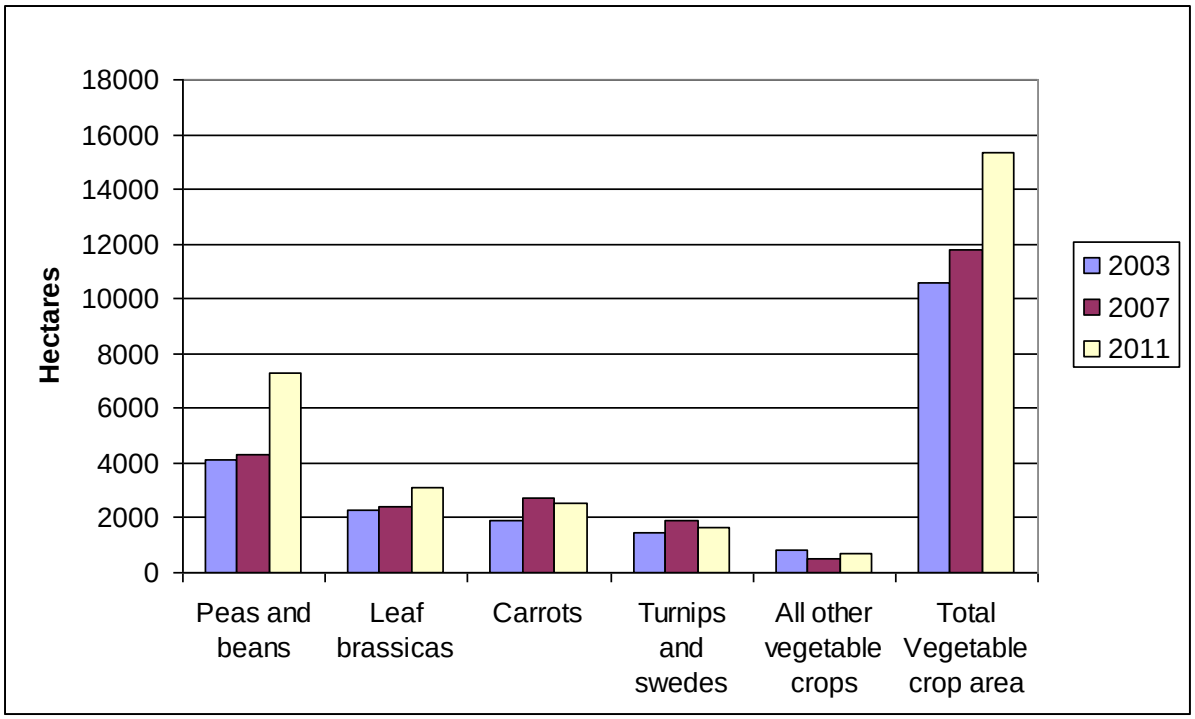


Figure 3: Area of vegetable crops treated with the major pesticide groups in Scotland 2003-2011 (formulation ha)

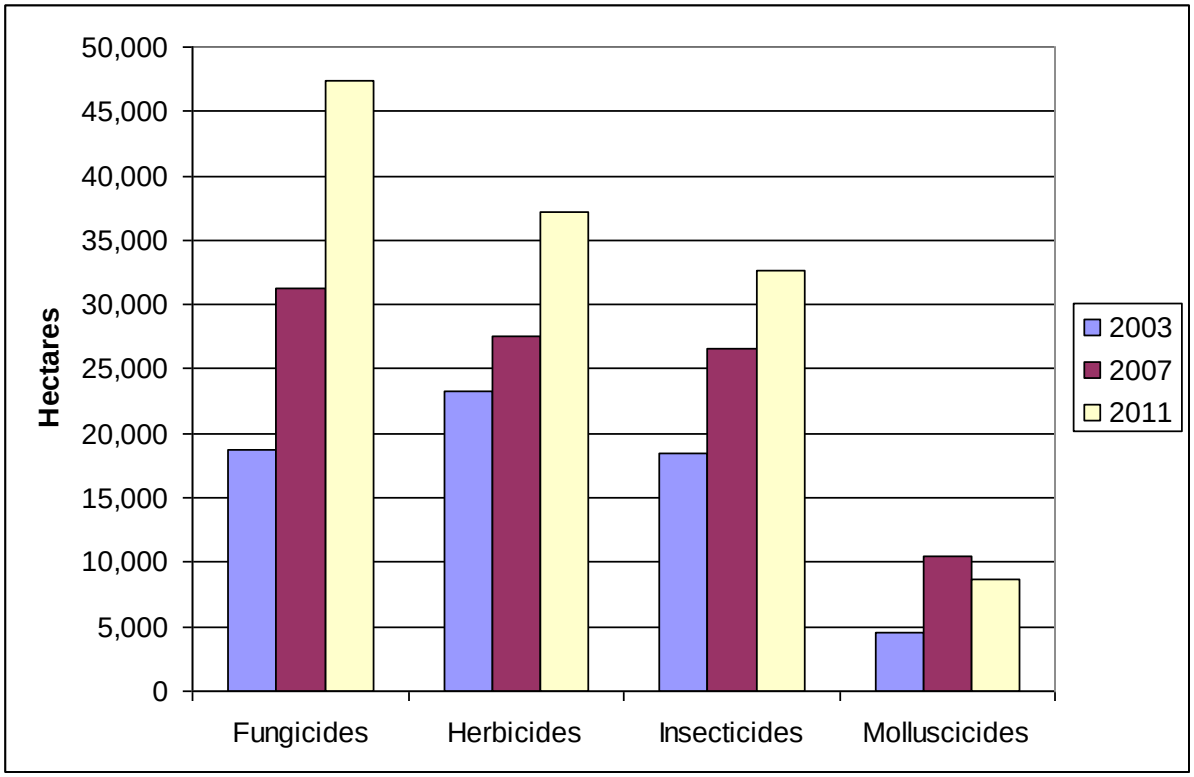
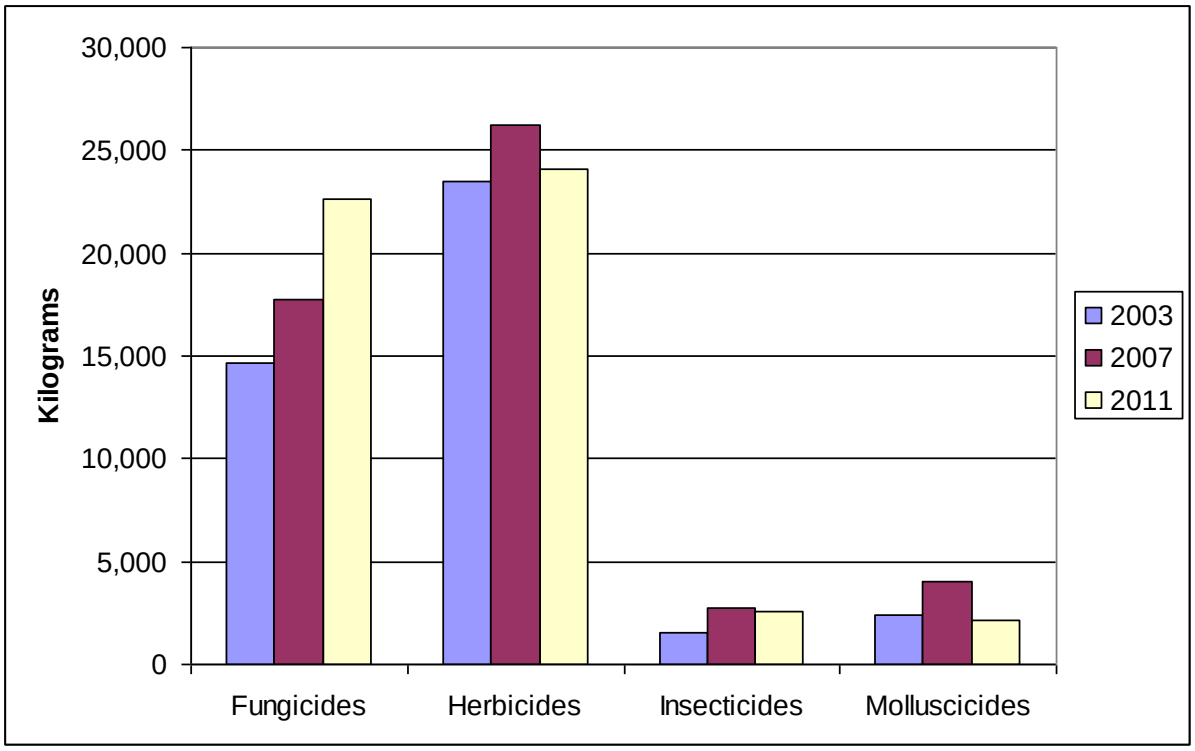


Figure 4: Quantity of the major pesticide groups applied to vegetable crops in Scotland 2003-2011



Crops and Pesticide Usage 2011

Figure 5: Vegetable crop areas 2011 (% of total area)

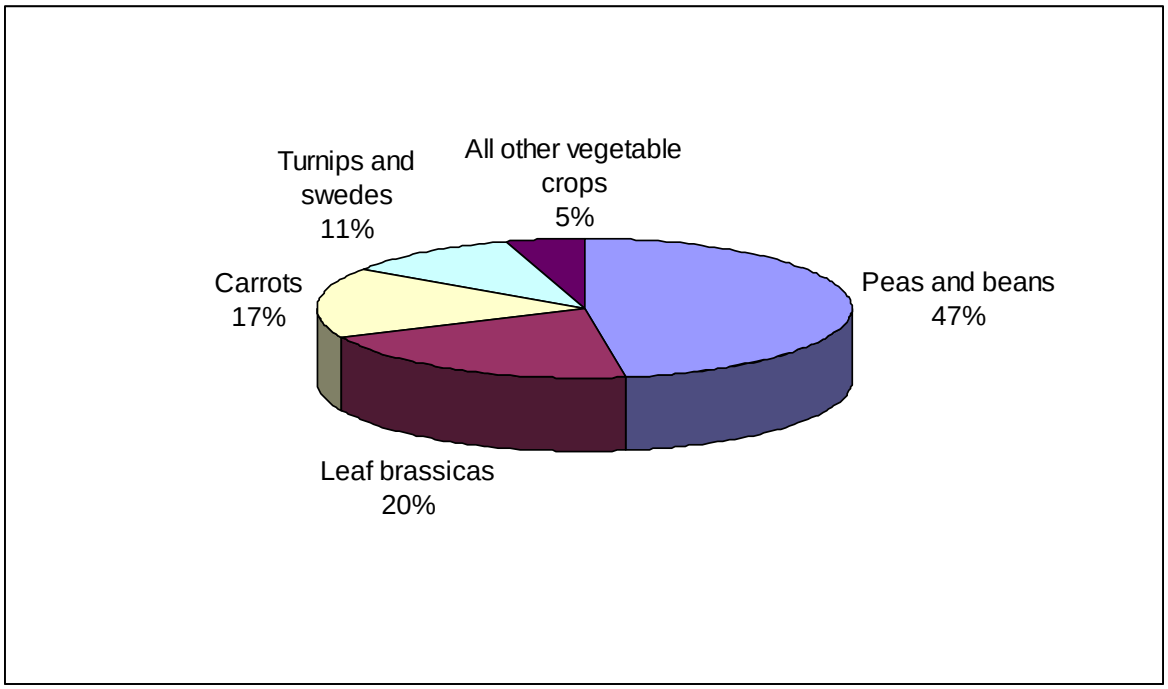


Figure 6: Percentage of leaf brassica crops treated with pesticides 2011

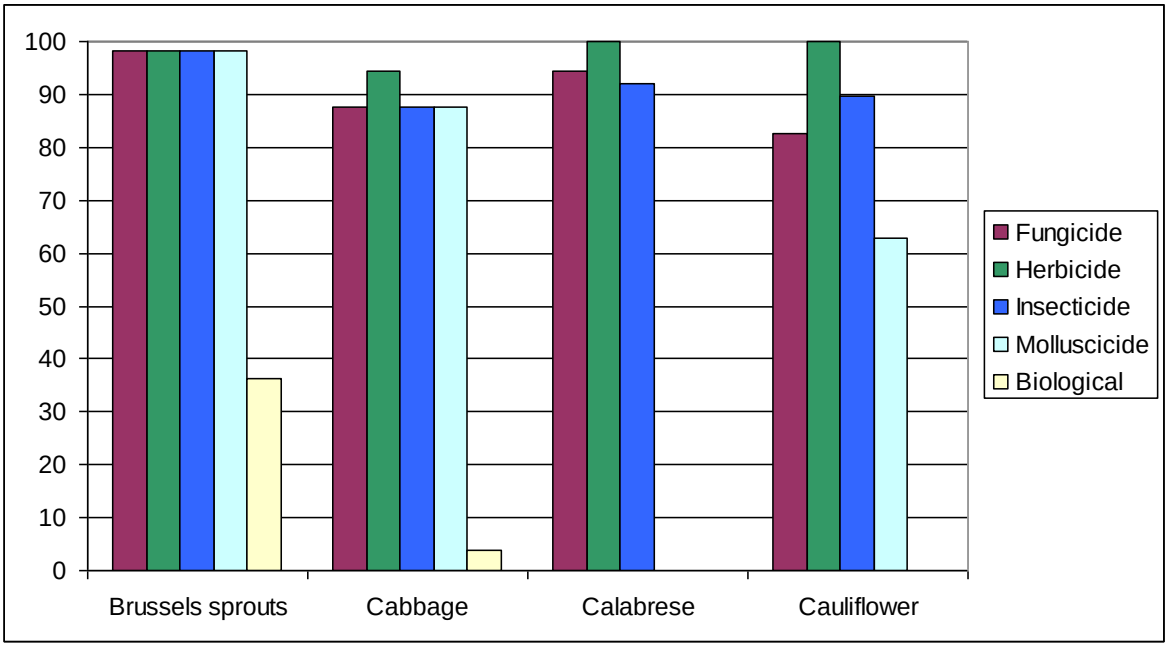
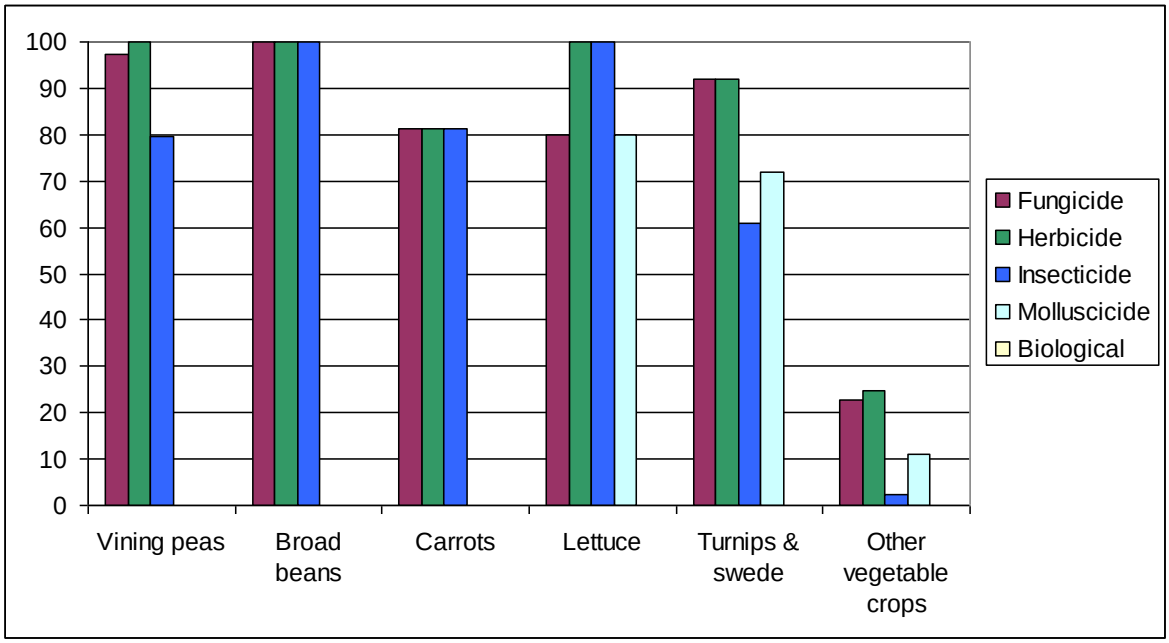


Figure 7: Percentage of legumes and other vegetable crops treated with pesticides 2011



Vining Peas

- 6,276 hectares grown in 2011, a 65% increase from 2007
- 29,293 hectares treated with a pesticide formulation
- 100% of the vining pea crop was treated with a pesticide
- 14,625 kg of pesticides applied in total

Summary of pesticide use on vining peas

Pesticide group	Formulation area treated (ha)	Weight of pesticides applied (kg)	% of crop area treated	Most used formulation (ha)
Fungicides	6,118	4,620	97	Boscalid/pyraclostrobin (2,743)
Herbicides	10,918	8,442	100	Imazamox/pendimethalin (3,929)
Insecticides	5,981	655	80	Pirimicarb (5,594)
Seed treatments	6,276	908	100	Cymoxanil/fludioxonil/ metalaxyl-M (6,276)

Figure 8: Use of pesticides on vining peas (% of total area treated with formulations) – 2011

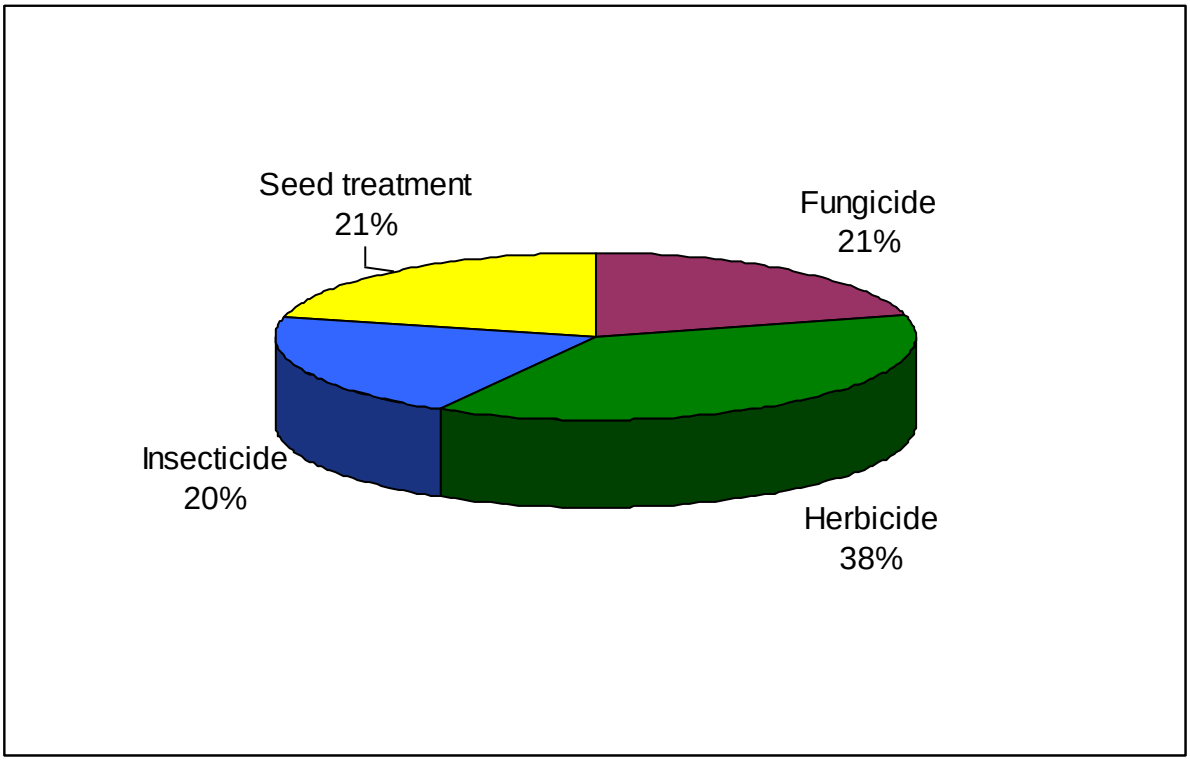


Figure 9: Area of vining peas treated with the major pesticide groups in Scotland 2003-2011 (formulation ha)

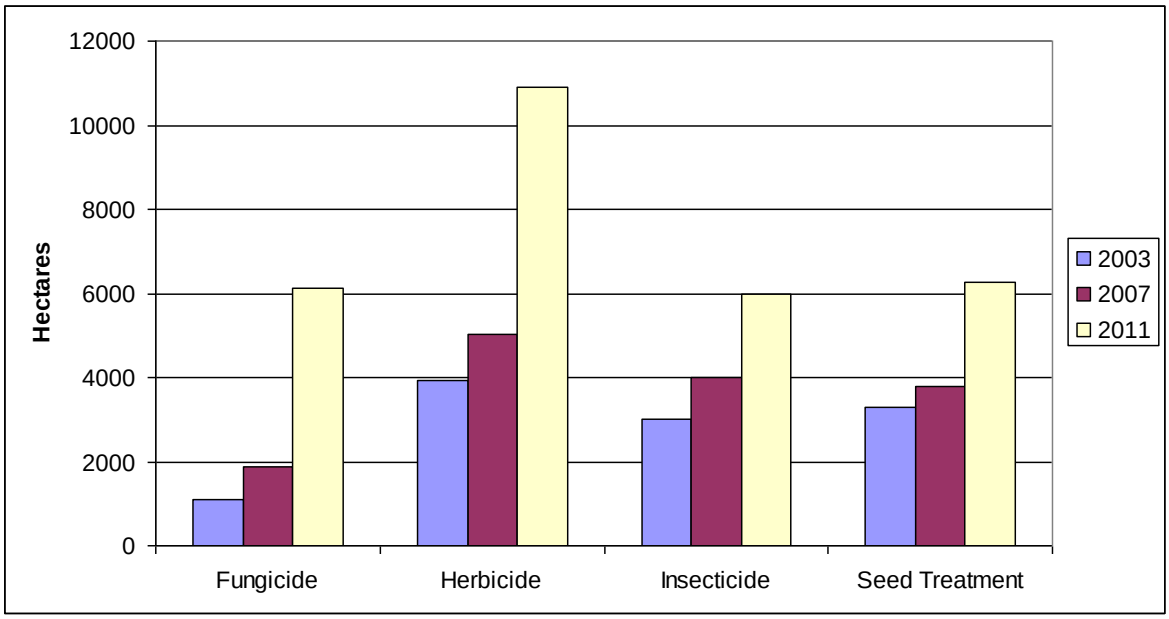
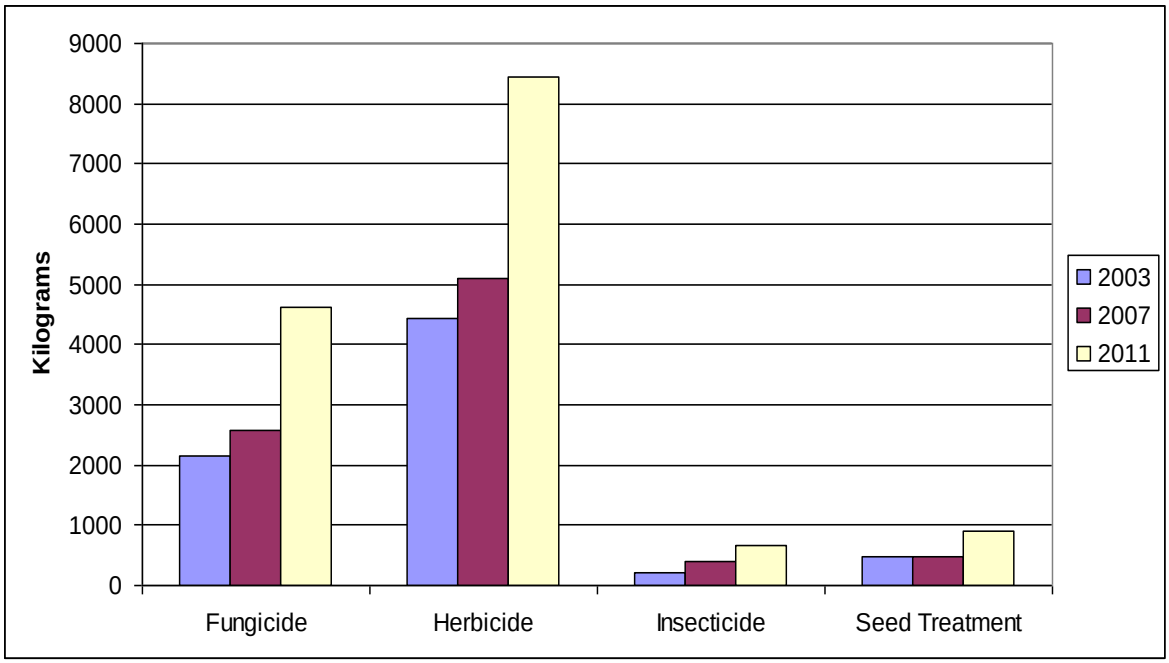


Figure 10: Quantity of the major pesticide groups applied to vining peas in Scotland 2003-2011



Broad Beans

- 996 hectares of broad beans grown in 2011, an increase of 167% from 2007
- 10,473 hectares treated with a pesticide formulation
- 100% of the crop received a pesticide treatment
- 2,995 kg of pesticides applied

Summary of pesticide use on broad beans

Pesticide group	Formulation area treated (ha)	Weight of pesticides applied (kg)	% of crop area treated	Most used formulation (ha)
Fungicides	4,572	1,408	100	Azoxystrobin & tebuconazole (both 1,619)
Herbicides	1,622	1,268	100	Imazamox/pendimethalin (676)
Insecticides	3,283	220	100	Pirimicarb (1,957)
Seed treatments	996	99	100	Cymoxanil/fludioxonil/ metalaxyl-M (996)

Figure 11: Use of pesticides on broad beans (% of total area treated with formulations) – 2011

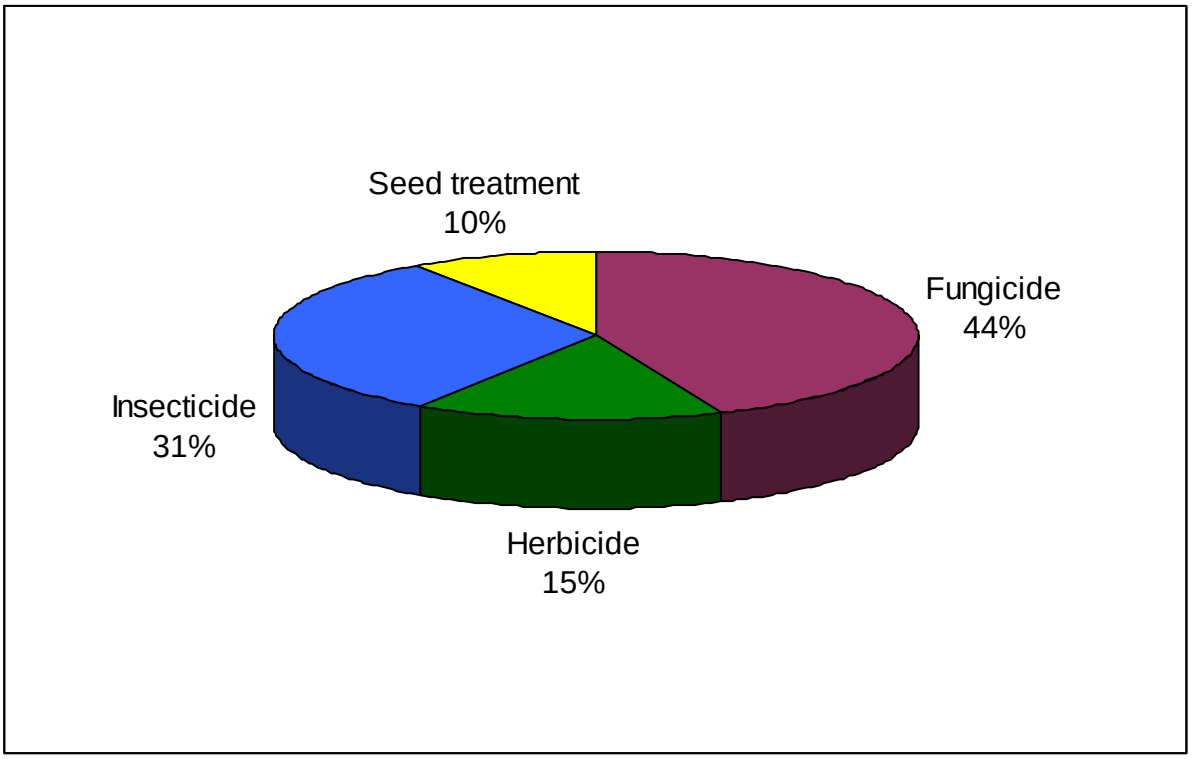


Figure 12: Area of broad beans treated with the major pesticide groups in Scotland 2003-2011 (formulation ha)

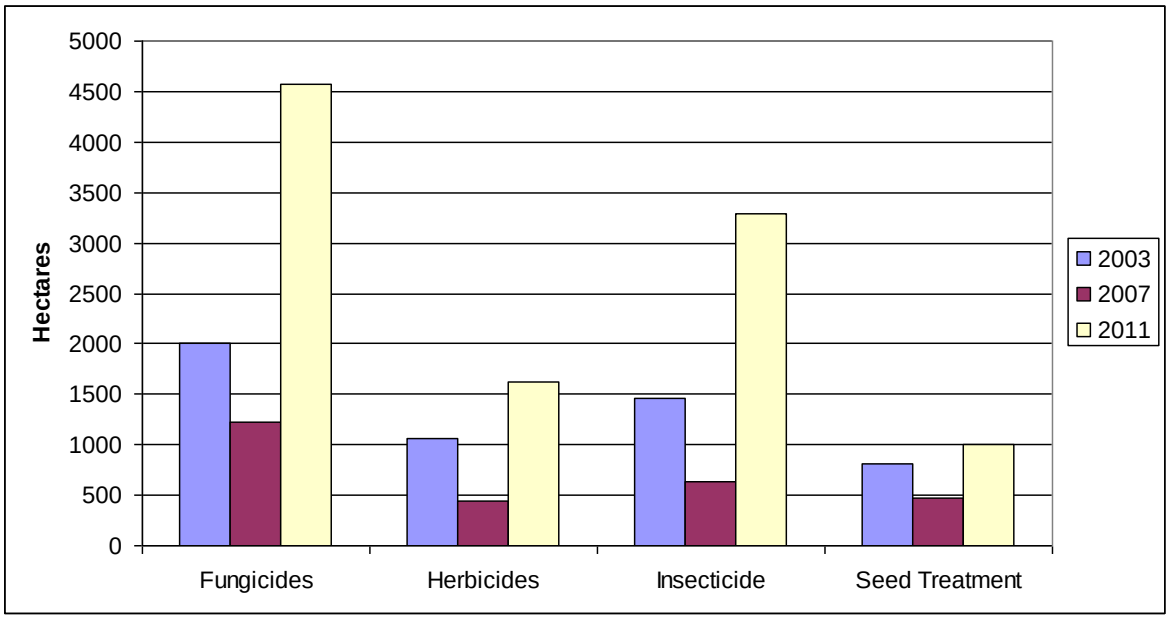
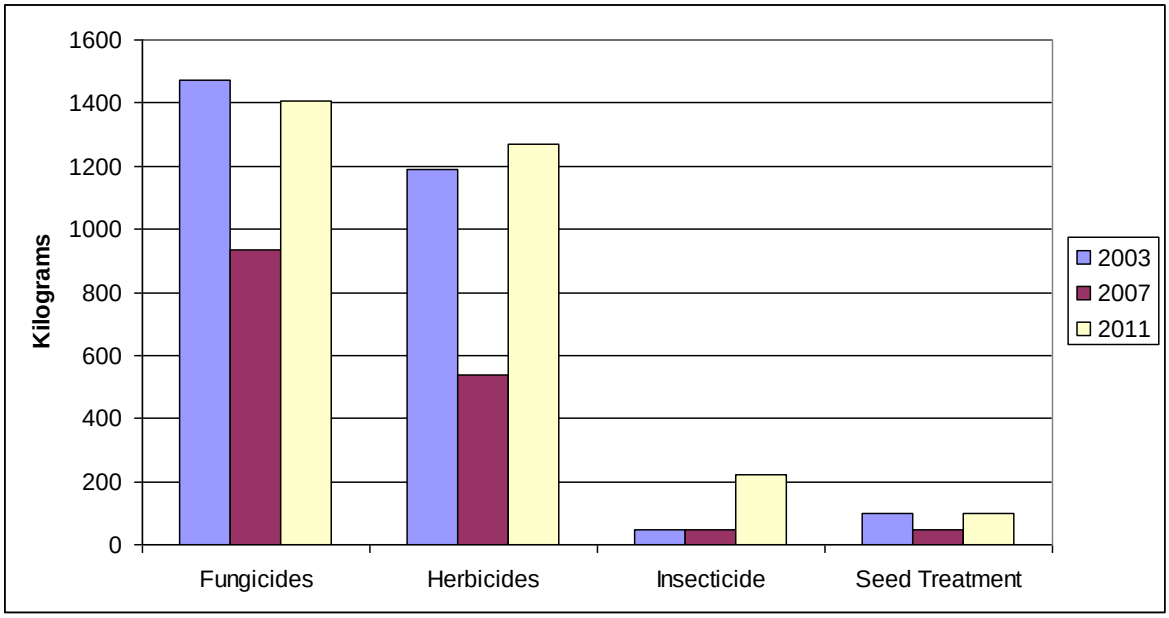


Figure 13: Quantity of the major pesticide groups applied to broad beans in Scotland 2003-2011



Brussels Sprouts

- The total estimated area of Brussels sprouts grown in Scotland was 904 hectares, comprising of 776 hectares in the 'Brussels sprouts' census category and a further 128 hectares recorded in the 'other vegetable' census category. This is a decrease of 5% from the 2007 figure.
- 24,222 hectares treated with a pesticide formulation
- 100% of the crop received a pesticide treatment
- 100% of the crop was grown from transplants
- 6,339 kg of pesticide were used in total on the Brussels sprouts crop

Summary of pesticide use on Brussels sprouts

Pesticide group	Formulation area treated (ha)	Weight of pesticides applied (kg)	% of crop area treated	Most used formulation (ha)
Fungicides	8,992	3,356	98	Tebuconazole/trifloxystrobin (2,345)
Herbicides	1,765	863	98	Metazachlor (889)
Insecticides	7,366	952	98	Pymetrozine (2,196)
Molluscicides	5,770	1,167	98	Metaldehyde (2,971)
Biological agents	329	NA	36	*Phasmarhabditis hermaphrodita* (314)

Figure 14: Use of pesticides on Brussels sprouts (% of total area treated with formulations) - 2011

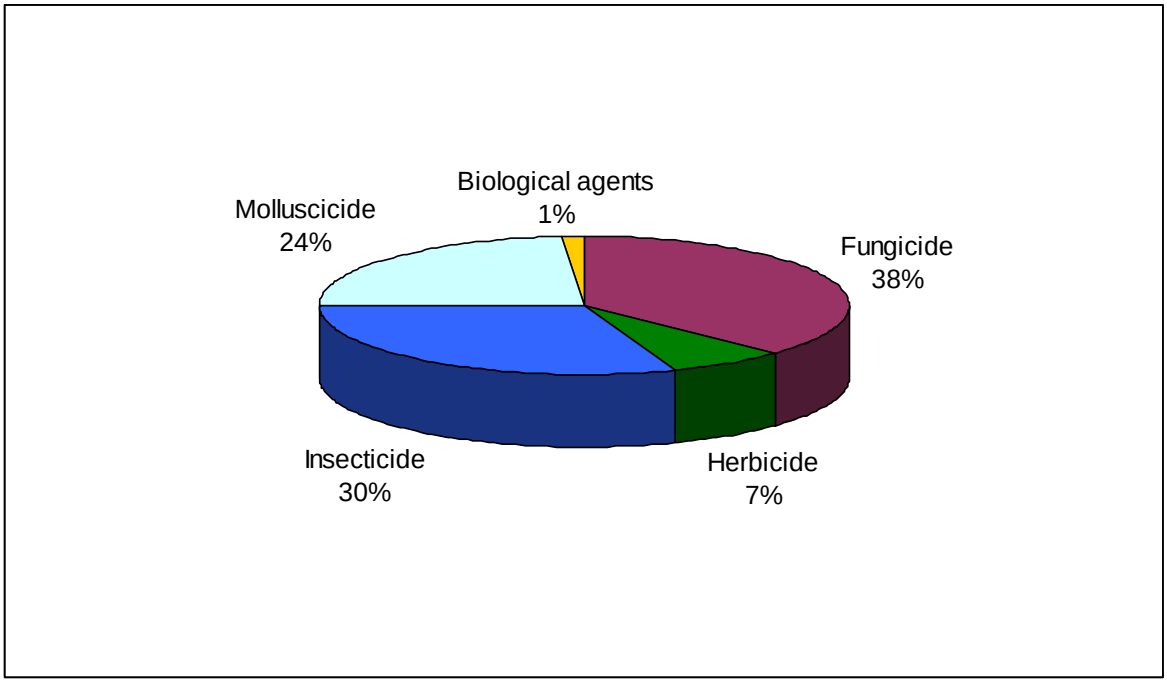


Figure 15: Area of Brussels sprouts treated with the major pesticide groups in Scotland 2003-2011(formulation ha)

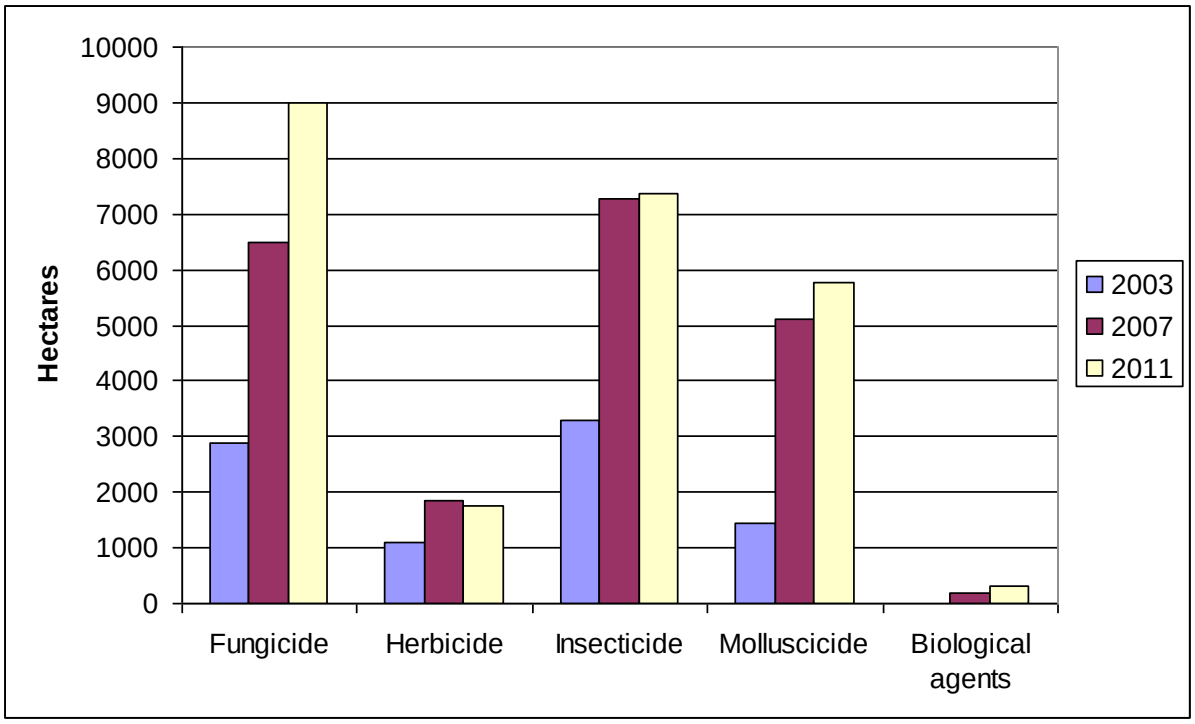
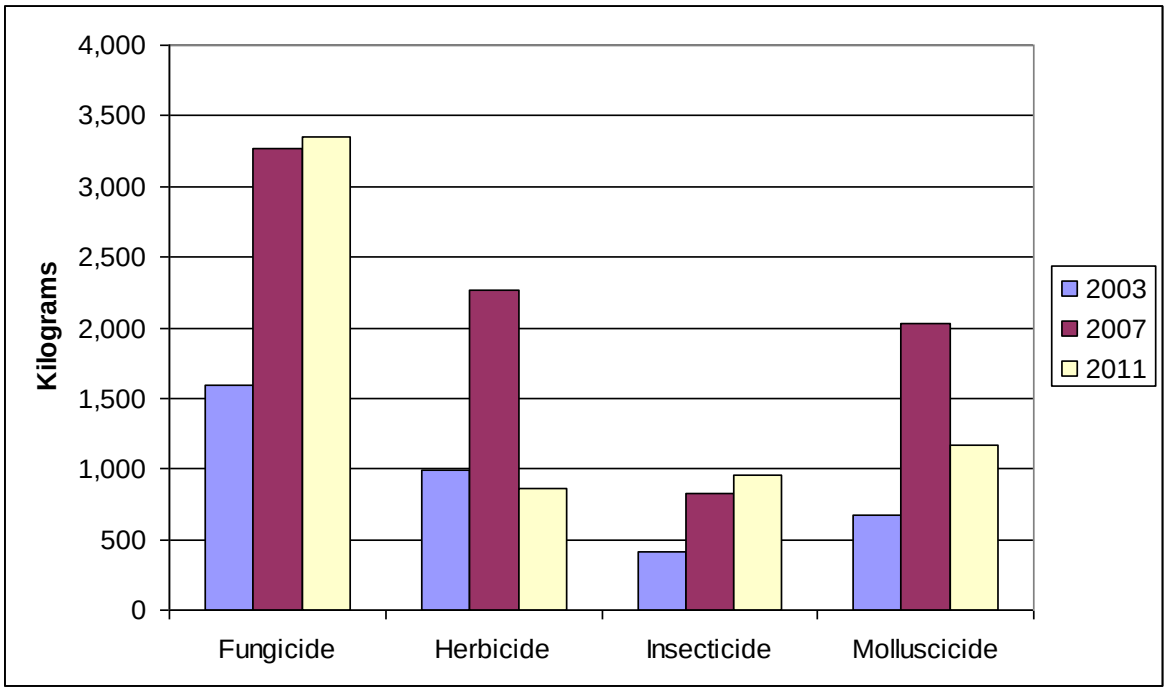


Figure 16: Quantity of the major pesticide groups applied to Brussels sprouts in Scotland 2003-2011



Cabbages

- The total estimated area of cabbage grown in Scotland is 273 hectares, which includes 239 hectares recorded in the 'cabbage' census category and 34 hectares which were recorded in the 'other vegetable' census category
- 2,826 hectares treated with a pesticide formulation
- All of the cabbage crop received a pesticide treatment
- 62% of the cabbage crop was direct sown, all of which was treated with imidacloprid, the remaining 38% was grown from transplants
- 646 kg of pesticide were used in total on the cabbage crop

Summary of pesticide usage on cabbages

Pesticide group	Formulation area treated (ha)	Weight of pesticides applied (kg)	% of crop area treated	Most used formulation (ha)
Fungicides	717	309	88	Azoxystrobin, difenoconazole, mancozeb/metalaxyl-M (all 239)
Herbicides	196	180	94	Metazachlor (257)
Insecticides	1,195	70	88	Deltamethrin (717)
Molluscicides	239	50	88	Metaldehyde (239)
Biological agents	10	NA	4	*Bacillus thuringiensis* (10)
Seed Treatments	169	36	62	Imidacloprid (169)

Figure 17: Use of pesticides on cabbages (% of total area treated with formulations) - 2011

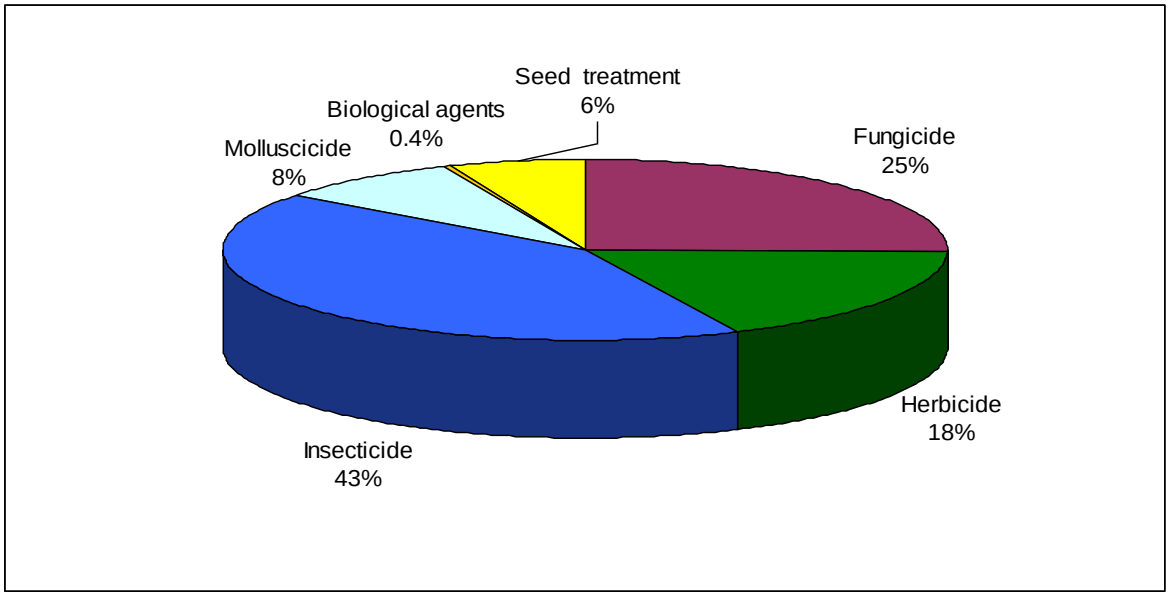


Figure 18: Area of cabbages treated with the major pesticide groups in Scotland 2003-2011 (formulation ha)

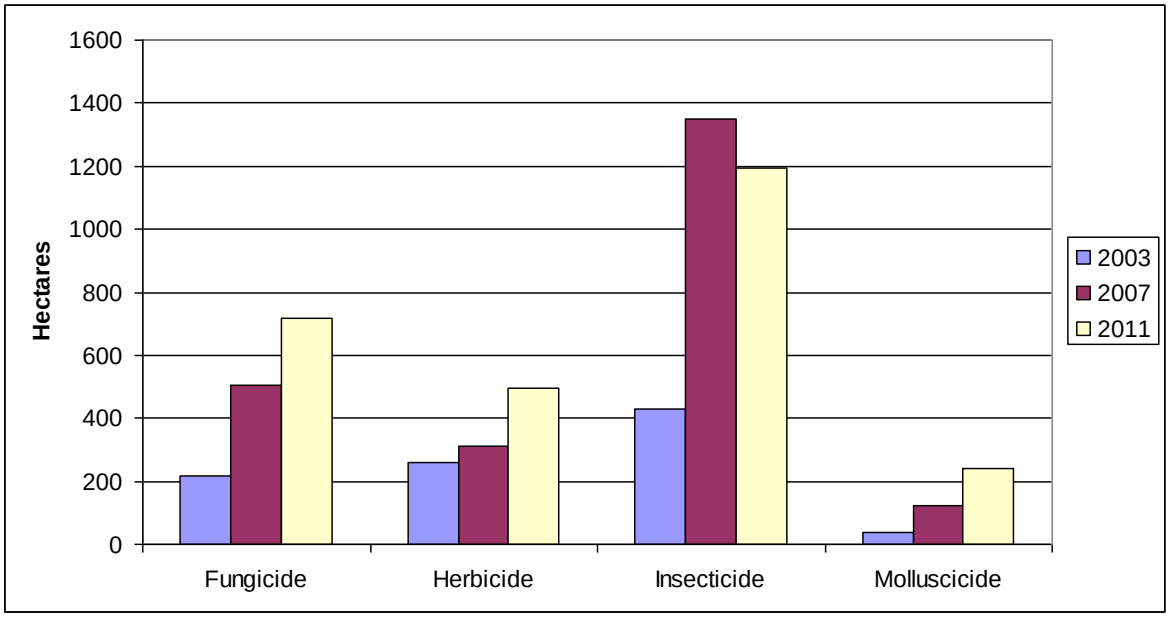
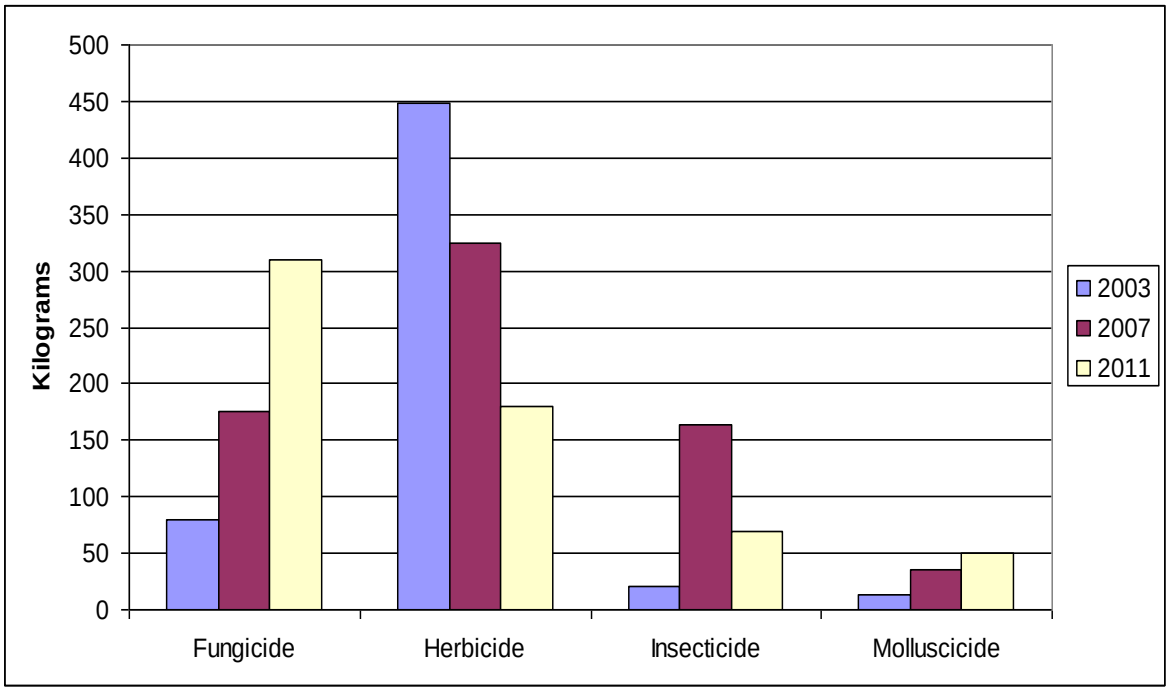


Figure 19: Quantity of the major pesticide groups applied to cabbages in Scotland 2003-2011



Calabrese

- Total estimated area of calabrese grown in Scotland is 1,692 hectares, which includes 1,276 hectares recorded in the 'calabrese' census category, 393 hectares which were recorded in the 'other vegetable' census category and an estimated 23 hectares of multi-cropping.
- The census area shows a 29% increase from 2007
- 14,739 hectares treated with a pesticide formulation, with 100% of the crop receiving a pesticide treatment,
- The entire crop was grown from transplants
- 7,189 kg of pesticide were applied

Summary of pesticide usage on calabrese

Pesticide group	Formulation area treated (ha)	Weight of pesticides applied (kg)	% of crop area treated	Most used formulation (ha)
Fungicides	5,787	2,865	95	Copper oxychloride (3,924)
Herbicides	4,580	4,139	100	Glyphosate (1,786)
Insecticides	4,372	185	92	Lambda-cyhalothrin (2,965)

Figure 20: Use of pesticides on calabrese (% of total area treated with formulations) - 2011

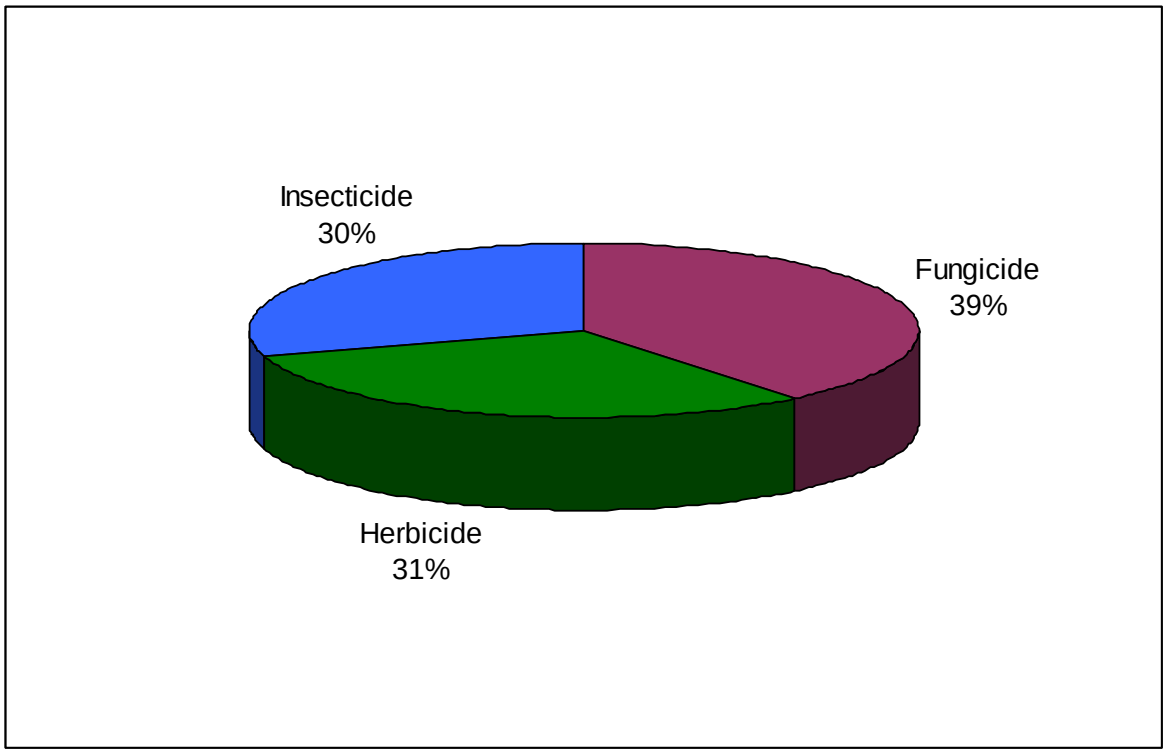


Figure 21: Area of calabrese treated with the major pesticide groups in Scotland 2003-2011 (formulation ha)

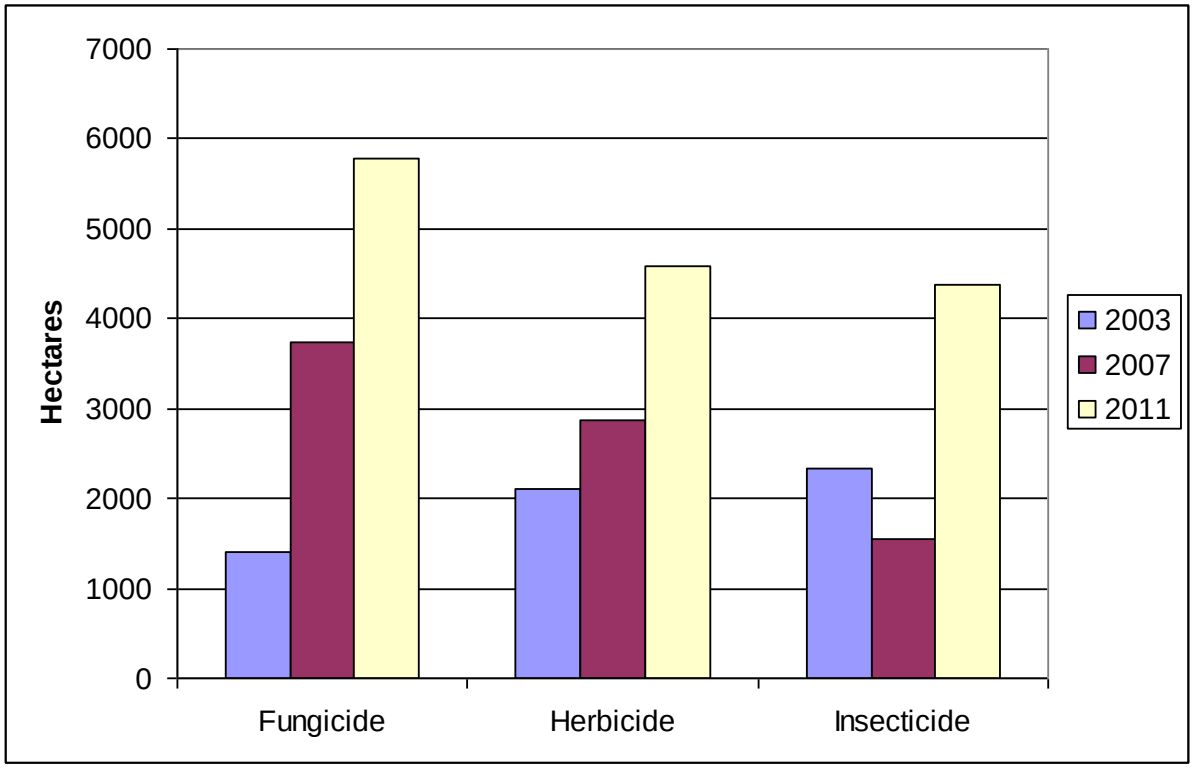
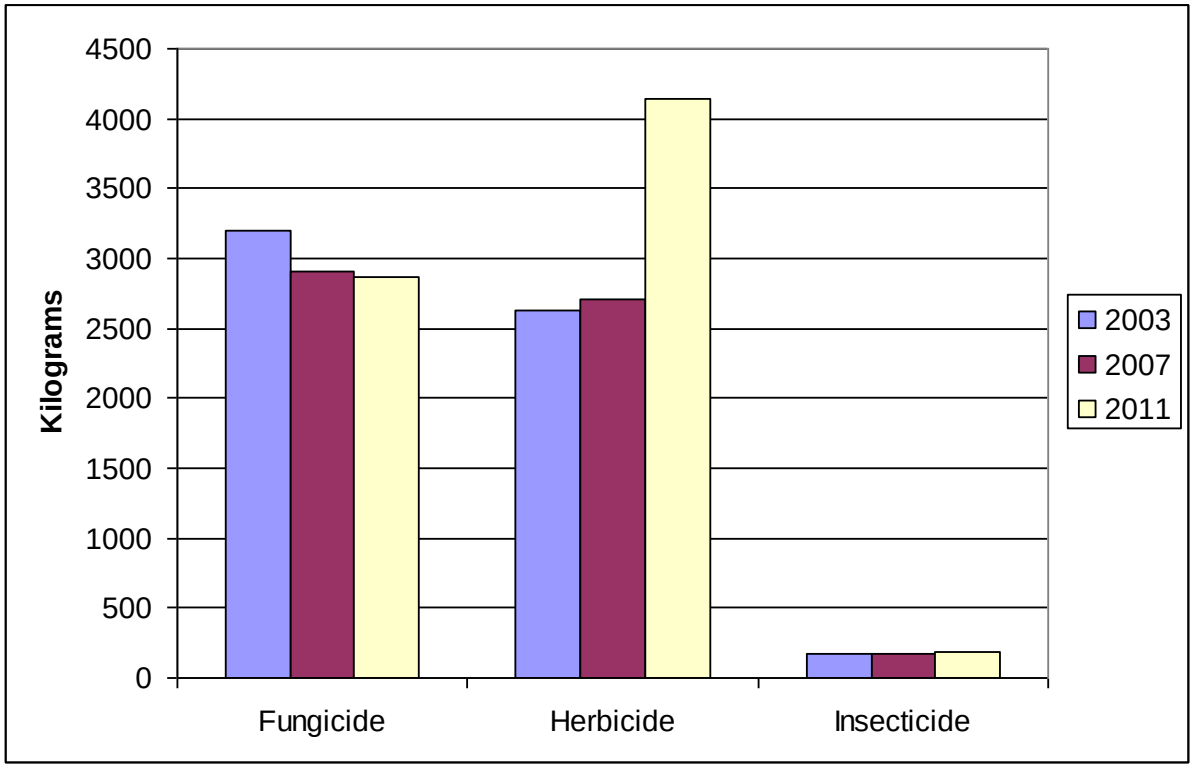


Figure 22: Quantity of the major pesticide groups applied to calabrese in Scotland 2003-2011



Cauliflower

- An estimated 265 hectares of cauliflowers were grown in Scotland, an 18% reduction from 2007
- 1,682 hectares treated with a pesticide formulation and 100% of the crop received a pesticide treatment
- 100% were grown from transplants
- 850 kg of pesticide were used in total

Summary of pesticide usage on cauliflower

Pesticide group	Formulation area treated (ha)	Weight of pesticides applied (kg)	% of crop area treated	Most used formulation (ha)
Fungicides	357	216	82	Azoxystrobin (161)
Herbicides	640	581	100	Metazachlor (265)
Insecticides	374	5	90	Lambda-cyhalothrin (330)
Molluscicides	311	48	63	Methiocarb (242)

Figure 23: Use of pesticides on cauliflower (% of total area treated with formulations) - 2011

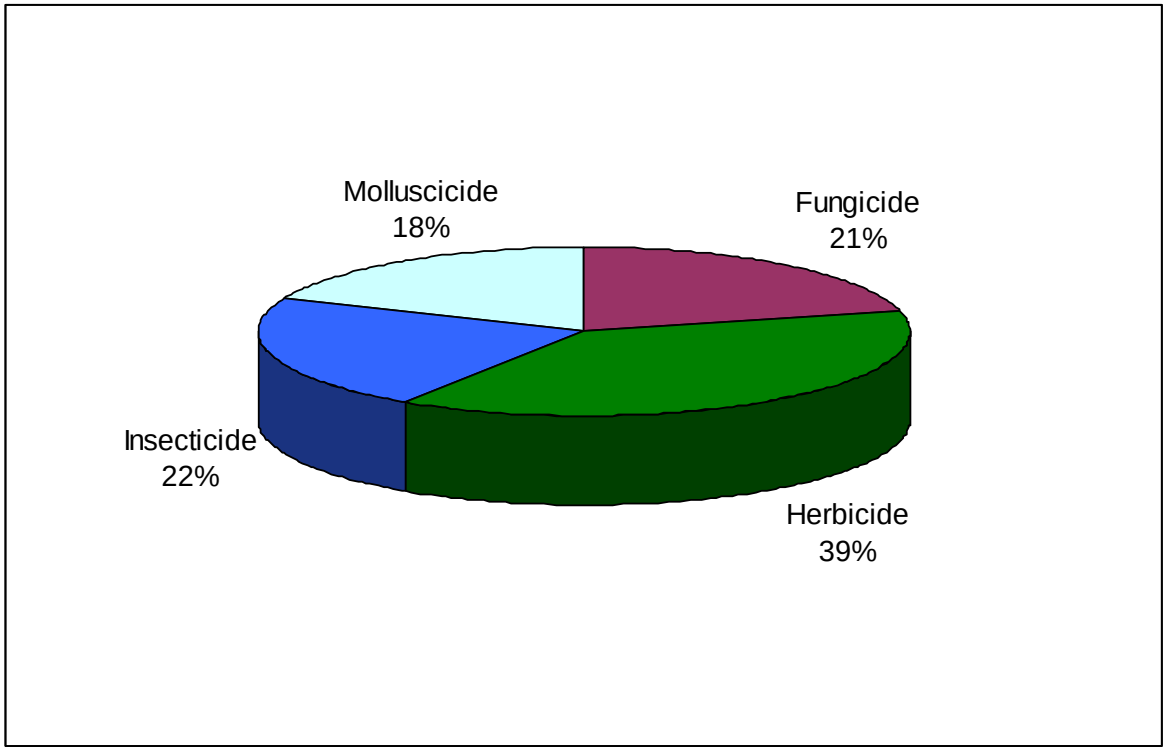


Figure 24: Area of cauliflower treated with the major pesticide groups in Scotland 2003-2011 (formulation ha)

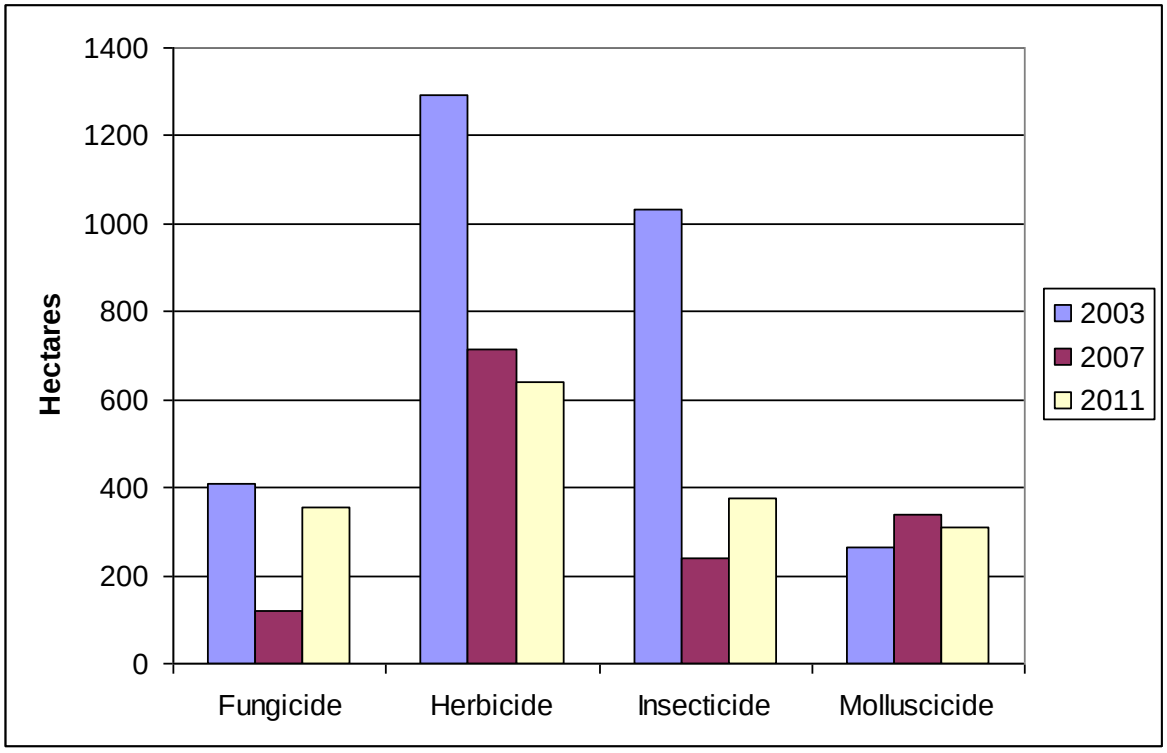
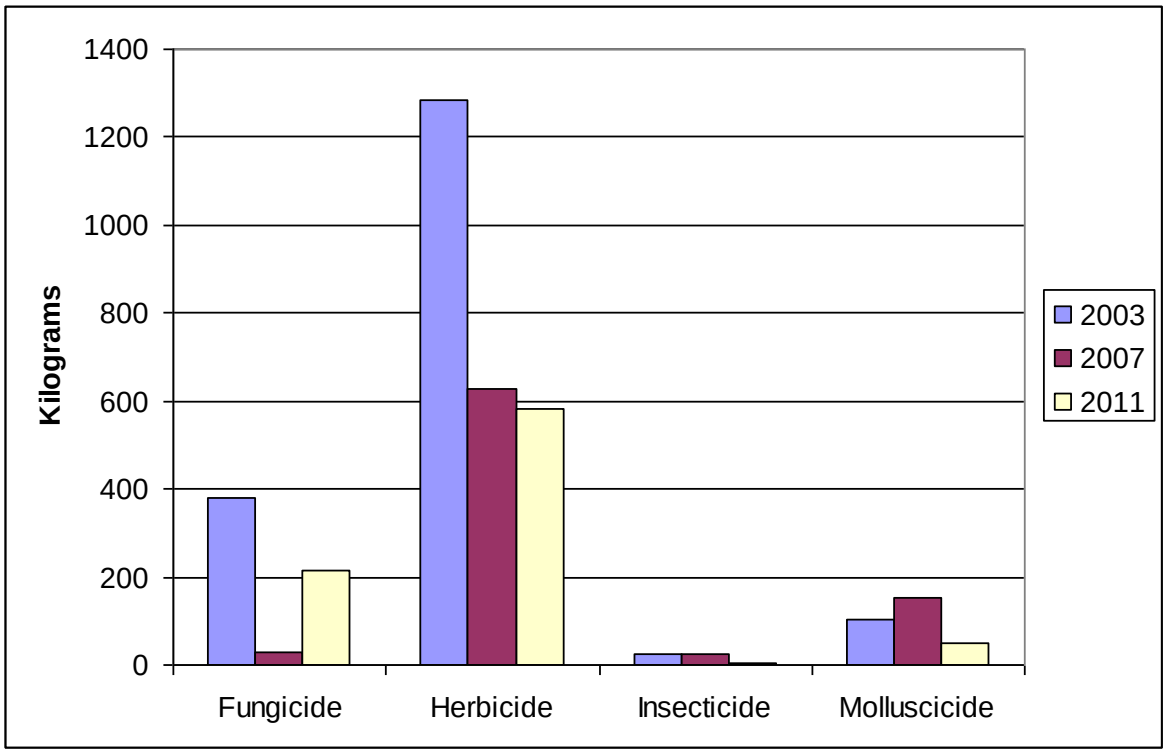


Figure 25: Quantity of the major pesticide groups applied to cauliflower in Scotland 2003-2011



Carrots

- The estimated area of 2,530 hectares of carrots grown in Scotland is comprised of 2,463 hectares of carrots recorded in the 'carrot' census category and 67 hectares recorded under 'other vegetable' census category
- 38,214 hectares were treated with a pesticide formulation
- 81% of the crop received a pesticide treatment
- 12,555 kg of pesticide were applied to the carrot crop in total

Summary of pesticide usage on carrots

Pesticide group	Formulation area treated (ha)	Weight of pesticides applied (kg)	% of crop area treated	Most used formulation (ha)
Fungicides	15,244	5,829	81	Boscalid/pyraclostrobin (2,551)
Herbicides	11,779	6,232	81	Linuron (4,386)
Insecticides	7,893	392	81	Lambda-cyhalothrin (6,955)
Seed treatments	3,298	102	81	Cymoxanil/fludioxonil/ metalaxyl-M (2,032)

Figure 26: Use of pesticides on carrots (% of total area treated with formulations) - 2011

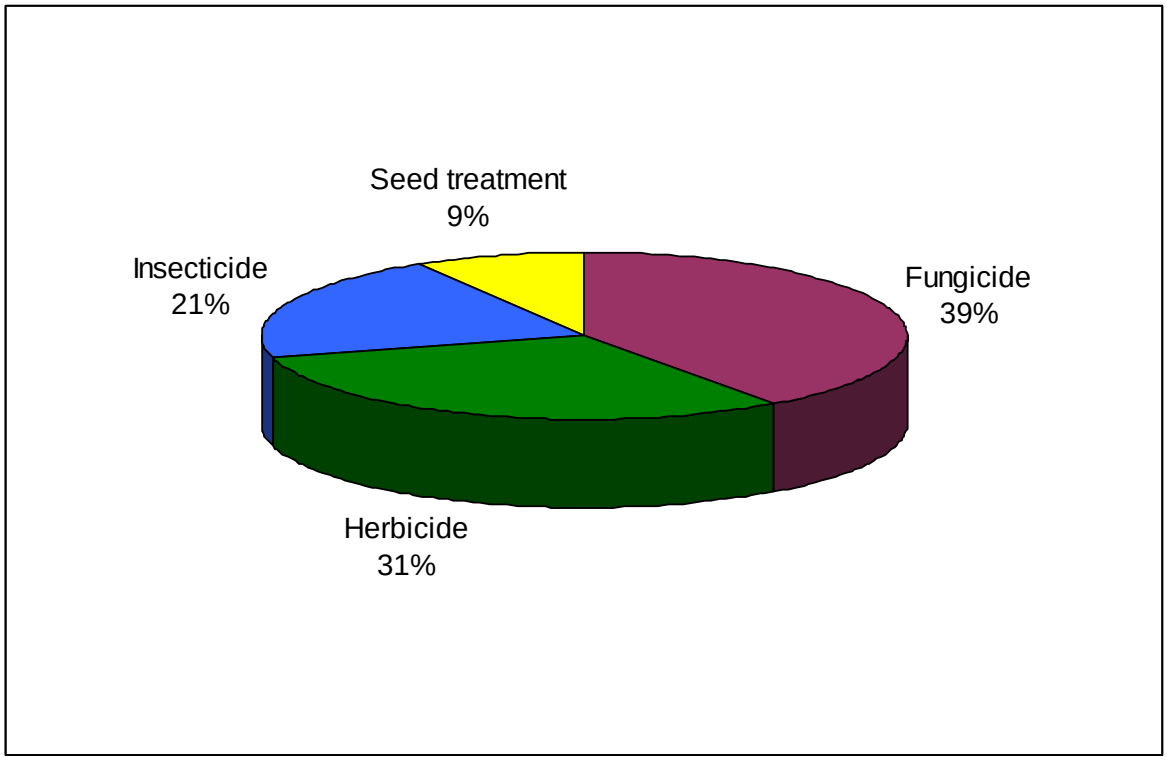


Figure 27: Area of carrots treated with the major pesticide groups in Scotland 2003-2011 (formulation ha)

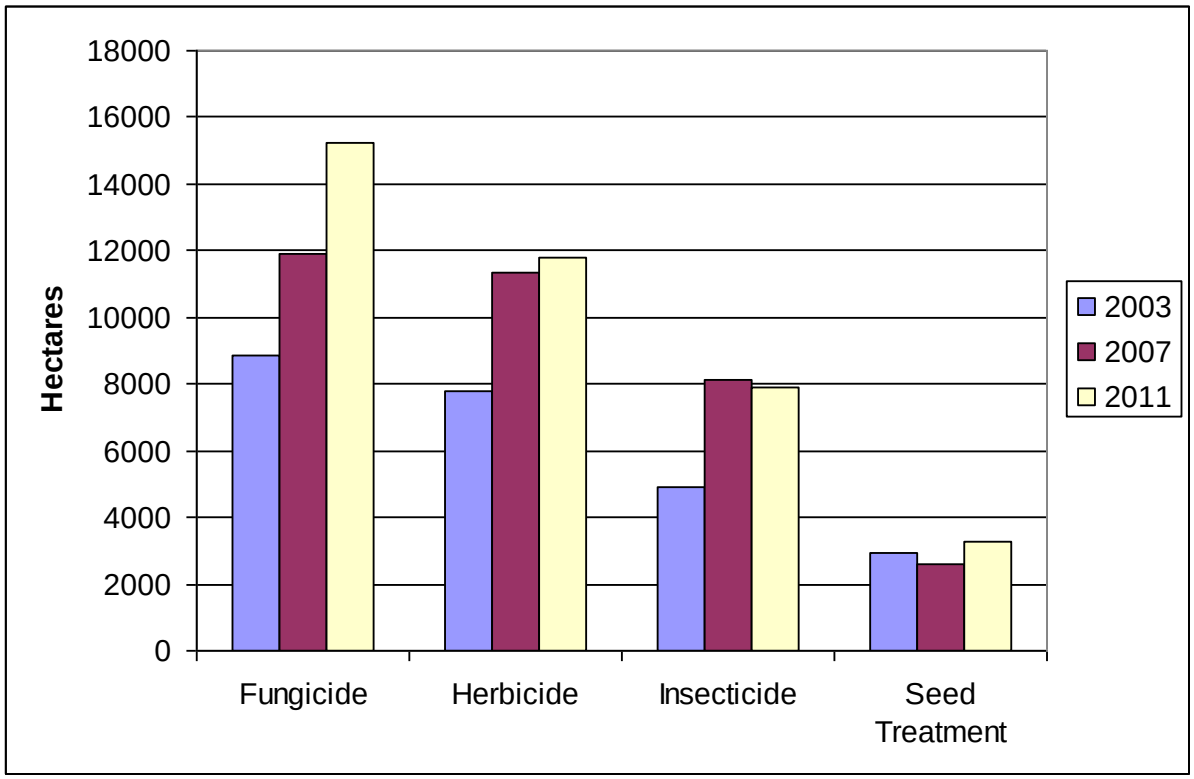
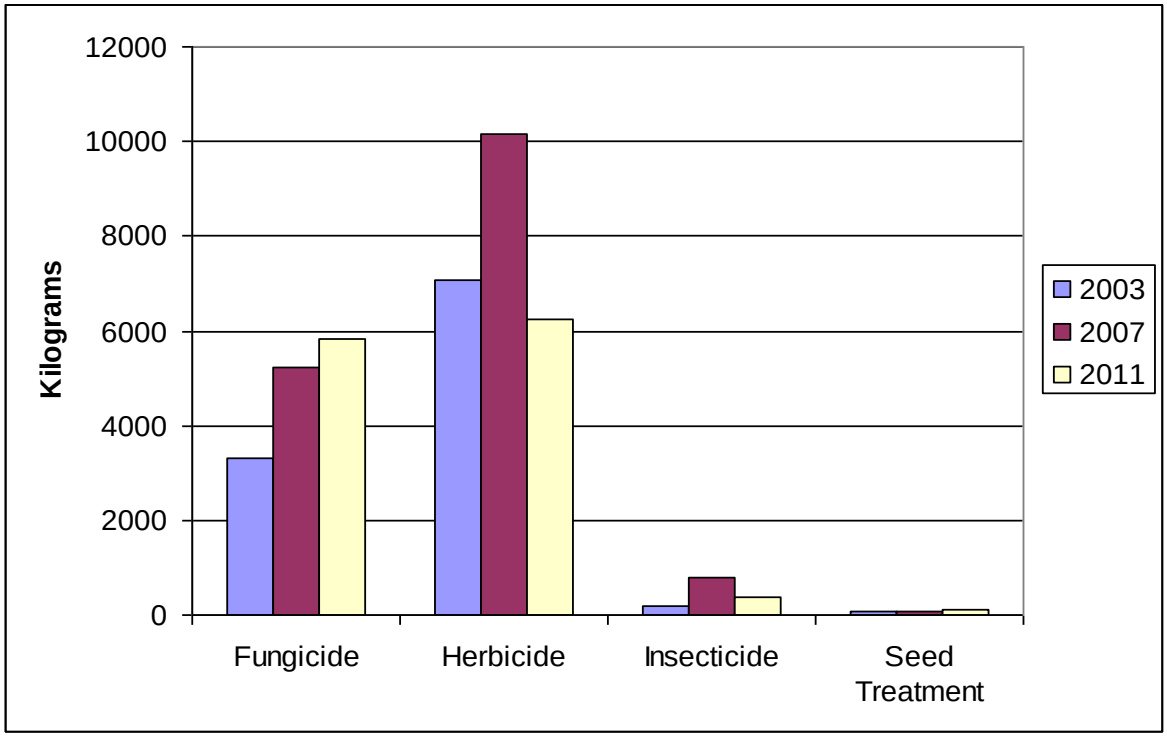


Figure 28: Quantity of the major pesticide groups applied to carrots in Scotland 2003-2011



Lettuce

- The total estimated area of lettuce grown in Scotland is 124 hectares, this comprises of 74 hectares recorded under the 'lettuce' census category and an estimated 50 hectares of multi-cropping
- 1,001 hectares treated with a pesticide formulation
- All of the crop was grown from transplants, and all of the crop was treated with a pesticide
- 523 kg of pesticide was applied

Summary of pesticide use on lettuce

Pesticide group	Formulation area treated (ha)	Weight of pesticides applied (kg)	% of crop area treated	Most used formulation (ha)
Fungicides	255	196	80	Boscalid/pyraclostrobin (118)
Herbicides	336	302	100	Pendimethalin (211)
Insecticides	311	7	100	Deltamethrin (211)
Molluscicides	99	18	80	Metaldehyde (99)

Figure 29: Use of pesticides on lettuce (% of total area treated with formulations) - 2011

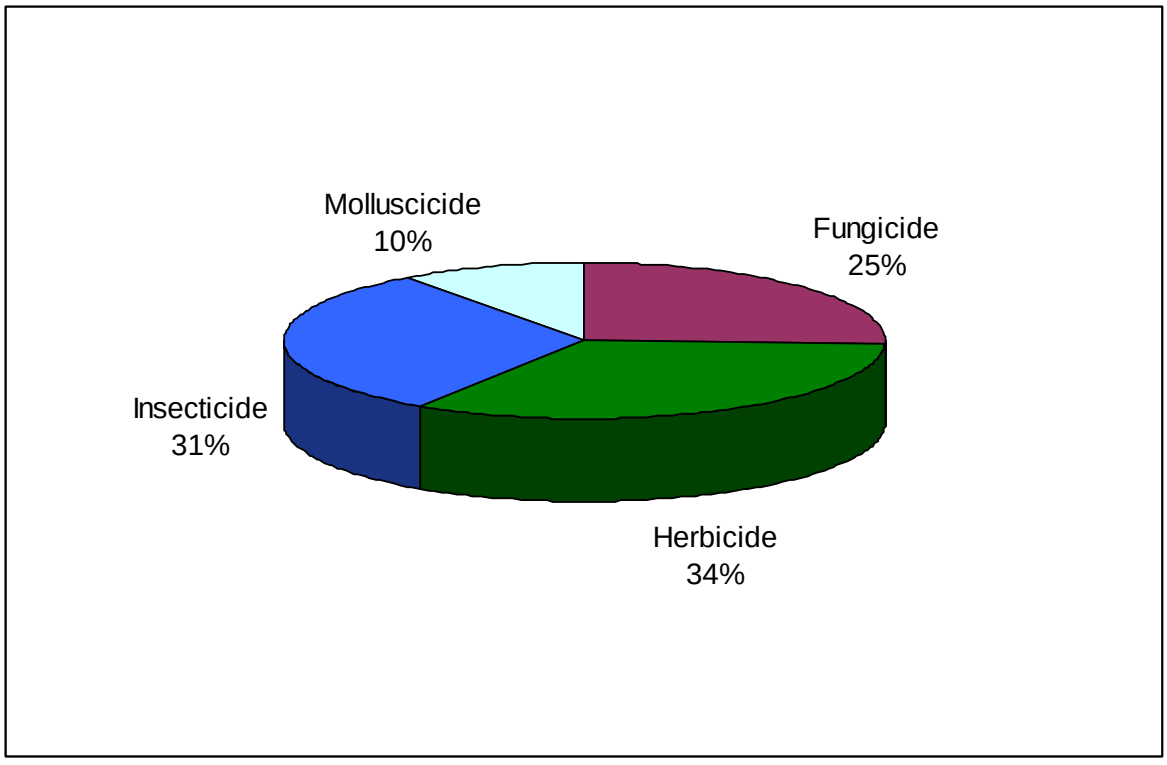


Figure 30: Area of lettuce treated with the major pesticide groups in Scotland 2003-2011 (formulation ha)

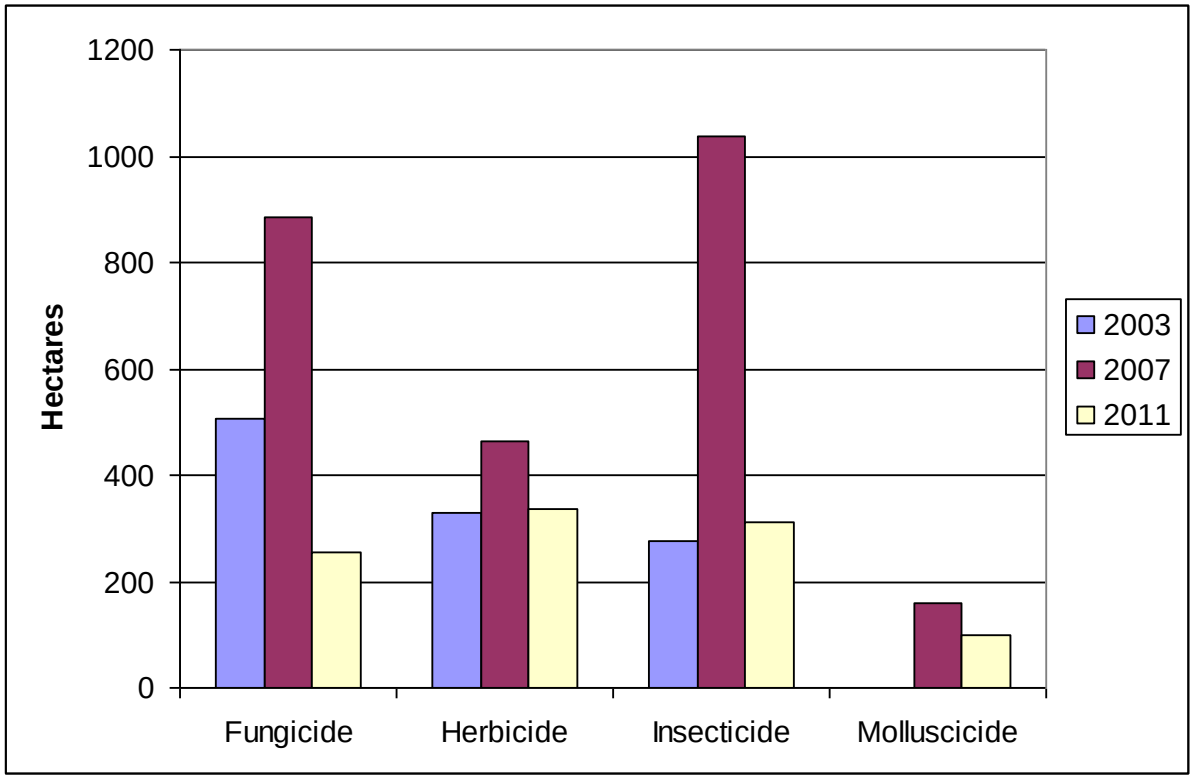
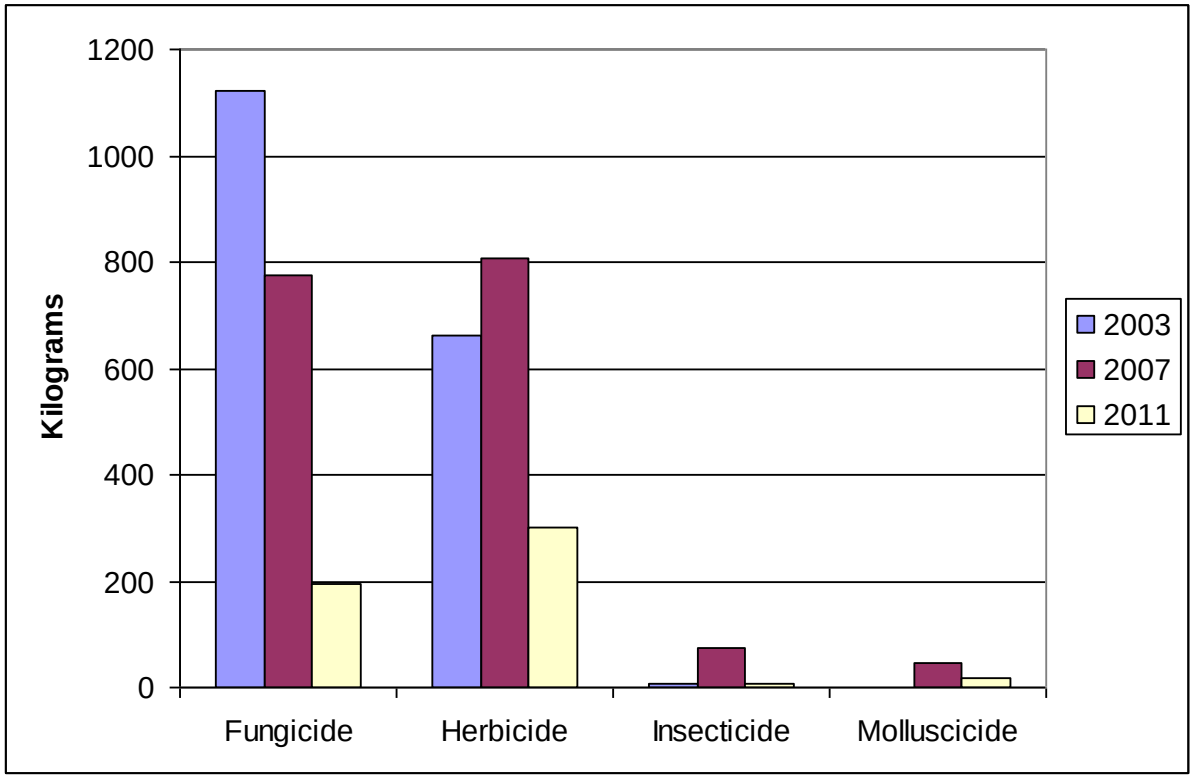


Figure 31: Quantity of the major pesticide groups applied to lettuce in Scotland 2003-2011



Turnips and Swedes

- The total estimated area of 1,659 hectares is comprised of 1,613 hectares recorded in the 'turnips and swedes' category in the census and 46 hectares from the 'other vegetable' category of the census
- 14,038 hectares treated with a pesticide formulation
- 96% of the turnip and swede crop was treated with a pesticide
- 5,575 kilograms of pesticide were applied to the crop

Summary of pesticide usage on turnips and swedes

Pesticide group	Formulation area treated (ha)	Weight of pesticides applied (kg)	% of crop area treated	Most used formulation (ha)
Fungicides	4,612	3,118	92	Azoxystrobin (2,042)
Herbicides	3,914	1,484	92	Metazachlor (1,445)
Insecticides	1,887	124	61	Deltamethrin (788)
Molluscicides	2,206	847	72	Metaldehyde (2,188)
Seed treatment	1,419	2	85	Thiram (1,419)

Figure 32: Use of pesticides on turnips and swedes (% of total area treated with formulations) - 2011

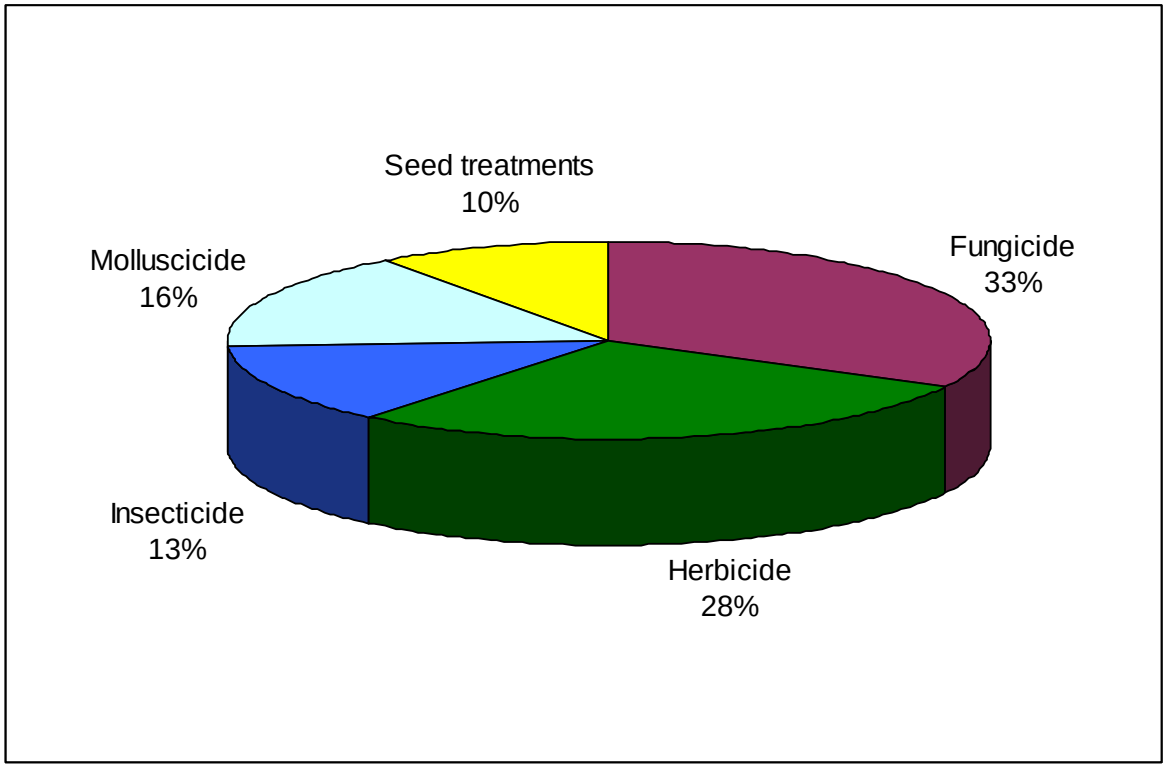


Figure 33: Area of turnips and swedes treated with the major pesticide groups in Scotland 2003-2011 (formulation ha)

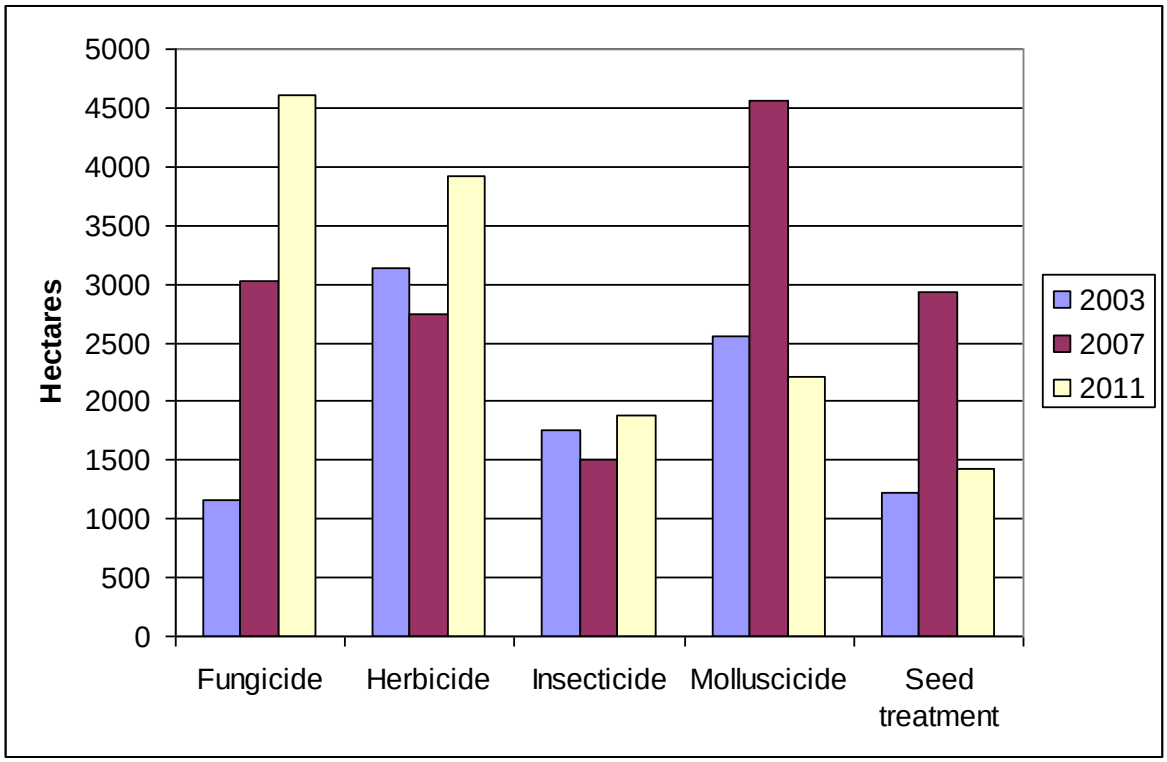
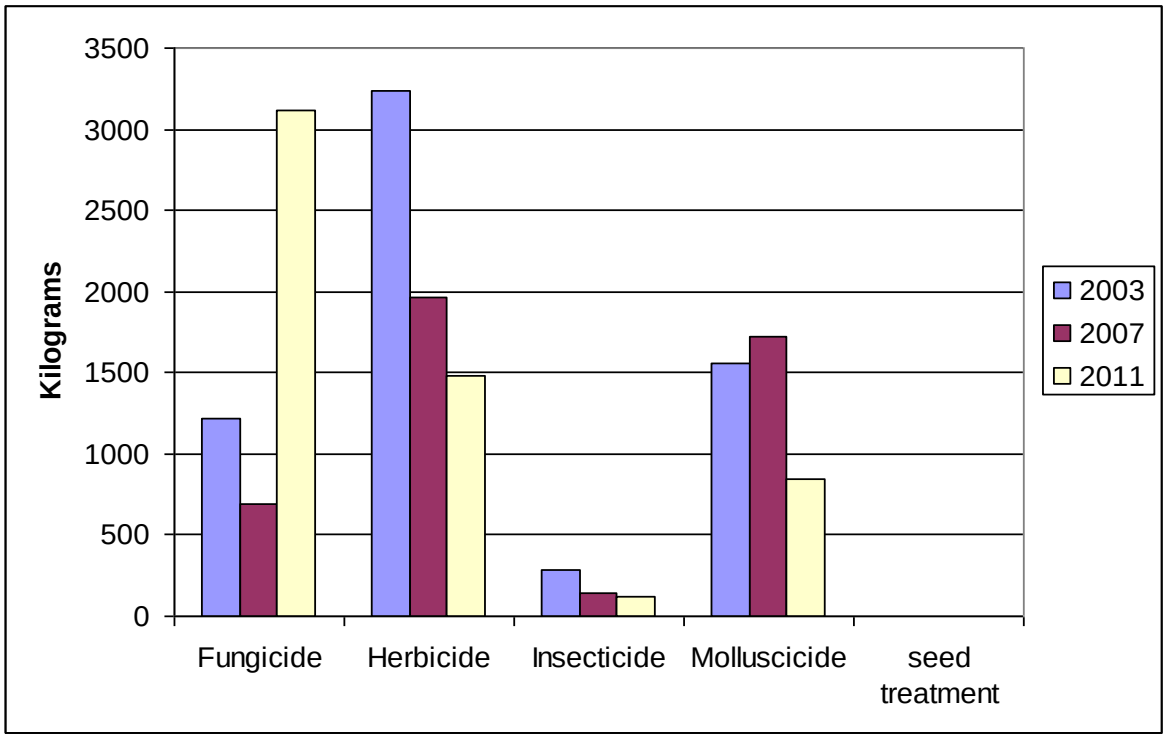


Figure 34: Quantity of the major pesticide groups applied to turnips and swedes in Scotland 2003-2011



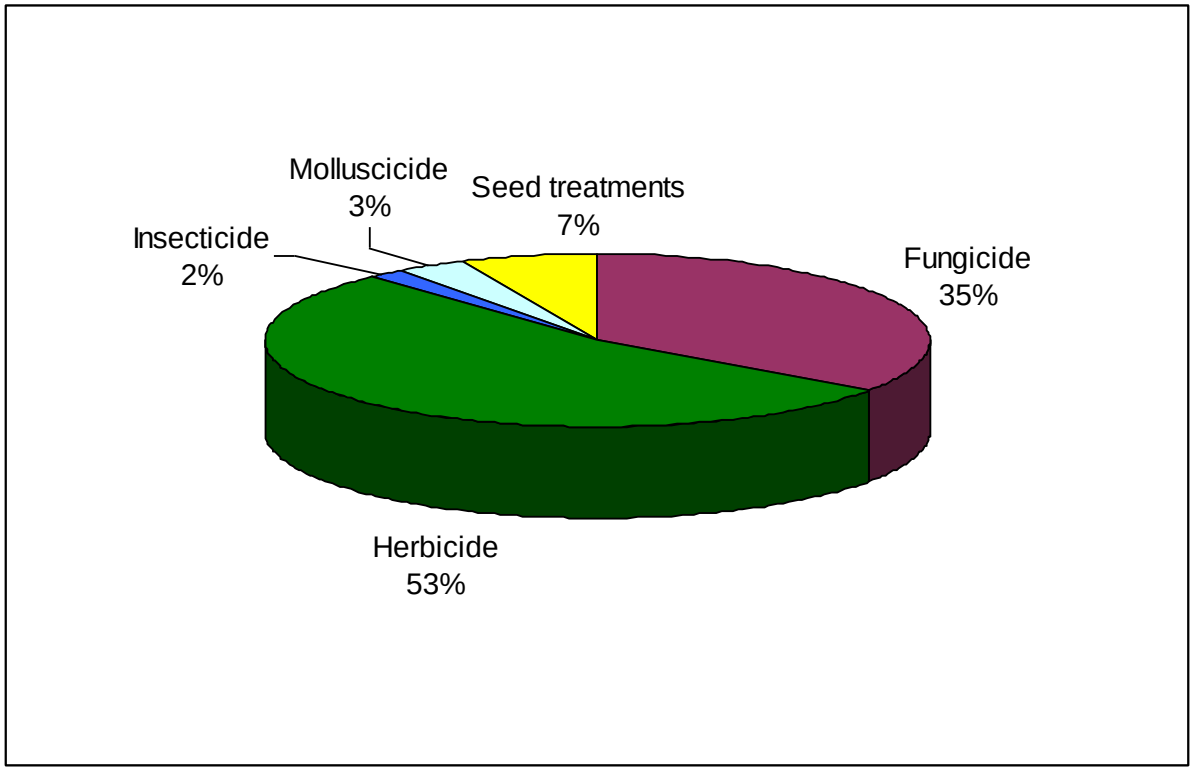
Other Vegetable Crops

- 'Other Vegetable' crops encountered in the 2011 survey were celeriac, parsley, beetroot, parsnips and onions. The data from the 'leek' and 'rhubarb' census categories have also been included in this category. This is because too few holdings were encountered to report these crops separately. Therefore the total estimated area of 'other vegetable' crops is 598 hectares
- 2,015 hectares of other vegetable crops treated with a pesticide formulation
- 39% of the crops were treated with a pesticide
- 1,300 kilograms of pesticide were applied to the crops
- 3% of the crops were grown from transplants

Summary of pesticide usage on other vegetable crops

Pesticide group	Formulation area treated (ha)	Weight of pesticides applied (kg)	% of crop area treated	Most used formulation (ha)
Fungicides	701	725	23	Copper oxychloride (192)
Herbicides	1,073	569	25	Pendimethalin (141)
Insecticides	40	1	2	Lambda-cyhalothrin (40)
Molluscicides	67	6	11	Metaldehyde (64)
Seed treatment	134	1	12	Cymoxanil/fludioxonil/ metalaxyl-M (72)

Figure 35: Use of pesticides on other vegetable crops (% of total area treated with formulations) - 2011



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References

1. Food and Environment Protection Act 1985: http://www.pesticides.gov.uk/approvals.asp?id=329

2. Walker, A. Pesticide usage survey report, Vegetables for Human Consumption 2007, SGRPID, Edinburgh 2008.

3. Snowden, J.P. Pesticide usage survey report, Vegetables for Human Consumption 2003; SEERAD, Edinburgh 2004.

4. Agricultural Statistics, Scotland 2011. HMSO, Edinburgh 2011.

5. Wood, H.J. An Agricultural Atlas of Scotland. George Gill and Sons, London, 1931.

Table 1 Census crop areas 2011 (hectares)[4]

	Scotland 2011	Scotland 2007	% change
Vining peas	**6,276**	3,793	65%
Broad beans	**996**	373	167%
Brussels sprouts	**776**	820	-5%
Cabbage	**239**	186	28%
Calabrese	**1,276**	991	29%
Cauliflower	**265**	322	-18%
Carrots	**2,463**	2,400	3%
Lettuce	**75**	144	-48%
Turnips & swedes	**1,614**	1,773	-9%
Leeks	**80**	155	-48%
Rhubarb	**76**	42	81%
All vegetable crops*	**15,246**	11,778	29%

'*' Includes other vegetable crops
Note: areas exclude multi-cropping

Table 2 Distribution of vegetable sample (excluding holdings growing only peas)

Number of holdings surveyed in each region and size group

Size* (ha)	Highlands & Islands and Caithness & Orkney	Moray Firth	Aberdeen	Angus	East Fife	Lothian	Central Lowlands	Tweed Valley	Scotland
0.1 - 9.9	4	1	1	2	1	0	2	1	12
10 - 19.9	0	2	1	10	4	0	1	0	18
20 - 29.9	0	1	1	5	2	4	2	2	17
30 - 39.9	0	1	0	2	2	1	0	0	6
40+	0	1	1	5	4	0	1	2	14
All sizes	**4**	**6**	**4**	**24**	**13**	**5**	**6**	**5**	**67**

'*' refers to area of vegetable crops (excluding vining peas) grown on holding

Table 3 Distribution of pea sample

Number of holdings surveyed in each region and size group

Size* (ha)	Angus	East Fife	Central Lowlands	Tweed Valley	Scotland
0.1-9.9	2	0	0	0	2
10-19.9	8	1	1	1	11
20-29.9	5	1	0	1	7
30-39.9	3	0	1	1	5
>40	6	0	2	0	8
All sizes	**24**	**2**	**4**	**3**	**33**

'*' refers to the area of vining peas grown on holding

Table 4 Percentage of each crop treated with pesticides

	Vining peas	Broad beans	Brussels sprouts	Cabbage	Calabrese	Cauliflower	Carrots	Lettuce	Turnips & swedes	Other vegetable crops
Insecticides	80	100	98	88	92	90	81	100	61	2
Molluscicides	0	0	98	88	0	63	0	80	72	11
Biological agents	0	0	36	4	0	0	0	0	0	0
Fungicides	97	100	98	88	95	82	81	80	92	23
Herbicides	100	100	98	94	100	100	81	100	92	25
Any pesticide	100	100	100	100	100	100	81	100	96	39

Table 5 Peas and beans seed treatment formulations

Area (ha) and percentage of crop treated

Seed treatments	Vining peas		Broad beans		Total	2007
	(ha)	(%)	(ha)	(%)	**(ha)**	(ha)
Cymoxanil/fludioxonil/metalaxyl-M	6,276	100	996	100	**7,272**	4,167
Area grown	6,276		996		**7,272**	4,298

Table 6 Peas and beans insecticide formulations

Area (ha) and percentage of crop treated

Insecticides	Vining peas		Broad beans		Total	2007
	(ha)	(%)	(ha)	(%)	**(ha)**	(ha)
Deltamethrin	0	0	347	35	**347**	107
Lambda-cyhalothrin	387	6	978	65	**1,365**	620
Pirimicarb	5,594	73	1,957	100	**7,551**	3,896
All insecticides	**5,981**	**80**	**3,283**	**100**	**9,263**	**4,623**
Area grown	6,276		996		**7,272**	4,298

Table 7 Peas and beans fungicide formulations

Area (ha) and percentage of crop treated

Fungicides	**Vining peas**		**Broad beans**		**Total**	**2007**
	(ha)	(%)	(ha)	(%)	**(ha)**	(ha)
Azoxystrobin	2,538	40	1,619	65	**4,157**	1,545
Boscalid/pyraclostrobin	2,743	44	0	0	**2,743**	0
Chlorothalonil/metalaxyl-M	0	0	1,335	67	**1,335**	753
Sulphur	837	13	0	0	**837**	579
Tebuconazole	0	0	1,619	65	**1,619**	58
All fungicides	**6,118**	**97**	**4,572**	**100**	**10,690**	**3,110**
Area grown	6,276		996		**7,272**	4,298

Table 8 Peas and beans herbicide formulations

Area (ha) and percentage of crop treated

Herbicides	**Vining peas**		**Broad beans**		**Total**	**2007**
	(ha)	(%)	(ha)	(%)	**(ha)**	(ha)
Bentazone	1,347	21	62	6	**1,409**	0
Diquat	202	3	182	18	**384**	0
Glyphosate	777	12	248	25	**1,025**	283
Imazamox/pendimethalin	3,929	63	676	68	**4,605**	429
Isoxaben/terbuthylazine	2,346	37	320	32	**2,667**	434
MCPA/MCPB	84	1	0	0	**84**	101
MCPB	400	6	0	0	**400**	0
Pendimethalin	1,833	29	134	13	**1,967**	0
All herbicides	**10,918**	**100**	**1,622**	**100**	**12,540**	**5,464**
Area grown	6,276		996		**7,272**	4,298

Table 9 Leaf brassica seed treatment formulations

Area treated (ha), percentage of crop treated and percentage of crop grown from transplants

Seed treatments	Brussels sprouts		Cabbage		Calabrese		Cauliflower		Total	2007
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(ha)
Imidacloprid	0	0	169	62	0	0	0	0	**169**	0
Crop grown from transplant	904	100	104	38	1,692	100	265	100	**2,965**	2,391
Area grown	904		273		1,692		265		**3,134**	2,424

Table 10 Leaf brassica insecticide, molluscicide and biological formulations

Area (ha) and percentage of crop treated

Insecticides	**Brussels sprouts**		**Cabbage**		**Calabrese**		**Cauliflower**		**Total**	**2007**
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(ha)
Cypermethrin	0	0	0	0	132	8	7	3	**140**	0
Deltamethrin	1,749	98	717	88	0	0	0	0	**2,465**	2,024
Indoxacarb	12	1	0	0	0	0	0	0	**12**	0
Lambda-cyhalothrin	564	24	0	0	2,965	92	330	87	**3,859**	2,484
Lambda-cyhalothrin/pirimicarb	1,249	80	0	0	0	0	0	0	**1,249**	1,320
Pirimicarb	803	67	0	0	419	25	0	0	**1,222**	2,769
Pymetrozine	2,196	82	239	88	109	6	0	0	**2,543**	1,268
Spirotetramat	0	0	239	88	0	0	0	0	**239**	0
Thiacloprid	794	80	0	0	746	44	36	14	**1,577**	513
All insecticides	**7,366**	**98**	**1,195**	**88**	**4,372**	**92**	**374**	**90**	**13,306**	**10,408**
Molluscicides										
Ferric phosphate	2,651	98	0	0	0	0	0	0	**2,651**	0
Metaldehyde	2,971	98	239	88	0	0	68	24	**3,278**	5,616
Methiocarb	149	16	0	0	0	0	242	52	**392**	30
All molluscicides	**5,770**	**98**	**239**	**88**	**0**	**0**	**311**	**63**	**6,320**	**5,647**
Biological agents										
Bacillus thuringiensis	15	2	10	4	0	0	0	0	**25**	0
Phasmarhabditis hermaphrodita	314	35	0	0	0	0	0	0	**314**	203
All biological agents	**329**	**36**	**10**	**4**	**0**	**0**	**0**	**0**	**339**	**203**
Area grown	904		273		1,692		265		**3,134**	2,424

Table 11 Leaf brassica fungicide formulations

Area (ha) and percentage of crop treated

Fungicides	Brussels sprouts		Cabbage		Calabrese		Cauliflower		Total	2007
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(ha)
Azoxystrobin	0	0	239	88	610	36	161	61	**1,010**	187
Azoxystrobin/difenoconazole	777	72	0	0	0	0	0	0	**777**	364
Boscalid/pyraclostrobin	778	79	0	0	69	4	0	0	**847**	1,058
Chlorothalonil	728	80	0	0	0	0	0	0	**728**	757
Chlorothalonil/metalaxyl-M	586	65	0	0	99	6	57	22	**742**	977
Copper oxychloride	0	0	0	0	3,924	95	0	0	**3,924**	2,536
Difenoconazole	642	64	239	88	0	0	0	0	**881**	1,332
Fluopicolide/propamocarb	0	0	0	0	0	0	139	52	**139**	0
Flusilazole	237	26	0	0	0	0	0	0	**237**	104
Iprodione	1,286	68	0	0	0	0	0	0	**1,286**	0
Mancozeb/metalaxyl-M	0	0	239	88	0	0	0	0	**239**	43
Prothioconazole	1,614	98	0	0	0	0	0	0	**1,614**	0
Sulphur	0	0	0	0	1,086	32	0	0	**1,086**	1,387
Tebuconazole/trifloxystrobin	2,345	98	0	0	0	0	0	0	**2,345**	940
All fungicides	**8,992**	**98**	**717**	**88**	**5,787**	**95**	**357**	**82**	**15,853**	**10,854**
Area grown	904		273		1,692		265		**3,134**	2,424

Table 12 Leaf brassica herbicide formulations

Area (ha) and percentage of crop treated

Herbicides	Brussels sprouts		Cabbage		Calabrese		Cauliflower		Total	2007
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(ha)
Clomazone	740	82	239	88	344	20	28	10	**1,351**	211
Cycloxydim	0	0	0	0	0	0	15	6	**15**	0
Glyphosate	29	3	0	0	1,786	70	119	37	**1,934**	1,067
Metazachlor	889	98	257	94	1,716	100	265	100	**3,127**	2,297
Pendimethalin	107	12	0	0	734	43	209	71	**1,049**	351
Tepraloxydim	0	0	0	0	0	0	6	2	**6**	0
All herbicides	**1,765**	**98**	**496**	**94**	**4,580**	**100**	**640**	**100**	**7,482**	**5,747**
Area grown	904		273		1,692		265		**3,134**	2,424

Table 13 Vegetables (excluding legumes and leaf brassicas) seed treatment formulations

Area treated (ha), percentage of crop treated and percentage of crop grown from transplants

Seed treatments	Carrots		Lettuce		Turnips and swedes		Other vegetable crops		Total	2007
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(ha)
Cymoxanil/fludioxonil/metalaxyl-M	2,032	80	0	0	0	0	72	12	**2,104**	2,086
Tefluthrin	1,266	50	0	0	0	0	0	0	**1,266**	908
Thiram	0	0	0	0	1,419	85	59	10	**1,477**	1,377
Unspecified seed treatment	0	0	0	0	0	0	3	+	**3**	11
Crop grown from transplant	0	0	124	100	0	0	18	3	**142**	397
No seed treatment	478	19	0	0	241	15	349	58	**1,067**	985
Area grown	2,531		124		1,659		598		**4,912**	5,097

'+'=<0.5%

Table 14 Vegetables (excluding legumes and leaf brassicas) insecticide and molluscicide formulations

Area (ha) and percentage of crop treated

Insecticides	**Carrots**		**Lettuce**		**Turnips & swedes**		**Other vegetable crops**		**Total**	**2007**
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(ha)
Acetamiprid	0	0	62	50	0	0	0	0	**62**	70
Deltamethrin	524	16	211	100	788	47	0	0	**1,523**	3,022
Lambda-cyhalothrin	6,955	81	0	0	440	17	40	2	**7,435**	5,524
Oxamyl	139	6	0	0	0	0	0	0	**139**	565
Pirimicarb	82	3	0	0	440	13	0	0	**522**	1,163
Spirotetramat	0	0	37	30	0	0	0	0	**37**	0
Thiacloprid	192	8	0	0	220	13	0	0	**412**	128
All insecticides	**7,893**	**81**	**311**	**100**	**1,887**	**61**	**40**	**2**	**10,131**	**11,573**
Molluscicides										
Metaldehyde	0	0	99	80	2,188	71	64	11	**2,351**	4,448
Methiocarb	0	0	0	0	18	1	3	1	**21**	215
All molluscicides	**0**	**0**	**99**	**80**	**2,206**	**72**	**67**	**11**	**2,372**	**4,813**
Area grown	2,531		124		1,659		598		**4,912**	5,097

Table 15 Vegetables (excluding legumes and leaf brassicas) fungicide formulations

Area (ha) and percentage of crop treated

Fungicides	Carrots		Lettuce		Turnips & swedes		Other vegetable crops		Total	2007
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(ha)
Azoxystrobin	1,655	37	0	0	2,042	92	59	10	**3,755**	3,523
Azoxystrobin/difenoconazole	969	38	0	0	0	0	0	0	**969**	0
Benthiavalicarb	0	0	0	0	0	0	128	11	**128**	0
Boscalid/pyraclostrobin	2,551	81	118	80	0	0	0	0	**2,669**	2,783
Copper oxychloride	179	7	0	0	0	0	192	11	**370**	407
Cyprodinil/fludioxonil	1,277	50	0	0	0	0	0	0	**1,277**	17
Dimethomorph/mancozeb	0	0	37	30	0	0	64	11	**101**	13
Fenpropimorph	1,661	55	0	0	0	0	0	0	**1,661**	1,784
Fluoxastrobin/prothioconazole	0	0	0	0	0	0	128	11	**128**	0
Flusilazole	0	0	0	0	1,008	61	0	0	**1,008**	385
Iprodione/thiophanate-methyl	298	10	0	0	0	0	0	0	**298**	2,000
Mancozeb	0	0	0	0	0	0	91	13	**91**	41
Mancozeb/metalaxyl-M	0	0	99	80	0	0	0	0	**99**	95
Metalaxyl-M	1,936	76	0	0	0	0	0	0	**1,936**	1,553
Prothioconazole	358	14	0	0	885	37	0	0	**1,243**	0
Sulphur	82	3	0	0	450	27	27	2	**559**	269
Tebuconazole	2,527	70	0	0	228	14	13	2	**2,768**	3,189
Tebuconazole/trifloxystrobin	1,753	64	0	0	0	0	0	0	**1,753**	677
All fungicides	**15,244**	**81**	**255**	**80**	**4,612**	**92**	**701**	**23**	**20,813**	**17,240**
Area grown	2,531		124		1,659		598		**4,912**	5,097

Table 16 Vegetables (excluding legumes and leaf brassicas) herbicide formulations

Area (ha) and percentage of crop treated

Herbicides	Carrots		Lettuce		Turnips & swedes		Other vegetable crops		Total	2007
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(ha)
Bentazone	0	0	0	0	0	0	64	11	**64**	0
Chloridazon	0	0	0	0	0	0	64	11	**64**	0
Chlorthal-dimethyl	0	0	0	0	36	2	0	0	**36**	0
Clomazone	1,595	63	0	0	1,275	77	0	0	**2,870**	354
Clopyralid	0	0	0	0	583	35	0	0	**583**	73
Diquat	149	6	0	0	104	6	13	2	**266**	0
Fluroxypyr	0	0	0	0	0	0	64	11	**64**	73
Glyphosate	29	1	0	0	78	5	3	1	**109**	659
Ioxynil	0	0	0	0	0	0	128	11	**128**	73
Lenacil	0	0	0	0	0	0	118	10	**118**	0
Linuron	4,386	78	0	0	0	0	40	2	**4,427**	4,371
Metamitron	0	0	0	0	0	0	13	2	**13**	226

Cont….

Table 16 Vegetables (excluding legumes and leaf brassicas) herbicide formulations continued

Area (ha) and percentage of crop treated

Herbicides	Carrots		Lettuce		Turnips & swedes		Other vegetable crops		Total	2007
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(ha)
Metazachlor	0	0	0	0	1,445	87	0	0	**1,445**	1,510
Metribuzin	1,663	52	0	0	0	0	0	0	**1,663**	564
Pendimethalin	1,797	71	211	100	0	0	141	13	**2,149**	2,095
Phenmedipham	0	0	0	0	0	0	118	10	**118**	0
Propaquizafop	136	5	0	0	357	22	0	0	**493**	558
Propyzamide	0	0	124	100	0	0	9	2	**133**	160
Prosulfocarb	1,004	35	0	0	0	0	91	13	**1,095**	73
S-metolachlor	0	0	0	0	36	2	0	0	**36**	0
Tepraloxydim	1,021	40	0	0	0	0	88	11	**1,109**	542
Triflusulfuron-methyl	0	0	0	0	0	0	118	10	**118**	0
All herbicides	**11,779**	**81**	**336**	**100**	**3,914**	**92**	**1,073**	**25**	**17,102**	**16,342**
Area grown	2,531		124		1,659		598		**4,912**	5,097

Table 17 Peas and beans seed treatment active ingredients

Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Seed treatments	**Vining peas**		**Broad beans**		**Total**	**Total**
	(ha)	(%)	(ha)	(%)	**(ha)**	(kg)
Cymoxanil	6,276	100	996	100	**7,272**	279
Fludioxonil	6,276	100	996	100	**7,272**	140
Metalaxyl-M	6,276	100	996	100	**7,272**	489
Area grown	6,276		996		**7,272**	

Table 18 Peas and beans insecticide active ingredients

Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Insecticides	**Vining peas**		**Broad beans**		**Total**	**Total**
	(ha)	(%)	(ha)	(%)	**(ha)**	(kg)
Pyrethroids						
Deltamethrin	0	35	347	35	**347**	3
Lambda-cyhalothrin	387	6	978	65	**1,365**	9
All pyrethroids	**387**		**1,325**		**1,712**	**11**
Carbamates						
Pirimicarb	5,594	73	1,957	100	**7,551**	864
All carbamates	5,594		**1,957**		**7,551**	**864**
All insecticides	**5,981**	**80**	**3,283**	**100**	**9,264**	**875**
Area grown	6,276		996		**7,272**	

Table 19 Peas and beans fungicide active ingredients

Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Fungicides	**Vining peas**		**Broad beans**		**Total**	**Total**
	(ha)	(%)	(ha)	(%)	(ha)	(kg)
Azoxystrobin	2,538	40	1,619	65	**4,157**	777
Boscalid	2,743	44	0	0	**2,743**	511
Chlorothalonil	0	0	1,335	67	**1,335**	988
Metalaxyl-M	0	0	1,335	67	**1,335**	74
Pyraclostrobin	2,743	44	0	0	**2,743**	128
Sulphur	837	13	0	0	**837**	3,346
Tebuconazole	0	0	1,619	65	**1,619**	204
All fungicides	**8,861**	**97**	**5,907**	**100**	**14,768**	**6,028**
Area grown	6,276		996		**7,272**	

Table 20 Peas and beans herbicide active ingredients

Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Herbicides	**Vining peas**		**Broad beans**		**Total**	**Total**
	(ha)	(%)	(ha)	(%)	**(ha)**	(kg)
Bentazone	1,347	21	62	6	**1,409**	1,191
Diquat	202	3	182	18	**384**	154
Glyphosate	777	12	248	25	**1,025**	738
Imazamox	3,929	63	676	68	**4,605**	275
Isoxaben	2,346	37	320	32	**2,667**	200
MCPA	84	1	0	0	**84**	3
MCPB	484	8	0	0	**484**	512
Pendimethalin	5,762	92	810	81	**6,572**	5,518
Terbuthylazine	2,346	37	320	32	**2,667**	1,120
All herbicides	**17,278**	**100**	**2,618**	**100**	**19,896**	**9,710**
Area grown	6,276		996		**7,272**	

Table 21 Leaf brassica seed treatments active ingredients

Area treated (ha), percentage of crop treated and grown from transplants and quantity (kg) of active ingredients for all crops

Seed treatments	Brussels sprouts		Cabbage		Calabrese		Cauliflower		Total	Total
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(kg)
Imidacloprid (neonicotinoid)	0	0	169	62	0	0	0	0	**169**	36
Crop grown from transplants	904	100	104	38	1,692	100	265	100	**2,965**	
Area grown	904		273		1,692		265		**3,134**	

Table 22 Leaf brassica insecticide, biological control agent and molluscicide active ingredients

Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Insecticides	Brussels sprouts		Cabbage		Calabrese		Cauliflower		Total	Total
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(kg)
Pyrethroids										
Cypermethrin	0	0	0	0	132	8	7	3	**140**	3
Deltamethrin	1,749	98	717	88	0	0	0	0	**2,465**	17
Lambda-cyhalothrin	1,813	97	0	0	2,965	92	330	87	**5,108**	38
All pyrethroids	**3,561**		**717**		**3,097**		**337**		**7,713**	**59**
Carbamates										
Pirimicarb	2,052	97	0	0	419	25	0	0	**2,471**	477
All carbamates	**2,052**		**0**		**419**		**0**		**2,471**	**477**
Neonicotinoids										
Thiacloprid	794	80	0	0	746	44	36	14	**1,577**	150
All neonicotinoids	**794**		**0**		**746**		**36**		**1,577**	**150**
Others										
Indoxacarb	12	1	0	0	0	0	0	0	**12**	+
Pymetrozine	2,196	82	239	88	109	6	0	0	**2,543**	509
Spirotetramat	0	0	239	88	0	0	0	0	**239**	18
All others	**2,208**		**478**		**109**		**0**		**2,794**	**527**
All insecticides	**8,615**	**98**	**1,195**	**88**	**4,372**	**92**	**374**	**90**	**14,555**	**1,213**

'+'=<0.5kg

Cont….

Table 22 Leaf brassica insecticide, biological control agent and molluscicide active ingredients continued

Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Molluscicides	**Brussels sprouts**		**Cabbage**		**Calabrese**		**Cauliflower**		**Total**	**Total**
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(kg)
Ferric phosphate	2,651	98	0	0	0	0	0	0	**2,651**	436
Metaldehyde	2,971	98	239	88	0	0	68	24	**3,278**	782
Methiocarb	149	16	0	0	0	0	242	52	**392**	47
All molluscicides	**5,770**	**98**	**239**	**88**	**0**	**0**	**311**	**63**	**6,320**	**1,265**
Biological agents										
Bacillus thuringiensis	15	2	10	4	0	0	0	0	**25**	NA
Phasmarhabditis hermaphrodita	314	35	0	0	0	0	0	0	**314**	NA
All biological agents	**329**	**36**	**10**	**4**	**0**	**0**	**0**	**0**	**339**	**NA**
Area grown	904		273		1,692		265		**3,134**	

'+'=<0.5kg

NA = not applicable

Table 23 Leaf brassica fungicide active ingredients

Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Fungicides	Brussels sprouts		Cabbage		Calabrese		Cauliflower		Total	Total
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(kg)
Azoxystrobin	777	72	239	88	610	36	161	61	**1,787**	374
Boscalid	778	79	0	0	69	4	0	0	**847**	213
Chlorothalonil	1,314	98	0	0	99	6	57	22	**1,469**	1,177
Copper oxychloride	0	0	0	0	3,924	95	0	0	**3,924**	1,479
Difenoconazole	1,419	98	239	88	0	0	0	0	**1,658**	163
Fluopicolide	0	0	0	0	0	0	139	52	**139**	14
Flusilazole	237	26	0	0	0	0	0	0	**237**	24
Iprodione	1,286	68	0	0	0	0	0	0	**1,286**	646
Mancozeb	0	0	239	88	0	0	0	0	**239**	229
Metalaxyl-M	586	65	239	88	99	6	57	22	**981**	48
Propamocarb hydrochloride	0	0	0	0	0	0	139	52	**139**	139
Prothioconazole	1,614	98	0	0	0	0	0	0	**1,614**	310
Pyraclostrobin	778	79	0	0	69	4	0	0	**847**	53
Sulphur	0	0	0	0	1,086	32	0	0	**1,086**	1,174
Tebuconazole	2,345	98	0	0	0	0	0	0	**2,345**	469
Trifloxystrobin	2,345	98	0	0	0	0	0	0	**2,345**	234
All fungicides	**13,478**	**98**	**956**	**88**	**5,954**	**95**	**553**	**82**	**20,941**	**6,746**
Area grown	904		273		1,692		265		**3,134**	

Table 24 Leaf brassica herbicide active ingredients

Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Herbicides	**Brussels sprouts**		**Cabbage**		**Calabrese**		**Cauliflower**		**Total**	**Total**
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(kg)
Clomazone	740	82	239	88	344	20	28	10	**1,351**	103
Cycloxydim	0	0	0	0	0	0	15	6	**15**	6
Glyphosate	29	3	0	0	1,786	70	119	37	**1,934**	2,060
Metazachlor	889	98	257	94	1,716	100	265	100	**3,127**	2,274
Pendimethalin	107	12	0	0	734	43	209	71	**1,049**	1,319
Tepraloxydim	0	0	0	0	0	0	6	2	**6**	+
All herbicides	**1,765**	**98**	**496**	**94**	**4,580**	**100**	**640**	**100**	**7,482**	**5,764**
Area grown	904		273		1,692		265		**3,134**	

'+'=<0.5kg

Table 25 Vegetables (excluding legumes and leaf brassicas) seed treatment active ingredients

Area treated (ha), percentage of crop treated and grown from transplants and quantity (kg) of active ingredients for all crops

Seed treatments	Carrots		Lettuce		Turnips & swedes		Other vegetable crops		Total	Total
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(kg)
Cymoxanil	2,032	80	0	0	0	0	72	12	**2,104**	2
Fludioxonil	2,032	80	0	0	0	0	72	12	**2,104**	1
Metalaxyl-M	2,032	80	0	0	0	0	72	12	**2,104**	4
Tefluthrin	1,266	50	0	0	0	0	0	0	**1,266**	96
Thiram	0	0	0	0	1,419	85	59	10	**1,477**	3
Unspecified seed treatment	0	0	0	0	0	0	3	+	**3**	NA
Crop grown from transplants	0	0	124	100	0	0	18	3	**142**	NA
No seed treatment	478	19			241	15	376	63	**1,095**	NA
Area grown	2,531		124		1,659		598		**4,912**	

'+'=<0.5%

NA = not applicable

Table 26 Vegetables (excluding legumes and leaf brassicas) insecticide and molluscicide active ingredients

Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Insecticides	Carrots		Lettuce		Turnips and swedes		Other vegetable crops		Total	Total
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(kg)
Pyrethroids										
Deltamethrin	524	16	211	100	788	47	0	0	**1,523**	11
Lambda-cyhalothrin	6,955	81	0	0	440	17	40	2	**7,435**	84
All pyrethroids	**7,480**		**211**		**1,228**		**40**		**8,959**	**95**
Carbamates										
Pirimicarb	82	3	0	0	440	13	0	0	**522**	104
All carbamates	**82**		**0**		**440**		**0**		**522**	**104**
Neonicotinoids										
Acetamiprid	0	0	62	50	0	0	0	0	**62**	3
Thiacloprid	192	8	0	0	220	13	0	0	**412**	40
All neonicotinoids	**192**		**62**		**220**		**0**		**474**	**43**
Others										
Oxamyl	139	6	0	0	0	0	0	0	**139**	279
Spirotetramat	0	0	37	30	0	0	0	0	**37**	3
All others	**139**		**37**		**0**		**0**		**177**	282
All insecticides	**7,893**	**81**	**311**	**100**	**1,887**	**61**	**40**	**2**	**10,131**	**523**

Cont….

Table 26 Vegetables (excluding legumes and leaf brassicas) insecticide and molluscicide active ingredients continued
Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Molluscicides	**Carrots**		**Lettuce**		**Turnips and swedes**		**Other vegetable crops**		**Total**	**Total**
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(kg)
Methiocarb	0	0	0	0	18	1	3	1	**21**	3
Metaldehyde	0	0	99	80	2,188	71	64	11	**2,351**	868
All molluscicides	**0**	**0**	**99**	**80**	**2,206**	**72**	**67**	**11**	**2,372**	**871**
Area grown	2,531		124		1,659		598		**4,912**	

Table 27 Vegetables (excluding legumes and leaf brassicas) fungicide active ingredients

Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Fungicides	Carrots		Lettuce		Turnips and swedes		Other vegetable crops		Total	Total
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(kg)
Azoxystrobin	2,624	76	0	0	2,042	92	59	10	**4,725**	1,040
Benthiavalicarb isopropyl	0	0	0	0	0	0	128	11	**128**	4
Boscalid	2,551	81	118	80	0	0	0	0	**2,669**	713
Copper oxychloride	179	7	0	0	0	0	192	11	**370**	337
Cyprodinil	1,277	50	0	0	0	0	0	0	**1,277**	383
Difenoconazole	969	38	0	0	0	0	0	0	**969**	121
Dimethomorph	0	0	37	30	0	0	64	11	**101**	15
Fenpropimorph	1,661	55	0	0	0	0	0	0	**1,661**	1,220
Fludioxonil	1,277	50	0	0	0	0	0	0	**1,277**	255
Fluoxastrobin	0	0	0	0	0	0	128	11	**128**	16
Flusilazole	0	0	0	0	1,008	61	0	0	**1,008**	156

Cont….

Table 27 Vegetables (excluding legumes and leaf brassicas) fungicide active ingredients continued

Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Fungicides	Carrots		Lettuce		Turnips and swedes		Other vegetable crops		Total	Total
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(kg)
Iprodione	298	10	0	0	0	0	0	0	**298**	100
Mancozeb	0	0	99	80	0	0	283	13	**382**	510
Metalaxyl-M	1,936	76	99	80	0	0	0	0	**2,035**	1,037
Prothioconazole	358	14	0	0	885	37	128	11	**1,371**	255
Pyraclostrobin	2,551	81	118	80	0	0	0	0	**2,669**	179
Sulphur	82	3	0	0	450	27	27	2	**559**	2,577
Tebuconazole	4,280	80	0	0	228	14	13	2	**4,521**	722
Thiophanate-methyl	298	10	0	0	0	0	0	0	**298**	100
Trifloxystrobin	1,753	64	0	0	0	0	0	0	**1,753**	131
All fungicides	**22,093**	**81**	**472**	**80**	**4,612**	**92**	**1,021**	**23**	**28,198**	**9,869**
Area grown	2,531		124		1,659		598		**4,912**	

Table 28 Vegetables (excluding legumes and leaf brassicas) herbicide active ingredients

Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Herbicides	Carrots		Lettuce		Turnips and swedes		Other vegetable crops		Total	Total
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(kg)
Bentazone	0	0	0	0	0	0	64	11	**64**	22
Chloridazon	0	0	0	0	0	0	64	11	**64**	29
Chlorthal-dimethyl	0	0	0	0	36	2	0	0	**36**	109
Clomazone	1,595	63	0	0	1,275	77	0	0	**2,870**	207
Clopyralid	0	0	0	0	583	35	0	0	**583**	63
Diquat	149	6	0	0	104	6	13	2	**266**	80
Fluroxypyr	0	0	0	0	0	0	64	11	**64**	5
Glyphosate	29	1	0	0	78	5	3	1	**109**	137
Ioxynil	0	0	0	0	0	0	128	11	**128**	9
Lenacil	0	0	0	0	0	0	118	10	**118**	65
Linuron	4,386	78	0	0	0	0	40	2	**4,427**	1,329
Metamitron	0	0	0	0	0	0	13	2	**13**	23

Cont…

Table 28 Vegetables (excluding legumes and leaf brassicas) herbicide active ingredients continued

Area treated (ha), percentage of crop treated and quantity (kg) of active ingredients for all crops

Herbicides	Carrots		Lettuce		Turnips and swedes		Other vegetable crops		Total	Total
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	**(ha)**	(kg)
Metazachlor	0	0	0	0	1,445	87	0	0	**1,445**	1,005
Metribuzin	1,663	52	0	0	0	0	0	0	**1,663**	348
Pendimethalin	1,797	71	211	100	0	0	141	13	**2,149**	2,922
Phenmedipham	0	0	0	0	0	0	118	10	**118**	57
Propaquizafop	136	5	0	0	357	22	0	0	**493**	67
Propyzamide	0	0	124	100	0	0	9	2	**133**	189
Prosulfocarb	1,004	35	0	0	0	0	91	13	**1,095**	1,807
S-metolachlor	0	0	0	0	36	2	0	0	**36**	35
Tepraloxydim	1,021	40	0	0	0	0	88	11	**1,109**	79
Triflusulfuron-methyl	0	0	0	0	0	0	118	10	**118**	1
All herbicides	**11,779**	**81**	**336**	**100**	**3,914**	**92**	**1,073**	**25**	**17,102**	**8,587**
Area grown	2,531		124		1,659		598		**4,912**	

Table 29 Principal active ingredients by area

Area treated with the 20 most used active ingredients on all vegetable crops surveyed

	Active	Type*	2011	2007
1	Lambda-cyhalothrin	I	**13,908**	10,223
2	Metalaxyl-M	F/S	**13,726**	9,706
3	Azoxystrobin	F	**10,669**	5,619
4	Pirimicarb	I	**10,544**	9,423
5	Pendimethalin	H	**9,771**	2,875
6	Cymoxanil	S	**9,376**	6,252
7	Fludioxonil	F/S	**9,376**	6,326
8	Tebuconazole	F/S	**8,485**	6,108
9	Boscalid	F	**6,259**	3,840
10	Pyraclostrobin	F	**6,259**	3,840
11	Metaldehyde	M	**5,629**	10,065
12	Imazamox	H	**4,605**	429
13	Metazachlor	H	**4,573**	3,808
14	Linuron	H	**4,427**	4,371
15	Deltamethrin	I	**4,336**	5,153
16	Copper oxychloride	F	**4,294**	2,943
17	Clomazone	H	**4,221**	566
18	Trifloxystrobin	F	**4,098**	1,618
19	Glyphosate	H	**3,068**	2,008
20	Prothioconazole	F	**2,985**	0

* Pesticide type = H: Herbicide, F: Fungicide, I: Insecticide, M: Molluscicide, S: Seed treatment

Table 30 Principal active ingredients by weight

Quantity (kg) of the 20 most used active ingredients on all vegetable crops surveyed

	Active	Type*	2011	2007
1	Pendimethalin	H	**9,760**	4,421
2	Sulphur	F	**7,097**	5,344
3	Metazachlor	H	**3,279**	2,414
4	Glyphosate	H	**2,936**	2,118
5	Azoxystrobin	F	**2,191**	1,282
6	Chlorothalonil	F	**2,164**	2,638
7	Copper oxychloride	F	**1,816**	1,396
8	Prosulfocarb	H	**1,807**	117
9	Metalaxyl-M	F/S	**1,651**	1,214
10	Metaldehyde	M	**1,650**	3,978
11	Pirimicarb	I	**1,445**	1,507
12	Boscalid	F	**1,437**	1,036
13	Tebuconazole	F/S	**1,395**	1,078
14	Linuron	H	**1,329**	1,772
15	Fenpropimorph	F	**1,220**	1,310
16	Bentazone	H	**1,213**	230
17	Terbuthylazine	H	**1,120**	1,485
18	Iprodione	F	**746**	749
19	Mancozeb	F	**739**	254
20	Prothioconazole	F	**564**	0

* Pesticide type = H: Herbicide, F: Fungicide, I: Insecticide, M: Molluscicide, S: Seed treatment

Table 31 Total Vegetable Crop, comparison with previous years

Pesticide usage in 2003, 2007 and 2011, area treated with formulations and active ingredients (a.i.) and the quantities (kg) applied.

	2003			2007			2011		
	Formulations (ha)	**a.i. (ha)**	**kg**	**Formulations (ha)**	**a.i. (ha)**	**kg**	**Formulations (ha)**	**a.i. (ha)**	**kg**
Insecticides									
Pyrethroids	11,273	11,891	114	14,284	15,879	159	17,135	18,384	161
Organophosphates	303	303	222	0	0	0	0	0	0
Carbamates	4,688	5,305	1,075	7,829	9,423	1,507	9,295	10,544	1,445
Neonicotinoids*	0	0	0	711	711	65	2,051	2,051	192
Mixed formulation	618	0	0	1,595	0	0	1,249	0	0
Other insecticides	1,639	1,639	140	2,186	2,186	1,026	2,971	2,971	808
All insecticides	18,521	19,138	1,551	26,604	28,199	2,757	32,701	33,949	2,612
Molluscicides	4,509	4,509	2,403	10,460	10,460	4,019	8,692	8,692	2,136
Biological agents	0	0	0	277	500	0	339	339	0
Fungicides	18,771	22,198	14,667	31,205	40,981	17,714	47,356	63,907	22,643
Herbicides	23,255	27,994	23,518	27,552	32,335	26,230	37,124	44,480	24,061
Growth regulators	0	0	0	51	51	185	0	0	0
Seed treatments	8,974	19,509	669	14,207	26,911	607	12,292	31,043	1,049
All pesticides	**74,030**	**93,348**	**42,808**	**110,357**	**139,438**	**51,513**	**138,504**	**182,411**	**52,628**
Area grown (ha)	10,594			**11,818			***15,318		

'*' Neonicotinoids can also be found in the seed treatment category '**' includes 40 hectares of multi-cropping '***' includes 72 hectares of multi-cropping

Table 32 Sampled areas

Areas (ha) of vegetable crops (excluding peas) grown in sample

Size* (ha)	Scotland**
0.1-9.9	58.1
10-19.9	240.0
20-29.9	430.0
30-39.9	197.1
>40.0	813.1
All sizes	1,738.3

Table 33 Census areas

Areas (ha) of vegetable crops (excluding peas) grown in Scotland

Size* (ha)	Scotland**
0.1-9.9	1,618.3
10-19.9	2,731.1
20-29.9	1,674.2
30-39.9	1,097.7
>40.0	1,848.8
All sizes	8,970.1

Table 34 Raising factors (vegetable crops excluding peas)

Size* (ha)	Highlands & Islands and Caithness & Orkney	Moray Firth	Aberdeen	Angus	East Fife	Lothian	Central Lowlands	Tweed Valley
0.1-9.9	20.01	120.82	33.30	30.98	35.15	NA	15.45	5.17
10-19.9	NA	9.60	14.80	7.25	10.02	NA	17.24	NA
20-29.9	NA	3.88	3.48	5.38	7.05	2.16	2.92	2.03
30-39.9	NA	3.12	NA	9.02	2.35	4.90	NA	NA
>40.0	NA	3.09	1.00	1.68	2.06	NA	3.24	2.72

'*' size refers to area of vegetable crops (excluding peas) grown on holding, '**' regional data have not been provided in order to prevent disclosure of information relating to fewer than 5 holdings NA = not applicable

Table 35 Samples areas (peas)

Areas (ha) of peas grown in sample

Size* (ha)	Scotland**
0.1-9.9	13.5
10-19.9	152.11
20-29.9	164.23
30-39.9	183.19
>40.0	451.77
All sizes	**964.8**

Table 36 Census areas (peas)

Areas (ha) of peas grown in Scotland

Size* (ha)	Scotland**
0.1-9.9	778.63
10-19.9	2,289.53
20-29.9	1,308.25
30-39.9	787.49
>40.0	1,111.8
All sizes	**6,275.7**

Table 37 Raising factors (peas)

Size* (ha)	Angus	East Fife	Central Lowlands	Tweed Valley
0.1-9.9	42.47	NA	NA	NA
10-19.9	14.90	5.68	34.39	7.95
20-29.9	6.53	5.53	NA	8.46
30-39.9	2.87	NA	4.81	8.03
>40.0	2.44	NA	1.24	NA

'*' size refers to area of peas grown on holding
'**' regional data have not been provided in order to prevent disclosure of information relating to fewer than 5 holdings
NA = not applicable

Table 38 First and second adjustment factors

	Highlands & Islands and Caithness & Orkney	Moray Firth	Aberdeen	Angus	East Fife	Lothian	Central Lowlands	Tweed Valley	Adj 2
Vining peas	NA	NA	NA	1.00	1.17	NA	1.44	1.26	1.02
Broad beans	NA	NA	NA	0.86	NA	1.46	NA	1.76	1.14
Brussels sprouts	NA	NA	NA	0.32	NA	3.36	0.14	1.56	1.15
Cabbage (all other)	NA	NA	NA	NA	0.92	NA	NA	NA	3.72
Calabrese	NA	NA	NA	1.17	0.83	NA	0.28	NA	1.03
Carrots	NA	0.75	2.55	1.20	0.92	NA	NA	0.69	1.10
Cauliflower	NA	NA	NA	1.59	2.21	NA	0.25	0.31	1.01
Lettuce	NA	NA	NA	NA	1.18	NA	NA	NA	1.50
Total other vegetables	1.06	12.46	0.16	1.39	0.84	1.88	NA	NA	1.13
Rhubarb	0.07	NA	NA	2.14	NA	NA	0.34	NA	1.01
Turnips & swedes	NA	3.09	1.11	1.07	1.86	0.99	1.43	1.84	1.01

NA = not applicable

Table 39 Estimated standard errors

Estimated standard errors for the area treated (ha) with pesticide and for weight of active ingredient (kg) applied

Crops	Area SE (%)	Weight SE (%)
Broad beans	31	26
Brussels sprouts	21	24
Cabbages	*	*
Calabrese	17	16
Carrots	14	13
Cauliflower	37	34
Lettuce	*	*
Other vegetables **	100	100
Peas	13	11
Turnips and swedes	20	14
All vegetable crops	**9**	**9**

Note: The total pesticide treated area and weight applied used to calculate the standard errors excludes biological control agents as no applied rates were recorded and therefore the weights are unknown.

* Standard errors could not be calculated for cabbages or lettuce due to there only being a few active ingredients recorded.

**The standard error figure for 'other vegetables' is high as this category covers a large variety of different vegetable crops and a number of active ingredients were encountered only on individual holdings.

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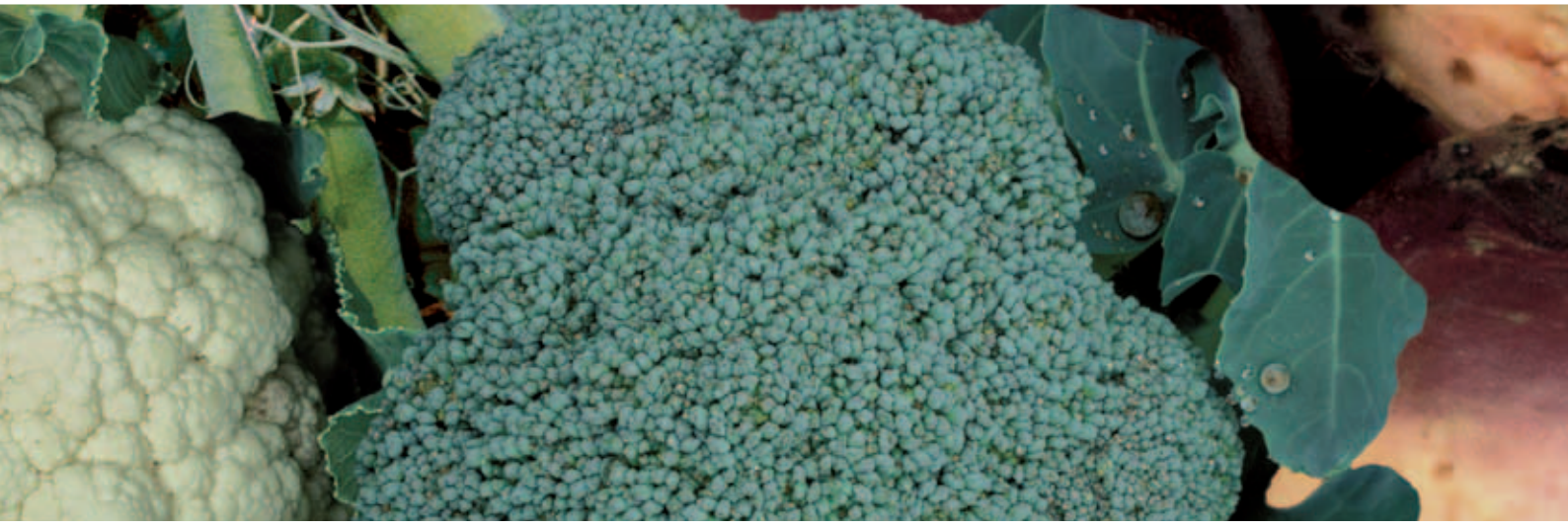

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