

PESTICIDE USAGE IN SCOTLAND

SURVEY REPORT 98

**VEGETABLES FOR HUMAN
CONSUMPTION 1991**

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1991**

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SUMMARY

This was the fourth survey of pesticide usage on these crops in Scotland. The previous three were in 1977, 1982 and 1989. (References 1, 2 and 3) The area of the crops grown had increased by 23% in the last two years to nearly 11,500 hectares.

Insecticides

Usage of insecticides had increased by nearly 30% (of active ingredient) since the last survey to 26,000 spray hectares.

Chlorfenvinphos was the most widely used insecticide (6,200 spray hectares) largely to control root fly on turnips and swedes. Carbofuran, which had a total usage of 4,000 spray hectares was also extensively used for the same purpose on 2,500 spray hectares of the same crop.

Aphids, however, were the most widespread pests and a variety of chemicals, particularly dimethoate, deltamethrin and demeton-S-methyl were used for their control.

Fungicides

The spray area treated rose in proportion to the area of the crop. Chlorothalonil was the most widely used at 6,000 spray hectares and this total was twice that in 1989.

Metalaxyl, in formulations with either chlorothalonil or mancozeb, was also extensively used, on around 2,000 spray hectares. Both fungicides were used to control a range of diseases. Iprodione, the second most used fungicide in 1989 (2,846 spray hectares) had its usage reduced to just over 1,000 spray hectares.

Herbicides

A wide range of herbicides was recorded. The main ones were trifluralin on nearly 5,000 spray hectares representing 40% of the crop and propachlor on 3,000 spray hectares. These were used mainly on brassicae. Cyanazine was applied to nearly 3,800 spray hectares of peas and beans and was the main herbicide used on these crops.

DEFINITIONS AND NOTES

Basic area (or basic hectares) is the planted area of crop which was treated with a given pesticide, irrespective of the number of times it was applied to that area.

Spray area (or spray hectares) is the basic area of a crop treated with a given pesticide multiplied by the number of treatments that area received.

Demeton-S-methyl and oxydemeton-methyl are both referred to as demeton-S-methyl because growers do not always differentiate between the 2 compounds.

The reasons stated were those given by the growers and occasionally may be inappropriate.

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

METHOD

Using the June 1990 Agricultural Census (Reference 4) a sample of vegetable growers representing the whole of Scotland was drawn. The sample was stratified by land use region (Figure 1 and Reference 5) and size group (Table 1). Sampling fractions, proportional to areas grown, were used for each size group so as to provide adequate representation of the relatively less numerous larger holdings. Only very small areas of vegetables were grown in regions 1, 2, 10 and 11 and were not included in this survey.

Data was obtained by personal interview during visits to the holdings and also when necessary from consultant agronomists and contractors. The survey period was the calendar year 1991. When considering overwintering crops, data was collected for those crops where the bulk of the growing season was in 1991.

For all crops the data was raised by applying one set of raising factors, based on the areas of vegetables grown in each region and 2 adjustment factors (Tables 3, 4 and 5) calculated from the June 1991 Agricultural Census (Reference 6) to give estimates of pesticide usage at the national level. Adjustments were made for each crop within each region by applying the first adjustment factors to the sample area of each crop grown and comparing this with the area from the 1991 census. A second adjustment was made for crops where no holdings were sampled in one or more regions.

PESTICIDE USAGE

The 1991 census area of vegetables grown in each region are shown in Table 2 which includes the 1989 totals for comparison. The proportions of crop grown which were not treated with the various types of pesticides are shown in Table 6.

The area of each crop treated with each formulation is shown in tables 55-57 and each active ingredient in tables 58-60. The estimated quantities of active ingredients used (kg) are shown in Tables 61-63. The top 25 chemicals used have been listed, ranked according to spray hectares in Table 64 and kg of active ingredient in Table 65. Regional usage of pesticide groups is shown in Table 66 and comparisons with previous surveys are given in Table 67.

BRUSSELS SPROUTS

The area of the crop grown was 277 hectares, broadly similar to the 254 hectares in 1989. None of the crop was pesticide free, compared with 5% in the previous survey. All the crop was treated with both insecticides and herbicides but fungicides were applied to 81% of the crop area. This compares with 85% for insecticides and herbicides and 48% for fungicides in the last survey.

Insecticides and molluscicides (Table 7)

Cypermethrin was used to control aphids and caterpillars on 348 spray hectares (42% of the crop) and deltamethrin on a similar area, to control aphids. Demeton-S-methyl (on 39% of the crop) and dimethoate (on 42% of

the crop) were also used as aphicides. Root fly was treated entirely by use of carbofuran on 61% of the crop. Both methiocarb and metaldehyde were used to control slugs (46% and 39% of crop respectively).

Fungicides (Table 8)

Carbendazim was the most used chemical and over 80% of the crop was treated against downy mildew or for unspecified reasons. White blister received the most attention, 42% of the crop being treated with mancozeb/metalaxyl and 39% with chlorothalonil/metalaxyl formulations.

Herbicides (Table 9)

As in 1989, trifluralin was the most commonly used, followed by metazachlor.

SUMMER/AUTUMN CABBAGE

The crop area had increased by 19% to 292 hectares since 1989. The proportion of the crop treated with any pesticide in this survey had risen from 91% to 95%. Insecticides were used on 91% of the crop compared with 84% in the last survey whilst fungicides use had risen slightly from 23 to 29%. Herbicide use had increased rather more, to 95% from 77%.

Insecticides (Table 11)

The main reasons for using insecticides were to control caterpillars (45% of the total insecticide spray area) followed by aphids (41%). The former were controlled mostly by deltamethrin or fenvalerate and the latter with demeton-S-methyl or pirimicarb.

Fungicides (Table 12)

29% of the crop was treated, mostly for unspecified reasons. Mildew, Alternaria and leaf spot were mentioned in connection with very small areas.

Herbicides (Table 13)

Trifluralin and propachlor were the main chemicals applied to control both annual broad-leaved weeds and annual grasses on 87% and 83% of the crop. Cycloxydim, new since the last survey, was used to control grass weeds on 38% of the crop area.

OTHER CABBAGE

The area of the crop grown was 174 hectares compared with 213 hectares in 1989. None was untreated; 97% received insecticide, 3% fungicide and all at least one herbicide.

Insecticides (Table 15)

Cypermethrin was by far the most used insecticide, 266 spray hectares on 59% of the crop, used primarily against aphids. In the previous survey, demeton-S-methyl was the main insecticide, (76% of the crop) used against aphids and caterpillars. Carbofuran was applied to 110 hectares, 63% of the crop area and was the main treatment against root fly. In the last survey only 42 spray hectares was used. Then, trichlorfon was the main chemical used against this pest.

Fungicides (Table 16)

Usage was minimal. Only 3% of the crop was treated, all with a mancozeb/metalaxyl formulation. This was in contrast with the findings of the last survey when at least 50% of the crop was treated.

Herbicides (Table 17)

As in previous surveys, trifluralin was the main chemical used, 166 spray hectares on 95% of the crop. Propachlor and metazachlor were also widely used (51% and 46% of the crop respectively). All were used to control annual broadleaved and annual grass weeds.

CALABRESE

The area of the crop grown was 1247 hectares compared with 1078 hectares in 1989, a 16% increase. Ninety two percent of the crop was treated with insecticide, 82% with fungicide and 96% with herbicide. Corresponding figures for 1989 were 94%, 52% and 94%.

Insecticides (Table 19)

The total spray area treated (3940 spray hectares) was 10% less than in the previous survey despite the increase in the crop area. Aphid and caterpillar control accounted for 80% of insecticide use whilst most of the remainder were treatments against root fly.

Pyrethroids (deltamethrin and fenvalerate) accounted for 46% of the total insecticide spray area (33% in 1988) whilst the organophosphates usage declined to 21% from 38% of the spray area. Fenitrothion, triazophos and trichlorfon, used in the previous survey were not found in this one. Carbamate usage remained static although within the group, carbofuran usage declined against root fly (307 spray ha) in relation to pirimicarb.

Fungicides (Table 20)

Usage of fungicides in general increased, in that 82% of the crop received fungicide compared with 32% in 1989. The main treatment in both surveys was with a chlorothalonil/metalaxyl formulation and the proportion of the crop treated had increased to 68% from 38%. Its use was mostly against mildew although often described as 'disease precaution' or not specified.

Herbicides (Table 21)

Almost all (95%) of the crop was treated. The main herbicides were propachlor (used on 90% of the crop) and trifluralin (64% of the crop) followed by chlorthal-dimethyl on 29% of the crop. The main reasons for their use were annual broadleaved and grass weeds.

CAULIFLOWER

The area of the crop had increased by a third since 1989 to 762 hectares. The proportion of the crop treated with insecticides had increased slightly from 91% to 96%, fungicides from 12% to 25%. All the crop was treated with a herbicide as opposed to 80% in the last survey.

Insecticides (Table 23)

Aphid treatments, (1,412 spray hectares), accounted for rather more than

half the area treated with insecticides. Cypermethrin was the main chemical used, followed by pirimicarb and fenvalerate. In the previous survey the principal aphicides were pirimicarb, demeton-S-methyl and dimethoate. Cabbage root fly control was entirely with carbofuran and 80% of the crop was treated, (67% in 1989).

Fungicides (Table 24)

Twenty five percent of the crop was treated with chlorothalonil, mostly against downy mildew but some against Alternaria. No other fungicide use was recorded.

Herbicides (Table 25)

Usage of herbicides was more extensive than in 1989; all the crop was treated compared with 81%. Trifluralin was still the main herbicide (93% of the crop compared with 52%). Metazachlor usage doubled from 12% to 24% of the crop area. Treatments were very largely against annual weeds. Glyphosate was used on smaller areas to control perennial weeds.

LETTUCE

The area of lettuce grown was 234 hectares. All crops received insecticides, fungicides and herbicides.

Insecticides (Table 27)

Over 90% of the insecticide spray area consisted of treatments against aphids. Pirimicarb was used on 69% of the crop whilst 55% was treated with cypermethrin, demeton-S-methyl and diazinon.

Fungicides (Table 28)

Most (96%) of the crop was treated with iprodione, mostly to control Sclerotinia and to a lesser extent, Botrytis. Benomyl was used on over 80% of the area to control the latter disease. Rather more than half the crop was treated with a metalaxyl/thiram formulation to combat downy mildew.

Herbicides (Table 29)

Only 3 herbicides were used, propyzamide on all the crop area and propachlor and trifluralin on about 80% and 60% of the crop.

TURNIPS AND SWEDES

The area of these crops had increased from 1,391 to 2,294 hectares in the last 2 years. Almost all the crops received insecticide and/or herbicide and 70% had fungicide treatments.

Insecticides (Table 31)

Chlorfenvinphos was at 5,918 spray hectares, the most used insecticide and all was for the control of root fly. In addition, 75% of the crop area (2,354 spray hectares) received carbofuran for the same reason. The other widespread treatment was dimethoate on 2,409 spray hectares (39% of the crop), to control aphids.

Around a third of the area was treated against slugs, mostly with methiocarb.

Fungicides (Table 32)

Chlorothalonil, all to control mildew, was the most used fungicide at 2,293 spray hectares (42% of the crop). Sulphur was applied, mostly as a nutrient, to 66% of the crop. Smaller areas, 267 spray hectares (12% of the crop) were treated with carbendazim or iprodione mostly against Alternaria.

In the last survey, carbendazim was the main fungicide and was used on 16% of the crop.

Herbicides (Table 33)

Trifluralin was again the main herbicide, 2,183 spray hectares on 95% of the crop compared with 82% in 1989. The other main herbicides were metazachlor and propachlor, used on 32% and 22% respectively of the crop area.

PEAS

There had been a slight decrease in the area grown to 3,626 hectares. Pesticide usage of the 3 main pesticide groups was generally similar to that in the previous survey. Twenty eight percent of the crop received an insecticide, 38% a fungicide and 96% a herbicide.

Insecticides (Table 35)

The main usage of insecticides was again for aphid control. The same 3 insecticides, fenvalerate, deltamethrin and demeton-S-methyl were recorded in this survey as in 1989.

Fungicides (Table 36)

Botrytis control was the main reason for fungicide usage. Chlorothalonil and vinclozolin (each 1,373 spray hectares) were the only fungicides used, compared with chlorothalonil and iprodione in 1989.

Herbicides (Table 37)

Herbicide usage was mainly for annual weed control. A smaller range of herbicide formulations was recorded in this survey than in 1989. As then, cyanazine was the principal herbicide used (3,385 spray hectares, 93% of the crop treated). MCPA/MCPB and terbuthylazine/terbutryn formulations were used on 27% and 3% of the crop. Bentazone formulations, found on 7% of the crop in 1989 were not recorded in this survey.

BROAD BEANS

The area of the crop had increased by 13% to 675 hectares since the last survey. Ninety per cent received an insecticide (65% in 1989), 51% a fungicide (66% in 1989) and 100% a herbicide (97% in 1989).

Insecticides (Table 39)

As in the previous survey, insecticides were applied solely for aphid control, and again, fenvalerate and pirimicarb were the principal insecticides used.

Fungicides (Table 40)

Usage of fungicides was mainly for chocolate spot control, compared with Botrytis in 1989. Chlorothalonil, either with carbendazim (437 spray hectares, 41% of the crop treated), or alone (131 spray hectares, 10% of the crop) were the principal formulations used. Iprodione, which had been popular in 1989, was not recorded in this survey.

Herbicides (Table 41)

All the herbicides recorded were for annual weed control. As in 1989, cyanazine (328 spray hectares, 49% of the crop treated) and terbuthylazine/terbutryn (279 spray hectares, 41% of the crop) were the most commonly used formulations.

LEEKs

The area of the crop was 170 hectares, a 13% reduction since 1989. Eight percent of the crop was treated with insecticides, compared with 15% in 1989, 77% with fungicides (59% in 1989) and 98% with herbicides (83% in 1989).

Insecticides (Table 43)

Malathion was the only insecticide recorded and was used to control frit fly and thrips on 8% of the crops. In 1989, only small quantities of demeton-S-methyl, triazophos and chlorpyrifos had been used, mainly for aphid control.

Fungicides (Table 44)

The main reason for use of fungicides, as in 1989, was for rust control. Again, fenpropimorph (241 spray hectares) and the proprietary mixture of ferbam/maneb/zineb (212 spray hectares) were the principal formulations used.

Herbicides (Table 45)

Herbicide usage increased from that in the previous survey, and was mainly for the control of annual broadleaved and annual grass weeds. Ioxynil (181 spray hectares, 78% of the crop treated), chlorbufam/chloridazon (143 spray hectares, 54% of the crop) and propachlor (124 spray hectares, 74% of the crop) were the main herbicides used. Usage of paraquat and chlorthal-dimethyl which were popular in 1989 had declined.

CARROTS

The area of the crop had increased from 910 to 1,296 hectares. Insecticides were applied to 90% of the crop (94% in 1989), fungicides 52% (56% in 1989) and herbicides 99% (94% in 1989).

Insecticides (Table 47)

The sole reason for insecticide usage was for carrot fly control. Only organophosphates were recorded in this survey whereas in 1989 both pyrethroids and carbamates were also used. The principal insecticides were phorate (703 spray hectares, 54% of the crop treated), followed by quinalphos, triazophos and disulfoton. In the previous survey phorate and triazophos predominated and neither quinalphos nor disulfoton were recorded.

Fungicides (Table 48)

As in 1989, the sole reason for fungicide usage was for cavity spot control, and the only formulation used was mancozeb/metalaxyl.

Herbicides (Table 49)

Herbicide usage was for the control of annual broadleaved and annual grass weeds. As in 1989, the two principal herbicides used were linuron (1519 spray hectares, 86% of the crop treated) and metoxuron (1110 spray hectares, 82% of the crop). Use of prometryn had declined and fluazifop-P-butyl was not recorded in this survey.

OTHER VEGETABLES

These were mostly parsnips, kale and onions, together with smaller areas of asparagus, parsley and spring onions.

Insecticides (Table 51)

Caterpillars and aphids were the main pests and they were controlled mostly with demeton-S-methyl or pyrethroids. Slugs were treated with methiocarb.

Fungicides (Table 52)

Small areas were treated with carbendazim and fenpropimorph, about 9% of the total crop area received both chemicals.

Herbicides (Table 53)

As might be expected a fairly wide variety of herbicides was found. 95% of the crop area was treated; chlorpropham/pentanachlor, glyphosate, linuron, metoxuron and propachlor predominated.

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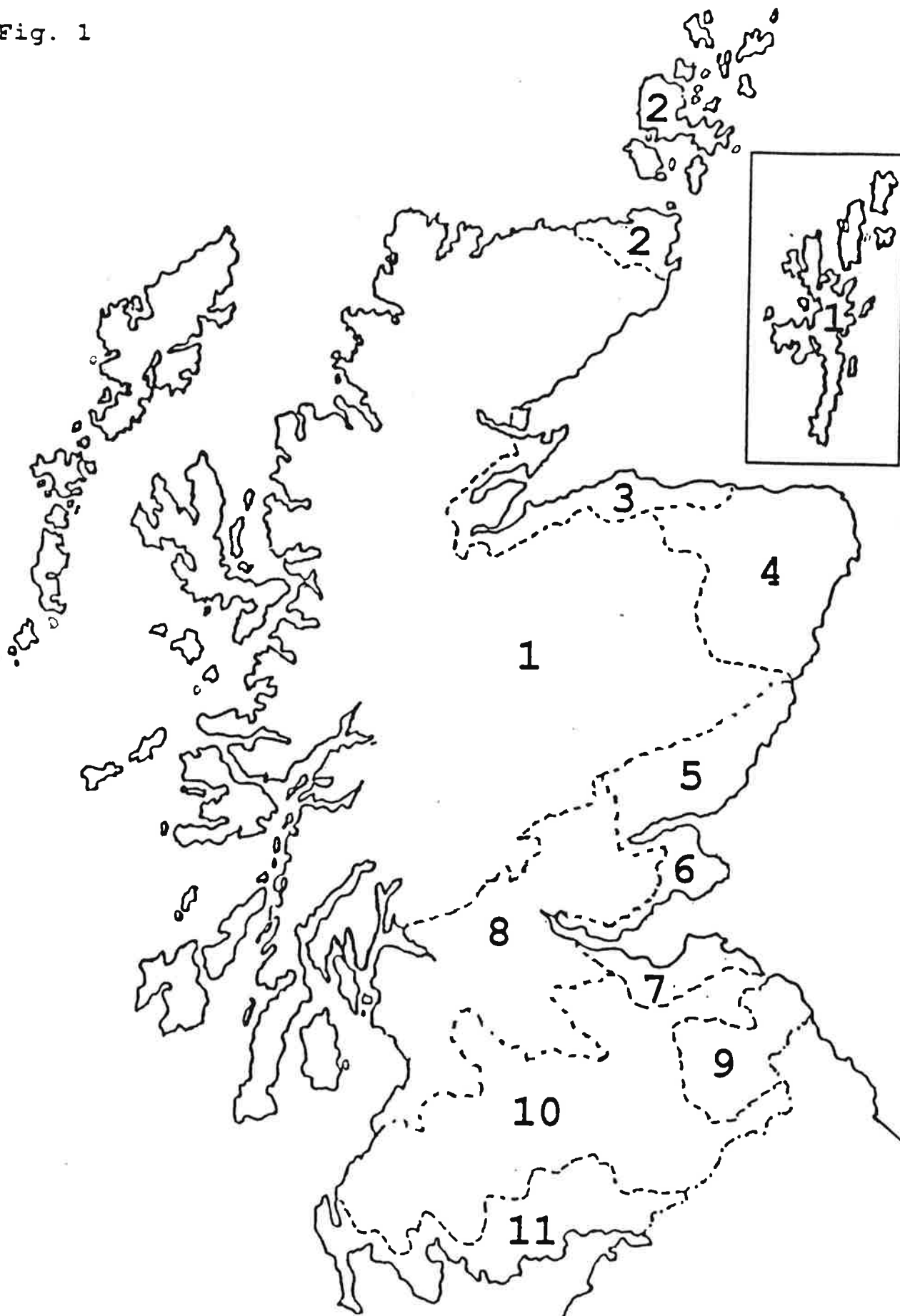
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Fig. 1



- 1. Highlands and Islands
- 2. Caithness/Orkney
- 3. Moray Firth
- 4. Aberdeen

- 5. Angus
- 6. E Fife
- 7. Lothian

- 8. Central Lowlands
- 9. Tweed Valley
- 10. Southern Uplands
- 11. Solway

TABLE 1: Number of holdings sampled in each region and size group

Size group (ha)	Moray Firth	Aberdeen	Angus	East Fife	Lothian	Central Lowlands	Tweed Valley	Scotland
0.1-1.9	.	.	1	.	.	.	.	.
2-4.9	.	1	1	1	.	1	.	4
5-9.9	1	1	2	.	2	.	1	7
10-19.9	1	1	5	2	2	1	7	19
20-29.9	.	1	4	3	.	1	4	13
30+	1	.	11	9	4	2	3	30
All	3	4	24	15	8	5	15	74

TABLE 2: Area (ha) of vegetables grown in Scotland: 1991 census

	Moray Firth	Aberdeen	Angus	East Fife	Lothian	Central Lowlands	Tweed Valley	Scotland 1989
Brussels Sprouts	5.9	3.0	24.0	138.4	100.6	5.4	.	277.3
Cabbage (summer/autumn)	15.8	33.8	20.4	124.2	75.0	18.6	4.1	291.9
Cabbage (other)	10.0	18.7	19.0	41.5	69.6	15.3	.	174.1
Outdoor lettuce	36.6	0.9	7.9	156.2	5.0	26.6	0.4	233.6
Calabrese	45.1	3.3	363.4	615.5	83.3	126.0	23.4	1260.0
Cauliflower	139.2	6.3	118.0	276.5	37.5	42.5	41.7	761.7
Turnip & Swedes	99.5	501.1	682.5	179.9	28.1	96.5	506.5	2294.1
Peas	.	.	1745.6	784.4	135.3	315.0	645.8	3626.1
Broad beans	49.5	0.2	321.5	.	.	0.1	303.0	674.3
Leeks	24.5	14.9	16.3	40.3	39.9	33.2	0.6	169.7
Carrots	333.6	58.6	278.4	538.1	14.1	65.6	7.1	1295.5
Other vegetables	73.6	34.1	78.0	102.9	29.9	95.1	6.6	420.2
All crops	833.3	674.9	3675.0	2997.9	918.3	839.9	1539.2	11478.5
								9479.8

TABLE 3: Raising factors for each region

	Moray Firth	Aberdeen	Angus	East Fife	Lothian	Central Lowlands	Tweed Valley
	13.65	11.95	5.08	3.54	3.53	5.99	5.05

TABLE 4: First adjustment factors

	Moray Firth	Aberdeen	Angus	East Fife	Lothian	Central Lowlands	Tweed Valley
Brussels Sprouts	.	.	47.29	.	0.56	.	.
Cabbage (summer/autumn)	0.29	0.35	40.19	1.11	.	1.19	.
Cabbage (summer/other)	.	0.98	37.44	0.19	4.93	.	.
Outdoor lettuce	.	0.38	.	0.52	.	22.20	.
Calabrese	2.06	.	0.95	0.67	0.32	0.52	.
Cauliflower	.	.	0.97	0.90	4.38	7.09	.
Turnip & Swedes	0.45	0.92	1.78	0.85	0.94	0.66	1.42
Peas	.	.	1.02	1.68	2.37	3.51	0.78
Broad beans	.	.	0.37	.	.	.	0.85
Leeks	0.29	.	32.12	0.73	0.29	0.75	.
Carrots	0.74	4.91	1.46	1.45	.	0.29	.
Other vegetables	.	.	4.80	3.26	.	1.31	.

TABLE 5: Second adjustment factors

Brussels Sprouts	Cabbage (summer/autumn)	Cabbage (other)	Cala-brese	Cauli-flower	Turnip & Swede	Peas	Broad beans	Leeks	Carrots	Outdoor lettuce	Other veg-etales	All crops
2.23	1.37	1.17	1.02	1.33	1.00	1.00	1.08	1.10	1.02	1.27	1.52	1.07

TABLE 6: Proportions of crops not treated with pesticides (%)

	Brussels Sprouts	Cabbage (summer/autumn)	Cabbage (other)	Cala-brese	Cauli-flower	Turnip & Swede	Peas	Broad beans	Leeks	Carrots	Other veg-etales
Insecticides/molluscicides	0	9	3	8	4	1	72	10	92	10	76
Fungicides	19	71	97	18	75	30	62	49	23	48	90
Herbicides	0	5	0	4	0	1	4	0	2	1	5
Any Pesticide	0	95	0	0	0	1	4	0	0	1	5

TABLE 7: Brussels sprouts: usage of insecticides and molluscicides, the reasons for their use (spray hectares of formulations) and the percentage of crop treated

	Aphids	Slugs	Root fly	Caterpillars	Aphids/ caterpillars	Total spray area	% of crop treated
PYRETHROIDS							
Cypermethrin	.	.	.	.	348	348	42
Deltamethrin	348	.	.	.	.	348	42
Fenvalerate	.	.	.	214	.	214	39
ORGANOPHOSPHATES							
Chlorpyrifos	.	.	.	214	.	214	39
Demeton-S-methyl	214	.	.	.	.	214	39
Dimethoate	232	.	.	.	.	232	42
CARBAMATE							
Carbofuran	.	.	170	.	.	170	61
OTHER							
Unspecified insecticide	.	.	.	.	54	54	19
Total insecticide	794	.	170	428	402	1794	.
MOLLUSCICIDES							
Metaldehyde	.	107	.	.	.	107	39
Methiocarb	.	358	.	.	.	358	46
Total molluscicide	.	465	.	.	.	465	
Total insecticide and molluscicide	794	465	170	428	402	2259	100

Crop area = 277 hectares

TABLE 8: Brussels sprout: usage of fungicides, the reason for their use (spray hectares of formulations) and the percentage of crop treated

	Downy mildew	Botrytis	Mildew	Light leaf spot	White blister	Unspecified	Total spray area	% of crop treated
Benomyl	.	.	.	232	.	.	232	42
Carbendazim	232	.	.	.	.	428	660	81
Chlorothalonil/metalaxyl	.	.	.	.	321	.	321	39
Fenpropimorph	.	.	321	.	.	.	321	39
Iprodione	.	232	107	.	.	.	339	81
Mancozeb/metalaxyl	.	.	.	.	232	.	232	42
Total fungicide	232	232	428	232	553	428	2105	81

Crop area = 277 hectares

TABLE 9: Brussels sprout: usage of herbicides, the reasons for their use (spray hectares of formulations) and the percentage of crop treated

	Annual broadleaved weeds	Annual b.l. and grass weeds	Total spray area	% of crop treated
Clopyralid	107	.	107	39
Desmetryn	107	.	107	39
Metazachlor	.	116	116	42
Propachlor	54	.	54	19
Trifluralin	.	170	170	61
Total herbicide	268	286	554	100

Crop area = 277 hectares

TABLE 10: Repeated use of pesticides on brussels sprouts (percentage of the basic area treated more than once)

	Once	Twice	Three times	Four times	Basic area (ha)
MOLLUSCICIDES					
Methiocarb	8	.	92	.	127
FUNGICIDES					
Carbendazim	.	52	.	48	223
Iprodione	48	52	.	.	223

TABLE 11: Summer/autumn cabbage: usage of insecticides and molluscicides, the reasons for their use (spray hectares of formulations) and the percentage of crop treated

	Aphids	Aphids/ cater- pillars	Cater- pillar	Leather jackets	Root flies	Slugs	Total spray area	% of crop treated
PYRETHROIDS								
Cypermethrin	.	80	.	.	.	.	80	12
Deltamethrin	.	.	323	.	.	.	323	37
Fenvalerate	.	.	104	.	.	.	104	18
ORGANOPHOSPHATES								
Chlorfenvinphos	.	.	.	.	23	.	23	8
Chlorpyrifos	.	.	.	11	31	.	42	7
Demeton-S-methyl	183	.	.	.	.	.	183	63
Dimethoate	52	.	.	.	.	.	52	18
CARBAMATES								
Carbofuran	.	.	.	.	168	.	168	58
Pyrimicarb	131	.	.	.	.	.	131	45
OTHER								
Unspecified insecticide	.	28	.	.	.	.	28	10
Total insecticide	366	108	427	11	222	.	1134	.
MOLLUSCICIDE								
Methiocarb	.	.	.	.	.	1	1	+
Total insecticide and molluscicide	366	108	427	11	222	1	1135	91

Crop area = 292 hectares

'+' = less than 0.5% of the total spray area

TABLE 12: Summer/autumn cabbage: usage of fungicides, the reasons for their use (spray hectares of formulations) and the percentage of crop treated

	Disease precaution	Mildew	Alternaria	Alternaria/leafspot	Unspecified	Total spray area	% of crop treated
Carbendazim	.	.	.	.	52	52	18
Chlorothalonil/metalaxyl	.	.	.	.	.	11	4
Fenpropimorph	.	.	.	.	52	52	18
Iprodione	.	.	23	.	.	23	8
Mancozeb/metalaxyl	.	.	.	23	.	23	8
Tar oils	11	.	.	.	.	11	4
Total fungicide	11	11	23	23	104	172	29

TABLE 13: Summer/autumn cabbage: usage of herbicides, the reason for their use (spray hectares of formulations) and the percentage of crop treated

	Annual b.l. weeds	Ann. and perenn. grasses	Annual b.l. and grass weeds	Total spray area	% of crop treated
Aziprotryn	.	.	52	52	18
Clopyralid	23	.	.	23	8
Cycloxydim	.	111	.	111	38
Desmetryn	23	.	.	23	8
Diquat/paraquat	.	.	11	11	4
Metazachlor	23	.	.	23	8
Propachlor	49	.	192	241	83
Simazine	.	.	22	22	7
Tebutam	.	.	10	10	3
Trifluralin	23	.	232	255	87
Total herbicide	141	111	519	771	95

Crop area = 292 hectares

TABLE 14: Repeated use of pesticides on summer/autumn cabbage (percentage of the basic area treated more than once)

INSECTICIDE	Once	Twice	Three times	Four times	Basic area (ha)
Cypermethrin	33	.	67	.	34

TABLE 15: Other cabbage: usage of insecticides and molluscicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Capsid bug	Aphids	Slugs	Leather jacket	Root flies	Caterpillars	Aphids/caterpillars	Total spray area	% of crop treated
PYRETHROIDS									
Cypermethrin	.	244	.	.	.	.	22	266	59
Deltamethrin	.	.	.	.	.	13	.	13	4
Fenvalerate	.	.	.	.	.	39	.	39	22
ORGANOCHLORINE									
Gamma-HCH	77	.	.	.	.	.	.	77	22
ORGANOPHOSPHATES									
Chlorpyrifos	.	.	.	22	22	.	.	44	13
Demeton-S-methyl	.	45	.	.	.	.	.	45	26
Triazophos	.	.	.	.	.	39	.	39	22
CARBAMATES									
Carbofuran	.	.	.	.	110	.	.	110	63
Primicarb	.	45	.	.	.	.	.	45	26
OTHER									
Unspecified insecticide	.	.	.	.	.	.	22	22	13
Total insecticide	77	334	.	22	132	91	44	700	.
MOLLUSCICIDE									
Methiocarb	.	.	244	.	.	.	.	244	46
Total molluscicide	.	.	244	.	.	.	.	244	46
Total insecticide and molluscicide	77	334	244	22	132	91	44	944	97

Crop area = 174 hectares

TABLE 16: Other cabbage: usage of fungicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Downy mildew	Total spray area	% of crop treated
Mancozeb/metalaxyl	5	5	3
Total fungicides	5	5	3

TABLE 17: Other cabbage: usage of herbicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Annual b.l. weeds	Annual and perenn. grasses	Annual b.l. & grass weeds	Total spray area	% of crop treated
Cycloxydim	•	6	•	6	4
Metazachlor	81	•	•	81	46
Pendimethalin	•	•	4	4	2
Propachlor	44	•	45	89	51
Sodium monochloroacetate	5	•	•	5	3
Trifluralin	81	•	85	166	95
Total herbicide	211	6	134	351	100

Crop area = 174 hectares

TABLE 18: Repeated use of pesticides on other cabbage (percentage of the basic area treated more than once)

INSECTICIDE	Once	Twice	Three times	Basic area (ha)
Cypermethrin	21	•	79	103

TABLE 19: Calabrese: usage of insecticides and molluscicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Aphids	Aphids/ cater- pillars	Cater- pillars	Root flies	Unspec- ified	Total spray area	% of crop treated
PYRETHROIDS							
Deltamethrin	294	120	114	.	.	528	27
Fenvalerate	279	.	933	.	98	1310	59
ORGANOPHOSPHATES							
Chlorfenvinphos	.	.	.	214	.	214	17
Chlorpyrifos	.	.	.	175	.	175	14
Demeton-S-methyl	373	.	.	.	.	373	30
Dimethoate	48	.	.	.	.	48	4
Quinalphos/thiometon	34	.	.	.	.	34	3
CARBAMATES							
Carbufuran	.	.	.	307	.	307	24
Pirimicarb	951	.	.	.	.	951	45
Total insecticide	1979	120	1047	696	98	3940	92

TABLE 20: Calabrese: usage of fungicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Disease precaution	Downy mildew	Botrytis	Mildew	Alternaria	Unspec- ified	Total spray area	% of crop treated
Chlorothalonil	139	.	.	34	.	.	173	14
Chlorothalonil/metalaxyl	98	399	176	77	50	147	947	68
Copper oxychloride	5	.	.	.	.	88	93	7
Sulphur	26	.	.	.	.	.	26	2
Total fungicide	268	399	176	111	50	235	1239	82

Crop area = 1260 hectares

TABLE 21: Calabrese: usage of herbicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Annual weeds	Perennial grass	Annual and perenn. b.l. weeds	Annual b.l. and grass weeds	Total spray area	% of crop treated
Chlorthal-dimethyl	365	.	.	.	365	29
Cycloxydim	.	48	.	.	48	4
Glyphosate	.	213	54	38	305	24
Paraquat	.	.	24	.	24	2
Propachlor	334	.	.	847	1181	90
Tebutam	.	.	.	263	263	21
Trifluralin	.	.	.	855	855	64
Other herbicide	5	.	.	.	5	+
Total herbicide	704	261	78	2003	3046	96

Crop area = 1260 hectares Other herbicide used on less than 0.5% of the crop area, cycloxydim

TABLE 22: Repeated use of pesticides on calabrese (percentage of the basic area treated more than once)

	Once	Twice	Basic area (ha)
INSECTICIDE			
Carbofuran	98	2	301
Deltamethrin	48	52	345
Fenvalerate	22	78	736
Pirimicarb	32	68	566
FUNGICIDES			
Chlorothalonil/metalaxyl	90	10	858
HERBICIDES			
Propachlor	96	4	1131
Trifluralin	94	6	805

TABLE 23: Cauliflower: usage of insecticides and molluscicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Aphids	Caterpillars	Slugs	Root flies	Total spray area	% of crop treated
PYRETHROIDS						
Cypermethrin	549	•	•	•	549	24
Deltamethrin	•	206	•	•	206	27
Fenvalerate	312	189	•	•	501	37
ORGANOPHOSPHATES						
Chlorpyrifos	•	•	•	113	113	7
Demeton-S-methyl	225	•	•	•	225	29
CARBAMATES						
Carbufuran	•	•	•	614	614	80
Pirimicarb	326	•	•	•	326	35
Total insecticide	1412	395	•	727	2534	•
MOLLUSCICIDE						
Methiocarb	•	•	560	•	560	25
Total molluscicide	•	•	560	•	560	25
Total insecticide and molluscicide	1412	395	560	727	3094	96

Crop area = 762 hectares

TABLE 24: Cauliflower: usage of fungicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Downy mildew	Alternaria	Total spray area	% of crop treated
Chlorothalonil	130	60	190	25
Total fungicide	130	60	190	25
Crop area = 762 hectares				

TABLE 25: Cauliflower: usage of herbicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Annual weeds	Perennial grasses	Annual b.l. & grass weeds	Total spray area	% of crop treated
Glyphosate	.	139	.	139	18
Metazachlor	183	.	.	183	24
Propachlor	213	.	369	582	76
Tebutam	.	.	56	56	7
Trifluralin	183	.	525	708	93
Total herbicide	579	139	950	1668	100
Crop area = 762 hectares					

TABLE 26: Repeated use of pesticides on cauliflower (percentage of the basic area treated more than once)

	Once	Twice	Three times	Basic area (ha)
INSECTICIDES				
Fenvalerate	24	76	.	285
Pirimicarb	77	23	.	226
MOLLUSCICIDE				
Methiocarb	6	.	94	194

TABLE 27: Outdoor lettuce: usage of insecticides and molluscicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Aphids	Slugs	Caterpillars	Total spray area	% of crop treated
PYRETHROIDS					
Cypermethrin	129	.	.	129	55
Deltamethrin	9	.	.	9	4
Fenvalerate	.	.	61	61	26
ORGANOPHOSPHATES					
Demeton-S-methyl	129	.	.	129	55
Diazinon	129	.	.	129	55
Heptenophos	23	.	.	23	10
CARBAMATES					
Pirimicarb	162	.	.	162	69
Total insecticide	581	.	61	642	.
MOLLUSCICIDE					
Methiocarb	.	34	.	34	14
Total molluscicide	.	34	.	34	14
Total insecticide and molluscicide	581	34	61	676	100

Crop area = 234 hectares

TABLE 28: Outdoor lettuce: usage of fungicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Sclero- tinia	Downy mildew	Botrytis	Total spray area	% of crop treated
Benomyl	.	.	319	319	81
Chlorothalonil/metalaxyl	.	.	9	9	4
Iprodione	319	.	68	387	96
Metalaxyl/thiram	.	129	.	129	55
Total fungicide	319	129	396	844	100

Crop area = 234 hectares

TABLE 29: Outdoor lettuce: usage of herbicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Annual b.l. weeds	Annual b.l. & grass weeds	Redshank	Total spray area	% of crop treated
Propachlor	.	190	.	190	81
Propyzamide	61	172	.	233	100
Trifluralin	.	9	129	138	59
Total herbicide	61	371	129	561	100

Crop area = 234 hectares

TABLE 30: Repeated use of pesticides on outdoor lettuce (percentage of the basic area treated more than once)

	Once	Twice	Basic area (ha)
FUNGICIDES			
Benomyl	32	68	190
Iprodione	27	73	224

TABLE 31: Turnips and swedes: usage of insecticides and molluscicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Aphids	Flea beetles	Root flies	Slugs	Unspecified	Total spray area	% of crop treated
PYRETHROIDS							
Cypermethrin	40	.	.	.	.	40	1
Fenvalerate	.	.	.	.	183	183	4
ORGANOPHOSPHATES							
Chlorfenvinphos	.	.	5918	.	.	5918	95
Chlorpyrifos	.	.	31	.	.	31	1
Dimethoate	2409	.	.	.	.	2409	39
CARBAMATE							
Carbofuran	.	204	2354	.	.	2558	75
Total insecticides	2449	204	8303	.	183	11139	.
MOLLUSCICIDES							
Metalddehyde	.	.	.	20	.	20	1
Methiocarb	.	.	.	795	.	795	33
Total molluscicides	.	.	.	815	.	815	
Total insecticide and molluscicide	2449	204	8303	815	183	11954	99

Crop area = 2294 hectares

TABLE 32: Turnips and swedes: usage of fungicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Mildew	Alternaria/ botrytis	Disease precaution	Unspeci- fied	Total spray area	% of crop treated
Carbendazim	•	267	•	•	267	12
Chlorothalonil	2293	•	•	•	2293	42
Fenpropimorph	95	•	•	•	95	4
Iprodione	•	267	•	•	267	12
Mancozeb/metalaxyl	267	•	•	•	267	12
Sulphur	1598	•	21	267	1886	66
Triadimenol	267	•	•	•	267	12
Tridemorph	91	•	•	•	91	4
Other fungicides	21	20	•	•	41	
Total fungicide	4632	554	21	267	5474	70

Crop area = 2294 ha

Other formulations used on less than 0.5% of the spray area were, Carbendazim/maneb/sulphur, Triadimenol/tridemorph

TABLE 33: Turnips and swedes: usage of herbicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Annual b.l. weeds	Annual b.l. & grass weeds	Total spray area	% of crop treated
Chlorthal-dimethyl	56	.	56	2
Clopyralid	125	.	125	5
Metazachlor	37	694	731	32
Paraquat	.	91	91	4
Propachlor	323	172	495	22
Tebutam	.	91	91	4
Trifluralin	25	2158	2183	95
Total herbicide	566	3206	3772	99

Crop area = 2294.1 ha

TABLE 34: Repeated use of pesticides on turnips and swedes (percentage of the basic area treated more than once)

	Once	Twice	Three times	Four times	Basic area (ha)
INSECTICIDES					
Carbofuran	51	49	.	.	1720
Chlorfenvinphos	.	42	46	12	2187
Dimethoate	11	11	78	.	900
MOLLUSCICIDES					
Methiocarb	96	2	2	.	753
FUNGICIDES					
Chlorothalonil	19	54	.	28	971
Sulphur	77	23	.	.	1527

TABLE 35: Peas: usage of insecticides, the reasons for their use (spray hectares of formulation) and the percentage of crop treated

	Aphids	Unspec- ified	Total spray area	% of crop treated
PYRETHROIDS				
Deltamethrin	384	.	384	11
Fenvalerate	181	315	496	14
ORGANOPHOSPHATE				
Demeton-S-methyl	313	.	313	9
Total insecticide	878	315	1193	28

TABLE 36: Peas: usage of fungicides, the reasons for their use (spray hectares of formulation) and the percentage of crop treated

	Disease precaution	Botrytis	Botrytis/ ascochyta	Total spray area	% of crop treated
Chlorothalonil	136	732	505	1373	38
Vinclozolin	.	1373	.	1373	38
Total fungicide	136	2105	505	2746	38

Crop area = 3626 hectares

TABLE 37: Peas: usage of herbicides, the reasons for their use (spray hectares of formulation) and the percentage of crop treated

	Annual b.l. weeds	Annual & perenn. b.l. weeds	Annual b.l. and grass weeds	Chick- weed	Knotgrass	Total spray area	% of crop treated
Cyanazine	.	.	2810	315	260	3385	93
MCPA/MCPB	641	92	.	260	.	993	27
Terbutylazine/terbutryn	.	.	109	.	.	109	3
Total herbicide	641	92	2919	575	260	4487	96

Crop area = 3626 hectares

TABLE 38: Repeated use of pesticides on peas (percentage of the basic area treated more than once)

All formulations were applied only once.

TABLE 39: Broad beans: usage of insecticides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Aphids	Total spray area	% of crop treated
PYRETHROID			
Fenvalerate	328	328	49
CARBAMATE			
Pirimicarb	279	279	41
Total insecticide	607	607	90

TABLE 40: Broad beans: usage of fungicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Downy mildew	Rust	Choc. spot	Total spray area	% of crop treated
Carbendazim	.	.	66	66	10
Carbendazim/chlorothalonil	.	.	437	437	41
Chlorothalonil	.	.	131	131	10
Fosetyl-aluminium	18	.	.	18	3
Mancozeb/metalaxyl	.	66	.	66	10
Total fungicide	18	66	634	718	51

Crop area = 675 hectares

TABLE 41: Broad beans: usage of herbicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Annual weeds	Total spray area	% of crop treated
Cyanazine	328	328	49
Diquat/paraquat	8	8	1
Simazine	66	66	10
Terbuthylazine/terbutryn	279	279	41
Total herbicide	681	681	100

Crop area - 675 hectares

TABLE 42: Repeated use of pesticides on broad beans (percentage of the basic area treated more than once)

	Once	Twice	Basic area (ha)
FUNGICIDES			
Carbendazim/chlorothalonil	43	57	279

TABLE 43: Leeks: usage of insecticide, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Frit fly	Thrips	Total spray area	% of crop treated
ORGANOPHOSPHATE				
Malathion	14	14	28	8
Total insecticide	14	14	28	8

TABLE 44: Leeks: usage of fungicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Disease precaution	Rust	White tip	Total spray area	% of crop treated
Chlorothalonil/metalaxyl	.	.	3	3	2
Fenpropimorph	42	199	.	241	76
Ferbam/maneb/zineb	.	150	62	212	55
Total fungicide	42	349	65	456	77

Crop area = 170 hectares

TABLE 45: Leeks: usage of herbicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Annual b.l. weeds	Annual grasses	Annual and perenn. grasses	Annual b.l. grass weeds	Total spray area	% of crop treated
Alloxydim-sodium	.	8	.	.	8	5
Chlorbufam/chloridazon	143	.	.	.	143	54
Chlorthal-dimethyl	74	.	.	.	74	44
Diquat/paraquat	.	.	.	21	21	12
Fluazifop-P-butyl	.	.	21	.	21	12
Glyphosate	.	.	.	33	33	20
Ioxynil	181	.	.	.	181	78
Paraquat	.	.	.	43	43	26
Pendimethalin	.	8	.	46	54	32
Prometryn	27	.	.	44	71	33
Propachlor	14	.	.	110	124	74
Unspecified herbicide	18	.	.	.	18	11
Total herbicide	457	16	21	297	791	98

Crop area = 170 hectares

TABLE 46: Repeated use of pesticides on leeks (percentage of the basic area treated more than once)

	Once	Twice	Three times	Basic area (ha)
FUNGICIDES				
Fenpropimorph	33	47	20	127
Ferbam/maneb/zineb	17	36	47	93
HERBICIDES				
Chlorbufam/chloridazon	71	.	29	90
Ioxynil	74	14	12	132
Prometryn	71	29	.	55

TABLE 47: Carrots: usage of insecticides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Carrot fly	Total spray area	% of crop treated
ORGANOPHOSPHATES			
Chlorfenvinphos	21	21	2
Disulfoton	338	338	26
Phorate	703	703	54
Quinalphos	418	418	32
Triazophos	369	369	28
Total insecticide	1849	1849	90

TABLE 48: Carrots: usage of fungicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Cavity spot	Total spray area	% of crop treated
Mancozeb/metalaxyl	679	679	52
Total fungicide	679	679	52

Crop area = 1296 hectares

TABLE 49: Carrots: usage of herbicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Annual broadleaved weeds	Annual b.l. and grass weeds	Knotgrass	Total spray area	% of crop treated
Chlorpropham	15	.	.	15	1
Chlorpropham/pentanochlor	142	355	.	497	35
Diquat/paraquat	.	109	.	109	8
Glyphosate	63	63	.	126	10
Linuron	1196	323	.	1519	86
Metoxuron	447	663	.	1110	82
Pendimethalin	16	514	169	699	54
Prometryn	64	.	.	64	5
Trifluralin	.	216	.	216	17
Total herbicide	1943	2243	169	4355	99

Crop area = 1296 hectares

TABLE 50: Repeated use of pesticides on carrots (percentage of the basic area treated more than once)

	Once	Twice	Basic area (ha)
HERBICIDES			
Chlorpropham/pentanochlor	91	9	458
Linuron	64	36	1120
Metoxuron	96	4	1071

TABLE 51: Other vegetable crops: usage of insecticides and molluscicide, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Aphids	Slugs	Caterpillars	Root flies	Total spray area	% of crop treated
PYRETHROIDS						
Deltamethrin	.	.	76	.	76	9
Fenvalerate	.	.	38	.	38	9
ORGANOPHOSPHATES						
Demeton-S-methyl	115	.	.	.	115	9
Triazophos	38	.	.	38	76	9
CARBAMATES						
Pirimicarb	38	.	.	.	38	9
Total insecticide	191	.	114	38	343	.
MOLLUSCICIDE						
Methiocarb	.	62	.	.	62	15
Total insecticide and herbicide	191	62	114	38	405	24
Crop area = 420 hectares						

40.

TABLE 52: Other vegetable crops: usage of fungicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Disease precaution	Botrytis	Total spray area	% of crop treated
Carbendazim	38	.	38	9
Fenpropimorph	38	.	38	9
Iprodione	.	2	2	1
Total fungicide	76	2	78	10
Crop area = 420 ha				

TABLE 53: Other vegetable crops: usage of herbicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Annual b.l. weeds	Annual and perenn. grasses	Annual b.l. & grass weeds	Total spray area	% of crop treated
Chlorpropham/pentanochlor	82	.	49	131	31
Diquat/paraquat	.	.	35	35	8
Glyphosate	.	.	14	14	3
Linuron	96	.	35	131	31
Metoxuron	.	.	131	131	31
Pendimethalin	.	107	131	238	57
Propachlor	.	.	38	38	9
Simazine	119	.	.	119	28
Trifluralin	.	.	38	38	9
Other herbicides	4	.	.	4	1
Total herbicide	301	107	471	879	76

41.

Crop area = 420 hectares

Other herbicides used on less than 0.5% of the total spray area were:- bentazone, pentanochlor.

TABLE 54: Repeated use of pesticides on other vegetables (percentage of the basic area treated more than once)

All formulations were applied only once.

TABLE 55: Usage of insecticide and molluscicide on vegetable crops (spray hectares of formulations)

	Brussels sprouts	Cabbage summer/ autumn	Cabbage (other)	Cala- bresse	Cauli- flower	Outdoor lettuce	Turnip & swede	Peas	Broad beans	Leeks	Carrots	Other veg.	ALL crops 1989
INSECTICIDES													
PYRETHROIDS													
Cypermethrin	348	80	266	.	549	129	40	.	.	.	.	.	1412
Deltamethrin	348	323	13	528	206	9	.	384	.	.	.	76	1887
Fenvalerate	214	104	39	1309	501	61	183	496	328	.	.	38	3273
ORGANOPHOSPHATES													
Chlorfenvinphos	.	23	.	214	.	.	5919	.	.	.	21	.	6177
Chlorpyrifos	214	42	44	175	113	.	31	.	.	.	.	.	619
Demeton-S-methyl	214	183	45	373	225	129	.	313	.	.	115	.	1597
Diazinon	.	.	.	.	.	129	.	.	.	.	.	.	129
Dimethoate	232	52	.	48	.	.	2409	.	.	.	.	.	2741
Disulfoton	.	.	.	.	.	.	.	.	.	.	338	.	338
Heptenophos	.	.	.	.	.	23	.	.	.	.	.	.	23
Malathion	.	.	.	.	.	.	.	.	.	27	.	.	27
Phorate	.	.	.	.	.	.	.	.	.	.	703	.	703
Quinalphos	.	.	.	.	.	.	.	.	.	.	418	.	418
Quinalphos/thiometon	.	.	.	.	.	.	.	.	.	.	.	.	34
Triazophos	.	.	39	.	.	.	.	.	.	.	.	76	484
CARBAMATES													
Carbofuran	170	168	110	307	614	.	2559	.	.	.	.	.	3928
Pirimicarb	.	131	45	951	326	162	.	.	279	.	.	38	1932
ORGANOCHLORINE													
Gamma-HCH	.	.	77	.	.	.	.	.	.	.	.	.	77
OTHER													
Unknown insecticide	54	28	22	.	1	.	.	.	.	.	.	.	105
Total insecticide	1794	1134	700	3939	2535	642	11141	1193	607	27	1849	343	25904
MOLLUSCICIDES													
Metalddehyde	107	.	.	.	.	.	20	.	.	.	.	.	127
Methiocarb	358	1	244	.	560	34	795	.	.	.	.	62	2054
Total molluscicides	465	1	244	.	560	34	815	.	.	.	.	62	2181
Total													20064
													251
													797
													1048

TABLE 56: Usage of fungicide on vegetable crops (spray hectares of formulations)

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Cauli-browse	Cauli-flower	Outdoor lettuce	Turnip & swede	Peas	Broad beans	Leeks	Carrots	Other veg.	ALL crops 1989
Benomyl	232	52	.	.	.	319	267	.	.	.	.	.	551
Carbendazim	660	.	.	.	.	.	.	.	66	.	.	38	1083
Carbendazim/chloro-thalonil	.	.	.	.	.	.	.	.	.	.	.	.	1451
Carbendazim/maneb/sulphur	.	.	.	.	.	.	.	.	437	.	.	.	437
Chlorothalonil	.	.	.	.	.	.	20	.	.	.	.	.	.
Chlorothalonil/metalaxyl	321	11	.	174	190	.	2293	1373	131	.	.	.	20
Copper oxychloride	.	.	.	946	.	9	.	.	.	.	.	.	4161
Fenpropimorph	321	52	.	93	.	.	95	.	.	.	.	.	1290
Ferbam/maneb/zineb	.	.	.	.	.	.	.	.	.	240	.	38	93
Fosetyl-aluminium	.	.	.	.	.	.	.	.	.	213	.	.	746
Iprodione	339	23	.	.	.	.	.	.	18	.	.	.	213
Mancozeb/metalaxyl	232	23	5	.	.	386	267	.	.	.	.	2	18
Metalaxyl/thiram	.	.	.	.	.	129	267	.	66	.	679	.	1017
Sulphur	.	.	.	26	.	.	1886	.	.	.	.	.	1272
Tar oils	.	11	.	.	.	.	.	.	.	.	.	.	129
Triadimenol	.	.	.	.	.	.	.	.	.	.	.	.	1912
Triadimenol/tridemorph	.	.	.	.	.	.	267	.	.	.	.	.	11
Tridemorph	.	.	.	.	.	.	21	.	.	.	.	.	267
Vinclozolin	.	.	.	.	.	.	91	.	.	.	.	.	21
	.	.	.	.	.	.	.	1373	.	.	.	.	91
	.	.	.	.	.	.	.	.	.	.	.	.	268
	.	.	.	.	.	.	.	.	.	.	.	.	1373
Total fungicide	2105	172	5	1239	190	843	5474	2746	718	456	679	78	14705
													11858

TABLE 57: Usage of herbicides on vegetable crops (spray hectares of formulations)

	Brussels sprouts	Cabbage summer/ autumn	Cabbage (other)	Cala- bresse	Cauli- flower	Outdoor lettuce	Turnip & swede	Peas	Broad beans	Leeks	Carrots	Other veg.	All crops	All crops 1989
Alloxydim-sodium	8	.	.	8	141
Aziprotrryn	.	52	.	.	.	.	.	.	.	.	.	.	52	.
Bentazone	2	2	104
Chlorbufam/chloridazon	143	.	2	143	28
Chlorpropham	15	.	15	.
Chlorthal/pentanochlor	.	.	.	365	.	.	56	.	.	74	497	131	628	190
Chlorthal-dimethyl	.	.	.	5	.	.	125	.	.	.	.	.	260	24
Clopyralid	107	23	.	.	.	.	.	3385	328	.	.	.	3713	3935
Cyanazine	.	.	.	48	.	.	.	.	.	.	.	.	165	.
Cycloxydim	.	111	6	.	.	.	.	.	.	.	.	.	130	16
Desmetryn	107	23	.	.	.	.	.	.	8	21	109	35	184	31
Diquat/paraquat	.	11	.	.	.	.	.	.	.	21	.	.	21	203
Fluzifop-p-butyl	33	126	14	617	477
Glyphosate	.	.	.	305	139	.	.	.	.	181	.	.	181	54
Ioxynil	1519	131	1650	1528
Linuron	992	211
MCPA/MCPB	116	23	81	.	183	.	731	992	.	.	.	.	1134	871
Metazachlor	1110	131	1241	1113
Metoxuron	.	.	.	24	.	.	91	.	.	43	.	.	158	337
Paraquat	54	700	238	996	126
Pendimethalin	2	2	.
Pentanochlor	71	64	.	135	322
Prometryn	495	.	.	124	.	38	2995	2311
Propachlor	54	242	89	1181	582	190	.	.	.	.	.	.	233	.
Propyzamide	233	.	.	66	.	.	.	207	118
Simazine	.	22	.	.	.	.	.	.	.	.	.	119	207	.
Sodium monochloro- acetate	.	.	5	.	.	.	.	.	.	.	.	.	5	.
Tebutam	.	10	.	263	56	.	91	.	.	.	.	.	420	151
Terbuthylazine/terbutryn	109	279	.	.	.	388	1240
Trifluralin	170	255	167	855	708	138	2182	.	.	.	216	38	4729	3282
Unspecified herbicide	18	.	.	18	.
Total herbicide	554	772	352	3046	1668	561	3771	4486	681	791	4356	879	21917	18824

TABLE 58: Usage of insecticides and molluscicides on vegetable crops (spray hectares of active ingredients)

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Cala-brese	Cauli-flower	Outdoor lettuce	Turnip & swede	Peas	Broad beans	Leeks	Carrots	Other veg.	All crops	All crops 1989
INSECTICIDES														
PYRETHROIDS														
Cypermethrin	348	80	266	528	549	129	40	384	.	.	.	.	1412	180
Deltamethrin	348	323	13	528	206	9	.	384	.	.	.	76	1887	1788
Fenvalerate	214	104	39	1309	501	61	183	496	328	.	.	38	3273	2312
ORGANOPHOSPHATES														
Chlorfenvinphos	.	23	.	214	.	.	5919	.	.	.	21	.	6177	2748
Chlorpyrifos	214	42	44	175	113	.	31	.	.	.	.	.	619	539
Demeton-S-methyl	214	183	45	373	225	129	.	313	.	.	.	115	1597	3397
Diazinon	232	52	.	48	.	129	2409	.	.	.	.	.	129	1675
Dimethoate	.	.	.	.	.	.	.	.	.	.	338	.	338	.
Disulfoton	.	.	.	.	.	23	.	.	.	.	.	.	23	.
Heptenophos	.	.	.	.	.	.	.	.	.	27	.	.	27	.
Malathion	.	.	.	.	.	.	.	.	.	.	.	.	23	.
Phorate	.	.	.	.	.	.	.	.	.	.	.	.	27	.
Quinalphos	.	.	.	34	.	.	.	.	.	.	703	.	703	349
Thiometon	.	.	.	34	.	.	.	.	.	.	418	.	452	161
Triazophos	.	.	.	.	.	.	.	.	.	.	.	.	34	161
CARBAMATES														
Carbofuran	170	168	110	307	614	.	2559	.	.	.	.	76	484	1087
Pirimicarb	.	131	45	951	326	162	.	.	279	.	.	.	3928	2622
ORGANOCHLORINE														
Gamma-HCH	.	.	77	.	.	.	.	.	.	.	.	.	77	1951
OTHER														
Unknown insecticide	54	28	22	.	1	.	.	.	.	.	.	.	105	33
Total insecticide	1794	1134	700	3973	2535	642	11141	1193	607	27	1849	343	25938	20064
MOLLUSCICIDES														
Metaldehyde	107	.	.	.	.	.	20	.	.	.	.	.	127	251
Methiocarb	358	1	244	.	560	34	795	.	.	.	.	62	2054	797
Total molluscicide	465	1	244	.	560	34	815	.	.	.	.	62	2181	1048
Total insecticides and molluscicides	2259	1135	944	3973	3095	676	11956	1193	607	27	1849	405	28119	21112

TABLE 59: Usage of fungicides on vegetable crops (spray hectares of active ingredients)

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Cala-brese	Cauli-flower	Outdoor lettuce	Turnip & swede	Peas	Broad beans	Leeks	Carrots	Other veg.	All crops	All crops 1989
Benomyl	232	.	.	.	.	319	.	.	.	.	.	.	551	26
Carbendazim	660	52	.	.	.	.	187	.	503	.	.	38	1440	1451
Chlorothalonil	321	11	.	1120	190	9	2293	1373	568	3	.	.	5888	3640
Copper oxychloride	.	.	.	93	.	.	.	.	.	.	.	.	93	.
Fenpropimorph	321	52	.	.	.	.	95	.	.	240	.	38	746	325
Ferbam	.	.	.	.	.	.	.	.	.	213	.	.	213	254
Fosetyl-aluminium	.	.	.	.	.	.	.	.	18	.	.	.	18	44
Iprodione	339	23	.	.	.	386	267	.	.	.	.	2	1017	2846
Mancozeb	232	23	5	.	.	.	267	.	66	.	679	.	1272	1729
Maneb	.	.	.	.	.	.	20	.	.	213	.	.	233	44
Metalaxyl	553	34	.	946	.	138	267	.	66	3	15	.	2022	2255
Sulphur	.	.	.	26	.	.	1906	.	.	.	.	.	1932	326
Tar oils	.	11	.	.	.	.	.	.	.	.	.	.	11	.
Thiram	.	.	.	.	.	129	.	.	.	.	.	.	129	163
Triadimenol	.	.	.	.	.	.	288	.	.	.	.	.	288	786
Tridemorph	.	.	.	.	.	.	112	.	.	.	.	.	112	268
Vinclozolin	.	.	.	.	.	.	.	1373	.	.	.	.	1373	.
Zineb	.	.	.	.	.	.	.	.	.	213	.	.	213	254
Total fungicide	2658	206	5	2185	190	981	5702	2746	1221	885	694	78	17551	14279

TABLE 60: Usage of herbicides on vegetable crops (spray hectares of active ingredients)

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Cala-brese	Cauli-flower	Outdoor lettuce	Turnip & swede	Peas	Broad beans	Leeks	Carrots	Other veg.	All crops	All crops 1989
Alloxydim-sodium													8	141
Aziprotryn		52								8			8	
Bentazone												2	52	
Chlorbufam										143			2	
Chloridazon										143			143	28
Chlorpropham										143			143	28
Chlorthal-dimethyl				365			56			74	512	131	643	199
Clopyralid	107	23		5		125							495	425
Cyanazine				48				3385	328				260	114
Cycloxydim		111	6										3761	3935
Desmetryn	107	23											117	
Diquat		11											130	16
Fluazifop-P-butyl									8	21	109	35	184	31
Glyphosate				305	139					21			21	203
Ioxynil										33	126	14	617	477
Linuron										181			181	54
MCPA											1519	131	1650	1528
MCPB								992					992	211
Metazachlor	116	23	81		183		731	992					992	347
Metoxuron													1134	871
Paraquat		11		24			91				1110	131	1241	1113
Pendimethalin			4						8	64	109	35	342	368
Pentachlor										54	700	238	996	126
Prometryn											497	133	630	190
Propachlor	54	242	89	1181	582	190	495			71	64	38	135	322
Propyzamide						233				124			2995	2343
Simazine		22							66				233	
Sodium monochloro-acetate												119	207	149
Tebutam		10	5	263	56		91						5	
Terbutylazine								109					420	151
Terbutryn								109	279				388	1240
Trifluralin	170	255	167	855	708	138	2182						388	2058
Unspecified herbicide											216	38	4729	3282
Total herbicide	554	783	352	3046	1668	561	3771	5587	968	955	4962	1045	24252	21640

TABLE 61: Quantities of insecticide and molluscicide active ingredients used on vegetable crops (kg)

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Cala-bresse	Cauliflower	Outdoor lettuce	Turnip & swede	Peas	Broad beans	Leeks	Carrots	Other veg.	All crops 1989
INSECTICIDES													
PYRETHROIDS													
Cypermethrin	9	2	7	.	14	3	1	.	.	.	.	.	3
Deltamethrin	3	5	.	3	2	.	.	3	.	.	.	1	24
Fenvalerate	4	3	1	34	11	2	3	12	9	.	.	1	58
ORGANOPHOSPHATES													
Chlorfenvinphos	.	6	.	364	.	.	3480	.	.	.	21	.	3395
Chlorpyrifos	21	22	23	126	60	.	16	.	.	.	.	.	376
Demeton-S-methyl	52	45	11	87	67	31	.	54	.	.	.	28	711
Diazinon	.	.	.	.	.	39	.	.	.	.	.	.	.
Dimethoate	79	36	.	14	.	.	484	.	.	.	.	.	772
Disulfoton	.	.	.	.	.	.	.	.	.	.	668	.	668
Heptenophos	.	.	.	.	.	10	.	.	.	23	.	.	10
Malathion	.	.	.	.	.	.	.	.	.	.	.	.	23
Phorate	.	.	.	.	.	.	.	.	.	.	1150	.	1150
Quinalphos	.	.	.	7	.	.	.	.	.	.	782	.	789
Thiometon	.	.	.	7	.	.	.	.	.	.	.	.	7
Triazophos	.	.	40	.	.	.	.	.	.	.	337	26	865
CARBAMATES													
Carbofuran	196	227	124	298	796	.	2599	.	.	.	.	.	4240
Pirimicarb	.	18	6	137	54	23	.	.	39	.	.	2	278
ORGANO-CHLORINE													
Gamma-HCH	.	.	22	.	.	.	.	.	.	.	.	.	22
Total insecticides	364	364	234	1077	1004	108	6583	69	48	23	2958	58	12890
MOLLUSCICIDES													
Metaldehyde	72	.	.	.	.	.	6	.	.	.	.	.	78
Methiocarb	32	+	32	.	75	7	91	.	.	.	.	7	244
Total molluscicides	104	.	32	.	75	7	97	.	.	.	.	7	322
Total insecticides and molluscicides	468	364	266	1077	1079	115	6680	69	48	23	2958	65	13212

'+' = less than 0.5 kg

TABLE 62: Quantities of fungicide active ingredients used on vegetable crops (kg)

FUNGICIDES	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Cala-brese	Cauliflower	Outdoor lettuce	Turnip & swede	Peas	Broad beans	Leeks	Carrots	Other veg.	All crops 1989
Benomyl	58	29	.	.	.	157	.	.	.	.	.	.	15
Carbendazim	258	11	.	.	.	9	67	.	101	.	.	21	798
Chlorothalonil	214	.	.	1120	237	.	1294	903	458	3	.	.	2178
Copper oxychloride	.	.	.	279	.	.	.	.	.	.	.	.	.
Fenpropimorph	193	39	.	.	.	.	71	.	.	170	.	29	279
Ferbam	.	.	.	.	.	.	.	.	.	33	.	.	502
Fosetyl-aluminium	.	.	.	.	.	.	.	.	.	.	.	.	33
Iprodione	259	11	.	.	.	.	.	.	16	.	.	.	16
Mancozeb	235	15	6	.	.	417	67	.	.	.	2	.	756
Maneb	.	.	.	.	.	.	180	.	66	.	.	.	1994
Metalaxyl	58	3	1	139	.	.	5	.	.	.	3912	.	4414
Sulphur	.	.	.	62	.	.	20	.	7	.	815	.	245
Tar oils	.	3	.	.	.	.	5814	.	.	.	.	.	863
Thiram	.	.	.	.	.	96	.	.	.	.	.	.	909
Triadimenol	.	.	.	.	.	.	.	.	.	.	.	.	3
Tridemorph	.	.	.	.	.	.	16	.	.	.	.	.	96
Vinclozolin	.	.	.	.	.	.	42	938	.	.	.	.	16
Zineb	.	.	.	.	.	.	.	.	.	.	.	.	42
										33			938
													33
Total fungicide	1275	111	7	1600	237	700	7576	1841	641	456	4727	52	19223
													11948

TABLE 63: Quantities of herbicide active ingredients used on vegetable crops (kg)

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Cala-brese	Cauli-flower	Outdoor lettuce	Turnip & swede	Peas	Broad beans	Leeks	Carrots	Other veg.	All crops	All crops 1989
HERBICIDES														
Alloxydim-sodium	12	.	.	12	214
Aziprotrryn	.	117	.	.	.	.	.	.	.	.	.	.	117	.
Bentazone	1	1	159
Chlorbufam	78	.	.	78	25
Chloridazon	97	.	.	97	31
Chlorpropham	373	219	69	288	110
Chlorthal-dimethyl	.	.	.	1285	.	.	253	.	.	.	.	.	1911	2215
Clopyralid	10	2	.	.	.	.	7	4339	574	.	.	.	19	7
Cyanazine	.	50	3	19	.	.	.	.	.	.	.	.	4913	4956
Cycloxydim	27	5	.	.	.	.	.	.	.	2	.	.	32	4
Desmetryn	.	3	.	.	.	.	.	.	.	2	21	8	34	17
Diquat	8	.	.	8	32
Fluzifop-P-butyl	75	.	.	.	.	14	68	5	371	577
Glyphosate	.	.	.	209	.	.	.	.	.	57	.	.	57	34
Ioxynil	1329	69	1398	1383
Linuron	76	16
MCPA	76	.	.	.	.	482	211
MCPB	482	.	.	.	.	886	925
Metazachlor	81	16	57	.	128	.	604	.	.	.	.	.	3301	3905
Metoxuron	.	4	.	7	.	.	26	.	1	16	32	12	98	123
Paraquat	.	.	5	.	.	.	.	.	.	51	1022	367	1445	146
Pendimethalin	41	405	144	549	181
Pentanochlor	448	85	.	126	451
Prometryn	231	872	300	3997	1450	503	1719	.	.	.	.	110	9630	9437
Propachlor	318	.	.	.	.	.	.	318	.
Propyzamide	.	4	.	.	.	.	.	.	26	.	.	130	160	111
Simazine	102	.
Sodium monochloro-acetate	.	35	102	492	203	.	329	.	.	.	.	.	1059	543
Tebutam	46	.	.	.	.	163	520
Terbutylazine	107	117	.	.	.	381	1726
Terbutryn	187	276	181	871	782	79	2291	.	274	.	232	42	4941	3546
Trifluralin
Total herbicide	536	1384	648	6880	2638	900	5229	5050	992	1197	6486	1185	33125	32838

TABLE 64: Estimated area (spray area (spray hectares)) treated with the 25 most extensively used active ingredients, on all the vegetable crops surveyed, excluding seed dressings.

		<u>1991</u>	<u>1989</u>
1	Chlorfenvinphos	6177	2748
2	Chlorothalonil	5879	3640
3	Trifluralin	4729	3282
4	Carbofuran	3928	2622
5	Cyanazine	3761	3935
6	Fenvalerate	3273	2312
7	Propachlor	2995	2343
8	Dimethoate	2741	1675
9	Methiocarb	2054	797
10	Metalaxyl	2022	2255
11	Pirimicarb	1932	1951
12	Sulphur	1932	326
13	Deltamethrin	1887	1788
14	Linuron	1650	1528
15	Demeton-S-methyl	1597	3397
16	Carbendazim	1440	1451
17	Cypermethrin	1412	180
18	Vinclozolin	1373	.
19	Mancozeb	1272	1729
20	Metoxuron	1241	1113
21	Metazachlor	1134	871
22	Iprodione	1017	2846
23	Pendimethalin	996	126
24	MCPA	992	211
25	MCPB	992	347

TABLE 65: Estimated amount (kg) of the 25 most extensively used active ingredients, by weight, on all the vegetable crops surveyed, excluding seed dressings.

		<u>1991</u>	<u>1989</u>
1	Propachlor	9630	9437
2	Sulphur	5876	909
3	Trifluralin	4941	3546
4	Cyanazine	4913	4956
5	Mancozeb	4414	4140
6	Chlorothalonil	4249	2178
7	Carbofuran	4240	3236
8	Chlorfenvinphos	3871	3395
9	Metoxuron	3301	3905
10	Chlorthal-dimethyl	1911	2213
11	Pendimethalin	1445	146
12	Linuron	1398	1283
13	Phorate	1150	597
14	Metalaxyl	1064	925
15	Tebutam	1059	543
16	Vinclozolin	938	.
17	Metazachlor	886	925
18	Quinalphos	789	31
19	Iprodione	756	1994
20	Disulfoton	668	.
21	Dimethoate	613	772
22	Pentanochlor	549	181
23	Fenpropimorph	502	231
24	MCPB	482	211
25	Carbendazim	476	790

TABLE 66: Usage of pesticides on vegetables in each region (spray hectares of formulations)

	Moray Firth	Aber- deen	Angus	East Fife	Lothian	Central Lowlands	Tweed Valley	Scotland
Insecticides and molluscicides	968	1,982	6,062	6,546	6,299	1,330	4,898	28,085
Fungicides	101	2,739	2,131	3,062	3,374	948	2,350	14,705
Herbicides	1,579	1,235	6,317	7,176	1,923	1,841	1,846	21,917
All pesticides	2,648	5,956	14,510	16,784	11,596	4,119	9,094	64,707

COMPARISON WITH PREVIOUS SURVEYS (TABLE 67)

Since the last survey in 1989, the area of vegetables grown had increased by about 23% to 11,478 hectares. In particular, the turnip and swede area had risen by around 65% to nearly 2,300 hectares. There were no major decreases in any individual vegetable area.

The usage of insecticides had increased by 29% during the last 2 years. Chlorfenvinphos was the most widely used, the spray area having more than doubled since the last survey. Most, 96%, was applied to nearly 6,000 spray hectares of turnips and swedes (95% of the crop) to control root flies. Other major increases, mainly for the same reason, were those of dimethoate from 1,675 to 2,741 spray hectares and carbofuran from 2,622 to 3,928 spray hectares. The usage of demeton-S-methyl was more than halved to 1,597 spray hectares. Another reduced usage was that of triazophos, from 1,087 spray hectares to 484 spray hectares due to an almost complete absence of use on brassicae and also a reduction of its use on carrots.

Molluscicide usage had increased overall, methiocarb from about 800 to over 2,000 spray hectares but metaldehyde use was halved to 127 spray hectares.

The total usage of fungicides had, in general, increased in line with the increase in crop area and the range of chemicals used was also very similar to that in the previous survey. Chlorothalonil, applied mostly to turnips and swedes, peas and calabrese was still the most used fungicide and its total usage had increased by over 60% to nearly 6,000 spray hectares. The spray areas treated with the other main fungicides, metalaxyl, carbendazim and vinclozolin had declined. Sulphur (on 1,900 spray hectares) was used mainly as a nutrient.

Trifluralin was the main herbicide, being used on 4,700 spray hectares, an increase of over 40% compared with the last survey. Cyanazine, the most widely applied herbicide in 1989, was used on 3,760 spray hectares. Propachlor, applied to about 3,000 spray hectares, was, as in 1989, the next most used. Terbutylazine and terbutryn usage had declined considerably, from around 1,200 and 2,000 spray hectares respectively, to less than 400 spray hectares each.

TABLE 67: Comparison of pesticide usage on vegetables for human consumption 1982, 1989 and 1991 - spray hectares of active ingredients and amount used (kg)

	1982		1989		1991	
	Spray hectares	Kg.	Spray hectares	Kg.	Spray hectares	Kg.
INSECTICIDES						
Pyrethroids	1,259	36	4,890	105	6,572	133
Organophosphates	4,638	2,400	10,442	7,299	13,324	8,216
Organochlorines	318	300	.	.	77	22
Carbamates	1,944	1,472	4,699	3,614	5,860	4,517
Unspecified	24	.	33	.	105	.
Total insecticides	8,358	4,326	20,064	11,019	25,938	12,890
MOLLUSCICIDES						
	674	148	1,048	253	2,181	322
FUNGICIDES						
	2,614	2,180	14,279	11,948	17,551	19,223
HERBICIDES						
	12,192	18,495	21,640	31,838	24,252	33,125
Area grown		7,928		9,313		11,478