

PESTICIDE USAGE IN SCOTLAND

SURVEY REPORT 83

**VEGETABLES FOR HUMAN CONSUMPTION
1989**

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SUMMARY

The quantities and areas treated of individual active ingredients and formulations of pesticides used in Scotland on vegetables for human consumption were estimated from quantitative data supplied by 128 growers. There had been an overall 20% increase in the area of the vegetable crop since the last survey, largely due to plantings of calabrese and turnips and swedes. The only significant decreases in cropping areas were of brussels sprouts and broad beans.

The total crop area (9,313 ha) was treated with broadly similar numbers of chemicals as in 1982 but actual usage showed a considerable increase. Insecticide usage of 20,063 spray ha had increased from 9,032 spray ha in 1982. Fungicide usage of 11,858 spray ha showed the greatest increase from 2,614 spray ha previously. Herbicide usage of 18,824 spray ha had increased from 12,192 spray ha.

Insecticide usage saw considerable change. Demeton-S-methyl (3,397 spray ha) remained the most widely used insecticide followed by chlorfenvinphos (2,748 spray ha) and carbofuran (2,622 spray ha). The pyrethroids fenvalerate (2,312 spray ha) and deltamethrin (1,788 spray ha) also figured prominently. In 1982 the ranking was demeton-S-methyl (3,045 spray ha) followed by carbofuran (1,013 spray ha) and pirimicarb (972 spray ha). The only pyrethroids recorded were deltamethrin (695 spray ha) and cypermethrin (98 spray ha).

The main fungicides were chlorothalonil (3,640 spray ha) and iprodione (2,846 spray ha) both due to the extent of their usage on beans. Metalaxyl (2,255 spray ha) ranked third. In 1982 benomyl (641 spray ha) was the most widely used fungicide followed by mancozeb and metalaxyl each used on 556 spray ha.

The number of herbicides increased from 31 to 37, 14 of which appeared for the first time. Trifluralin (3,282 spray ha) was still the most widely used herbicide followed by propachlor (2,343 spray ha) and terbutryn (2,058 spray ha). In 1982 trifluralin was followed by terbuthylazine and terbutryn both used on 1,651 spray ha.

INTRODUCTION

This was the third survey of pesticide usage on vegetables for human consumption in Scotland. The previous two were in 1977 and 1982 (References 1 and 2).

DEFINITIONS AND NOTES

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

Demeton-S-methyl sulphone and oxydemeton-methyl are both referred to as demeton-S-methyl because growers do not always differentiate between the two 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 1988 Agricultural Census (Reference 3) a sample of vegetable growers representing the whole of Scotland was drawn. The sample was stratified by land use region (Figure 1 and Reference 4) 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.

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 1989. When considering overwintering crops, data was collected for those crops where the bulk of the growing season was in 1989.

For all crops the data was raised by area, applying one raising factor and two adjustment factors (Tables 3, 4 and 5) calculated from the June 1989 Agricultural Census (Reference 5) 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 1989 census. A second adjustment was made for crops where no holdings were sampled in one or more regions.

PESTICIDE USAGE

The 1989 census areas of vegetables grown in each region are shown in Table 2 which includes the 1982 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 42-44 and each active ingredient in table 45. The estimated quantities of active ingredients used (Kg) are shown in table 46. The top 25 chemicals used have been listed, ranked according to spray ha (Table 47) and Kg active ingredient (Table 48). Regional data has been summarised in table 49 and comparisons made with earlier surveys in table 50.

Areas and proportions of crops treated with seed dressings are shown in table 40 and quantities of active ingredients in table 41.

Brussels sprouts (Tables 7-9)

The area of crop grown was 254 ha compared with 542 ha in 1982. Fifteen percent of the crop area was pesticide free, only 5% being pesticide free in 1982. The percentage of crop treated with insecticides and molluscicides was 85%, fungicides 48%, and herbicides 85%. One molluscicide was used, methiocarb and this was applied to 58% of the crop area.

Demeton-S-methyl (544 spray ha, 43% of crop treated) remained the insecticide most used, all to control aphids and caterpillars. This was followed by fenvalerate (379 spray ha, 26% of the crop treated) appearing for the first time. Carbofuran in granular form (207 ha, 76% of crop treated) was used for root fly control and dimethoate (169 spray ha, 50% of crop treated) as an aphicide.

Fungicide usage had changed from the use of just mancozeb and metalaxyl in 1982. Use of iprodione, mostly for control of Alternaria spp. and a proprietary mixture of chlorothalonil and metalaxyl used mainly for mildew control were both applied to 38% of the crop. Triadimenol used for the control of light leaf spot and mildew was applied to 26% of the crop.

Trifluralin (88% of the crop treated) remained the most widely used herbicide, being used for general weed control and against annual broadleaved weeds in equal proportions. Propachlor (33% of crop treated) use followed a similar pattern. Metazachlor (26% of crop treated) was used for general weed control alone.

Cabbages (summer/autumn) (Tables 10-12)

In the previous survey pesticide usage data was presented for all cabbages and savoys together. On this occasion they were surveyed separately using the two agricultural census categories, cabbages and savoys (summer/autumn) and cabbages and savoys (other).

The area of the summer/autumn crop was 246 ha and nine percent of it was pesticide free. In the previous survey the whole crop was treated.

Most insecticide use was against aphids and caterpillars. Dimethoate (45% of crop treated) was the most widely used followed by pirimicarb (35% of crop treated), both mostly against aphids and carbofuran (31% of crop treated) against root fly. Insecticide use since the previous survey was characterised by both increased use and number of active ingredients. Molluscicide use also showed an increase, trace quantities only were recorded in 1982. This survey recorded that 3% of the crop was treated.

Fungicide usage showed considerable increase, 23% of the crop being treated. Iprodione (23% of crop treated) and triadimenol (3% of crop treated) were the chemicals used. The reasons for using iprodione were control of mildew, light leaf spot and alternaria spp. and for triadimenol control of alternaria spp.

Herbicide usage showed much less change. The two main chemicals trifluralin (71% of crop treated) and propachlor (51% of crop treated) ranked as in the previous survey. The third metazachlor (31% of crop treated) appeared for the first time. All was applied to control annual weeds and for general weed control.

Other cabbage (tables 13-15)

The area grown was 212.7 ha and five percent was pesticide free, in the previous survey all was treated.

Demeton-S-methyl (76% crop treated) was the most widely used insecticide followed by pirimicarb (51% of crop treated). Chlorfenvinphos which ranked third was used exclusively for root fly control, the non-systemic organophosphates being the most widely used group for this purpose on

this crop. Molluscicide use, methiocarb (20% of crop treated) stood out, trace quantities only having been recorded in 1982.

Fungicide use showed considerable increase, only iprodione being recorded in 1982 and on only 2% of the crop. In this survey 55% of the crop was treated. Iprodione (50% of crop treated) was the most widely used fungicide followed by a proprietary mixture of metalaxyl and thiram (38% of crop treated).

Herbicide usage showed less change. The two main chemicals trifluralin (92% of crop treated) and propachlor (52% of crop treated) ranked as in the previous survey. All were applied to control annual weeds and for general weed control.

Calabrese (Tables 16-18)

This crop had undergone a fivefold increase in area grown to 1,078 ha since the last survey.

Ninety-four percent of the calabrese was treated with insecticides, 52% a fungicide and 94% a herbicide.

In previous surveys data for calabrese had been amalgamated with that for cauliflower. The data is here presented separately.

The main insecticide was deltamethrin (863 spray ha, 48% of crops treated) followed by pirimicarb (671 spray ha, 50% of crop treated) and carbofuran (523 spray ha, 47% of crop treated). The bulk of the usage was for aphid and caterpillar control. Root fly was the other main problem and accounted for most of the carbofuran usage.

Fungicide usage was almost exclusively for mildew control, the ranking being proprietary mixtures of chlorothalonil and metalaxyl (38% of crop treated), mancozeb and metalaxyl (11% of crop treated) and fosetyl-aluminium (4% of crop treated). Thiophanate-methyl, the only fungicide recorded during the previous survey was not found on this occasion.

Propachlor (90% of crop treated) and trifluralin (79% of crop treated) remained the most widely used herbicides followed by chlorthal-dimethyl (19% of crop treated). The main reason for use was control of annual broadleaved weeds, however propachlor and trifluralin were also widely used to control mixed broadleaved and grass weeds.

Cauliflower (Tables 19-21)

Cauliflower had increased in area by one-third to 571 ha since the last survey. Ninety-one percent of this crop was insecticide treated, 12% fungicide treated and 80% herbicide treated.

Demeton-S-methyl (471 spray ha, 42% of crop treated) remained the main insecticide used followed by pirimicarb (425 spray ha, 59% of crop treated) and dimethoate (371 spray ha, 29% of crop treated). All 3 chemicals were largely used for aphid control. As in the case of the calabrese, carbofuran usage (54% of crop treated) was for root fly control. Pyrethroids, mainly deltamethrin, were also used for aphid and caterpillar control where their zero harvest interval made them particularly useful to growers.

Fungicide usage was solely with a proprietary mixture of chlorothalonil and metalaxyl (12% of crop treated) for control of mildew.

Trifluralin (81% of crop treated) and propachlor (52% of crop treated) were the most popular herbicides and were used to control annual broadleaved weeds and for general weed control.

Turnip and swede (Tables 22-24)

Since the previous survey the area of this crop grown had risen from 535 ha to 1,391 ha, 6% being pesticide free. 89% received insecticide, 48% fungicide and 94% herbicide. Previously no molluscicide usage was recorded. Insecticides and fungicides showed a marked increase in usage. The number of fungicide and herbicide chemicals in use had doubled.

The most popular insecticides were chlorfenvinphos and carbofuran on 67% and 76% of the crop respectively to control root fly. Dimethoate was used as an aphicide on 39%. Insecticide spray area increased from 616 to 5,541 spray ha, chlorfenvinphos showing the most obvious increase, from 52 to 2,223 spray ha. Molluscicide usage was 535 spray ha, none was recorded in the previous survey.

The main fungicides were carbendazim, chlorothalonil and mancozeb, all used on 16% of the crop. Most of this use was for unspecified reasons. Total fungicide usage went up from 143 to 4,571 spray ha.

Allowing for the increased area of crop grown herbicide usage only showed a marginal increase. The ranking was trifluralin (82% of crop treated), metazachlor (36% of crop treated) and propachlor (26% of crop treated). Chemicals were used mostly for control of annual broadleaved weeds and annual grasses. Total spray area increased from 809 to 2,623 spray ha.

Peas (Tables 25-27)

The area grown was 3,750 ha and less than 2% was pesticide free. 43% of the crop was treated with insecticides, 38% fungicides and 98% herbicides. No molluscicides were recorded.

Demeton-S-methyl (36% of crop treated) remained the most popular aphicide. The pyrethroids fenvalerate (18% crop treated) and deltamethrin (6% of crop treated) appeared for the first time.

The fungicides chlorothalonil (38% of crop treated) and iprodione (38% of crop treated) have replaced benomyl and maneb and were used for control of mildew and botrytis respectively.

Cyanazine (92% of crop treated) was the most widely used herbicide followed by proprietary mixtures of terbutylazine/terbutryn (27% of crop treated) and terbutryn/trietazine (21% of crop treated). Annual weeds and perennial grasses accounted for the majority of usage.

Broad Beans (tables 28-30)

The area grown was 596 ha and less than 3% of this crop was pesticide free. 65% was treated with an insecticide, 66% a fungicide and 97% a herbicide. No molluscicides were recorded.

Fenvalerate (45% of crop treated) was the most widely used insecticide followed by pirimicarb (18% of crop treated). Usage of the third chemical demeton-S-methyl (3% of crop treated) was in marked contrast to its usage on peas on which it was the most widely used chemical (36% of crop treated). The main use on both crops was control of aphids. No molluscicide use was recorded.

The fungicides used, chlorothalonil (67% of crop treated), iprodione (48% of crop treated) and carbendazim (20% of crop treated) had replaced benomyl and maneb and were almost exclusively used for control of botrytis.

Only triazine herbicides were used, the main ones being cyanazine (48% of crop treated) and terbuthylazine/terbutryn mixture (34% of crop treated). They were applied to control annual weeds and for general weed control.

Leeks (Tables 31-33)

The area of crop grown showed a 91% increase to 196 ha since the previous survey. 15% of the crop was treated with insecticides, 59% with fungicides and 83% with herbicides.

The small amount of insecticide recorded was mostly demeton-S-methyl (11% of crop treated) used to control aphids. No insecticide usage had been found in the course of the previous survey.

The bulk of the fungicide usage was with a proprietary mixture of ferbam/maneb/zineb (254 spray ha, 50% of crop treated) or fenpropimorph (252 spray ha, 64% of crop treated) intended mainly for control of rust. The two fungicides found in the previous survey, captafol and triadimefon were not recorded.

There was a marked increase in herbicide usage. Most treatment was with paraquat (67% of crop treated) followed by propachlor (59% of crop treated) and chlorthal-dimethyl (50% of crop treated) to control annual broadleaved weeds and for general weed control.

Carrots (Tables 34-36)

Since the previous survey the area of this crop grown had increased by 87% to 910 ha. Corrected for area, pesticide usage also increased by more than 50%. 94% of the crop received treatment with insecticides and herbicides and 56% with fungicides. In common with the previous survey no molluscicides were recorded.

The main insecticides used were triazophos (46% of crop treated), and phorate (37% of crop treated), used largely for the control of carrot fly. The second most popular chemical encountered in the previous survey, disulfoton, was not recorded.

Fungicides usage had seen most change on this crop, none being recorded in the previous survey. In 1989 536 spray ha of a proprietary mixture of mancozeb and metalaxyl (57% of crop treated) was found, mostly used to control cavity spot.

Linuron (1,527 spray ha, 91% of crop treated) and metoxuron (1,113 spray ha, 93% of crop treated) continued to be the most popular herbicides and were used for control of annual broadleaved and for

general weed control. They were followed by Prometryn (314 spray ha, 33% of crop treated) and fluazifop-P-butyl (203 spray ha, 22% of crop treated).

Other vegetables (Tables 37-39)

The area grown was 108 ha. The main crop in this category was beetroot and this heavily weighted the results. It also included a number of very small areas of minor crops such as parsley, spinach and spring onions. 93% of the total area received a herbicide but less than 1% an insecticide. No fungicide usage was recorded. The areas of these minor crops had declined since the previous survey. Usage on this group of crops in 1982 was too small to warrant individual tabulation. The main herbicides found in this survey were phenmedipham and met amitron followed by ethofumesate and paraquat in equal quantities. They were mostly used on beet to control annual broadleaved weeds and for general weed control.

Seed treatments (Tables 40-41)

Information on seed treatments was generally difficult to obtain, growers often not specifying seed dressings when buying seed and having no record of what was used once the packaging was disposed of. There is therefore a large unknown element in the data presented. No data is presented for carrots as the magnitude of the unknown element made the information of no value.

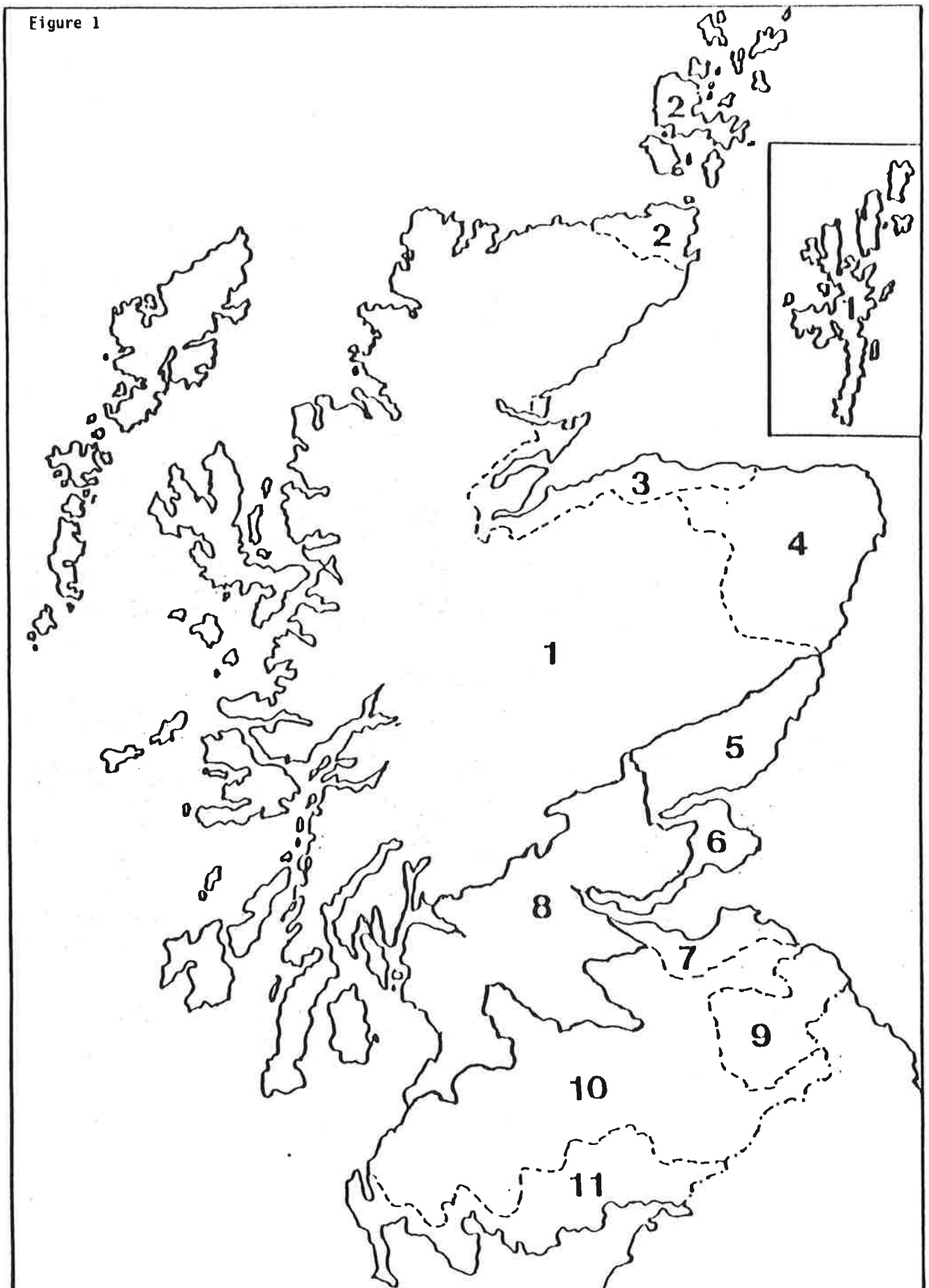
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REFERENCES

1. Umpleby, R. A., Sly, J. M. A., Cutler, J. R. and Symonds, W. Pesticide Usage Survey Report 19. Vegetables for Human Consumption 1977, MAFF, DAFS.
2. Brodie, J. A. and Wood, J. Pesticide Usage in Scotland Survey Report 46. Vegetables for Human Consumption 1982, 1986, DAFS.
3. Agricultural statistics, Scotland 1988. HMSO Edinburgh 1989.
4. Wood, H. J. An Agricultural Atlas of Scotland. George Gill and Sons, London 1931.
5. Agricultural Statistics, Scotland 1989 HMSO Edinburgh 1990.

Figure 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)	Highlands & Islands	Caith & Orkney	Moray Firth	Aber-deen	Angus Fife	Lothian Lowlands	Tweed Valley	Southern Uplands	Solway	Scotland
0.1-9.9	1	.	1	3	7	1	4	.	.	20
10-19.9	.	.	.	1	15	6	8	.	.	40
20-29.9	.	.	1	.	7	.	8	1	.	27
30-49.9	.	.	.	.	9	1	4	.	.	24
50+	1	.	.	.	10	2	2	.	.	18
All	1	.	2	4	41	10	26	1	.	128

TABLE 2: Area (ha) of vegetables grown in Scotland: 1989 census.

	Highlands & Islands	Caith & Orkney	Moray Firth	Aber-deen	Angus Fife	Lothian Lowlands	Tweed Valley	Southern Uplands	Solway	Scotland	1982
Brussels Sprouts	4.9	0.1	5.2	3.7	40.5	95.1	27.6	0.3	.	254.3	542.0
Cabbage (summer/autumn)	1.4	3.6	8.7	21.1	7.4	64.6	7.3	0.7	1.6	246.4]	571.1
Cabbage (Other)	0.4	1.9	7.5	11.4	19.3	72.4	.	0.9	.	212.7]	
Calabrese	18.5	0.2	25.8	7.2	297.9	27.8	45.5	1.2	.	1077.8	217.5
Cauliflower	75.6	0.7	29.8	9.9	64.5	101.1	34.5	0.3	1.4	570.7	426.3
Turnip & swede	12.5	5.1	36.3	251.2	277.9	208.1	346.1	38.5	3.7	1391.2	534.7
Peas	17.0	.	.	.	1879.4	165.2	731.9	.	.	3750.1	3943.0
Beans	39.0	0.1	.	2.0	295.8	.	259.0	0.1	.	596.0	722.7
Leeks	1.6	.	5.1	7.5	21.9	73.6	4.4	0.1	0.1	195.8	112.3
Carrots	3.7	4.3	170.2	52.9	300.9	33.8	2.2	0.3	3.1	910.0	490.2
Other veg.	0.4	0.1	18.3	30.4	27.8	16.5	.	0.1	.	108.2	254.8
All crops	175.0	16.1	306.9	397.3	3233.3	858.2	1458.5	42.5	9.9	9313.2	7928.3

TABLE 3: Raising factors: size group by region

Size group (ha)	Highlands & Islands	Caith & Orkney	Moray Firth	Aber-deen	Angus	East Fife	Lothian	Central Lowlands	Tweed Valley	Southern Uplands	Solway
1.0-9.9	5.62	.	11.70	11.72	13.32	28.24	20.92	29.36	5.46	.	.
10-19.9	.	.	.	13.22	5.28	3.15	3.07	3.96	4.70	.	.
20-29.9	.	.	2.51	.	2.83	1.90	.	1.04	2.05	1.00	.
30-49.9	1.63	1.47	3.85	4.28	1.12	.	.
50+	2.04	1.28	0.75	.	1.84	.	.

TABLE 4: First adjustment factors

	Highlands & Islands	Caith & Orkney	Moray Firth	Aber-deen	Angus	East Fife	Lothian	Central Lowlands	Tweed Valley	Southern Uplands	Solway
Brussels Sprouts	.	.	.	1.58	5.28	1.65	0.61	.	3.39	.	.
Cabbage (summer/autumn)	.	.	.	1.00	0.97	1.25	1.51	1.45	.	.	.
Cabbage (Other)	.	.	.	0.61	0.44	2.24	1.24	5.14	.	.	.
Calabrese	0.51	.	.	.	1.16	1.01	1.31	2.60	0.61	.	.
Cauliflower	.	.	.	1.06	0.76	0.96	0.39	.	0.53	.	.
Turnip & swede	.	.	.	0.83	0.72	0.55	2.56	11.56	0.94	1.91	.
Peas	1.16	0.86	0.76	0.81	1.07	.	.
Beans	1.15	.	.	.	1.06	.	.
Leeks	0.71	.	.	2.13	0.33	0.82	5.63	0.72	0.59	.	.
Carrots	.	.	1.27	2.38	0.58	1.47	2.13	.	1.01	.	.
Other veg.	.	.	0.60	.	2.73	.	2.54	.	.	.	.

TABLE 5: Second adjustment factors

Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Calabrese	Cauliflower	Turnip & swede	Peas	Broad Beans	Leeks	Carrots	Other veg.
1.10	1.10	1.05	1.03	1.35	1.04	1.00	1.07	1.03	1.06	1.73

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

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Calabrese	Cauli- flower	Turnip & swede	Peas	Broad Beans	Leeks	Carrots	Other veg.
Insecticides/ molluscicides	15	16	8	6	9	11	57	35	85	6	.
Fungicides	52	77	46	48	88	52	62	34	41	44	.
Herbicides	15	23	5	6	20	6	2	3	17	6	7
Any Pesticide	15	9	5	6	9	6	2	3	17	6	7

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

	Aphids	Aphids/ caterp.	Slugs	Root fly	Cater- pillar	Total spray area	% of crop treated
PYRETHROIDS							
Deltamethrin	36.8	.	.	.	92.6	129.4	31
Fenvalerate	.	221.2	.	.	157.8	379.0	26
SYSTEMIC ORGANOPHOSPHATES							
Demeton-S-methyl	289.9	253.8	.	.	.	543.7	43
Dimethoate	169.0	.	.	.	.	169.0	50
Quinalphos/thiometon	13.7	50.1	.	.	.	63.8	12
NON-SYSTEMIC ORGANOPHOSPHATES							
Chlorpyrifos	44.5	.	.	32.6	.	77.1	25
Triazophos	.	.	.	.	78.9	78.9	13
CARBAMATES							
Carbofuran	.	.	.	207.4	.	207.4	76
Pirimicarb	76.1	.	.	.	.	76.1	18
MOLLUSCICIDE							
Methiocarb	.	.	371.2	.	.	371.2	58
Total	630.0	525.1	371.2	240.0	329.3	2095.6	

Crop area = 254.3 ha

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

	Mildew	Light leaf spot	Alter-naria	Unspec-ified	Total spray area	% of crop treated
Chlorothalonil/metalaxyl	183.6	.	.	126.4	310.0	38
Iprodione	.	.	223.0	126.4	349.4	38
Iprodione/thiophanate-methyl	.	.	77.6	.	77.6	12
Triadimenol	126.4	157.8	.	.	284.2	26
Total	310.0	157.8	300.6	252.8	1021.2	

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

	Annual weeds	General weed control	Unspec-ified	Total spray area	% of crop treated
Metazachlor	.	65.9	.	65.9	25
Propachlor	46.7	39.4	16.7	102.8	33
Trifluralin	104.3	105.3	30.4	240.0	88
Total	151.0	210.6	47.1	408.7	

Crop area = 254.3 ha

TABLE 10: Summer/autumn cabbage: usage of insecticides, and molluscicide, the reasons for their use (spray hectares of formulation) and the percentage of the crop treated

	Aphids	Aphids/ caterp.	Flea beetle	Slugs	Root fly	Cater- pillar	Unspec- ified	Total spray area	% of crop treated
PYRETHROIDS									
Cyfluthrin	.	10.1	.	.	.	.	.	10.1	4
Deltamethrin	13.5	12.3	.	.	.	54.9	.	80.7	18
Fenvalerate	39.6	47.7	.	.	.	.	.	87.3	12
Permethrin	27.4	.	.	.	.	33.4	.	60.8	24
SYSTEMIC ORGANOPHOSPHATES									
Demeton-S-methyl	10.1	31.8	.	.	.	23.8	.	65.7	16
Dimethoate	76.3	48.5	.	.	.	27.4	12.9	165.1	45
NON-SYSTEMIC ORGANOPHOSPHATES									
Chlorfenvinphos	.	.	.	.	71.1	.	.	71.1	14
Chlorpyrifos	1.4	15.5	.	.	.	.	.	16.9	6
Triazophos	16.8	12.3	.	.	.	.	12.9	42.0	17
Trichlorfon	.	10.1	.	.	.	.	.	10.1	4
CARBAMATES									
Carbofuran	.	.	5.2	.	83.6	.	.	88.8	31
Pirimicarb	123.1	20.2	.	.	.	.	.	143.3	35
MOLLUSCICIDE									
Methiocarb	.	.	.	15.8	.	.	.	15.8	3
Total spray area	308.2	208.5	5.2	15.8	154.7	139.5	25.8	857.7	

Crop area = 246.4 ha

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

	Mildew	Light leaf spot	Alter-naria	Unspec-ified	Total spray area	% of crop treated
Iprodione	30.1	15.8	10.1	15.5	71.5	23
Triadimenol	.	.	15.8	.	15.8	3
Total spray area	30.1	15.8	25.9	15.5	87.3	

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

	Annual weeds	Perennial grasses	General weed control	Total spray area	% of crop treated
Chlorthal-dimethyl	16.8	.	.	16.8	7
Metazachlor	29.5	.	52.8	82.3	31
Propachlor	45.2	.	93.3	138.5	51
Quizalofop-ethyl	.	16.8	.	16.8	7
Trifluralin	66.2	.	121.3	187.5	71
Total spray area	157.7	16.8	267.4	441.9	

Crop area = 246.4

TABLE 13: Other cabbage: usage of insecticides and molluscicide, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Aphids	Aphids/ caterp.	Slugs	Root fly	Cater- pillar	Total spray area	% of crop treated
PYRETHROIDS							
Deltamethrin	5.9	13.2	.	.	2.4	21.5	8
Fenvalerate	.	162.6	.	.	.	162.6	38
SYSTEMIC ORGANOPHOSPHATES							
Demeton-S-methyl	4.7	160.3*	.	.	.	165.0	76
Dimethoate	2.9	22.5*	.	.	.	26.4	11
Quinalphos/thiometon	.	4.7	.	.	.	4.7	+
NON-SYSTEMIC ORGANOPHOSPHATES							
Chlorfenvinphos	.	.	.	97.9	.	97.9	45
Chlorpyrifos	3.5	.	.	79.0	.	82.5	38
Trichlorfon	.	.	.	162.6	.	162.6	38
CARBAMATES							
Carbofuran	.	.	.	41.7	.	41.7	17
Pirimicarb	28.8	162.6*	.	.	.	191.4	51
Unspecified insecticide	33.2	.	.	.	.	33.2	7
MOLLUSCICIDE							
Methiocarb	.	.	42.2	.	.	42.2	20
Total	79.0	525.9	42.2	381.2	2.4	1030.7	

Crop area = 212.7 ha

'+' = less than 0.5%

* Although stated by growers as being used for aphids/caterpillars, most usage is more likely to have been required for (and given control of) aphids only.

TABLE 14: Other cabbage: usage of fungicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Mildew	Light leaf spot	Alter-naria	Total spray area	% of crop treated
Benomyl	21.1	.	.	21.1	10
Iprodione	103.7	.	2.4	106.1	50
Metalaxyl/thiram	162.6	.	.	162.6	38
Total	287.4	.	2.4	289.8	

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

	Annual weeds	General weed control	Unspecified	Total spray area	% of crop treated
Chlorthal-dimethyl	15.8	.	.	15.8	8
Desmetryne	15.8	.	.	15.8	8
Metazachlor	.	22.5	.	22.5	10
Paraquat	15.8	.	.	15.8	8
Propachlor	34.8	81.3	2.4	118.5	52
Trifluralin	118.1	103.7	2.4	206.1	92
Total	200.3	207.5	4.8	412.6	

Crop area = 212.7 ha

TABLE 16: Calabrese usage of insecticides and molluscicide, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Aphids	Aphids/ caterp.	Flea beetle	Slugs	Root fly	Cater- pillar	Unspec- ified	Total spray area	% of crop treated
PYRETHROIDS									
Cypermethrin							180.5	180.5	17
Deltamethrin	467.3	134.7				260.6		862.6	48
Fenvalerate	18.5	176.8				189.9		385.2	20
SYSTEMIC ORGANOPHOSPHATES									
Demeton-S-methyl	254.5	118.5				24.8	180.5	578.3	42
Dimethoate	228.9	82.8				42.2		353.9	20
Quinalphos/thiometon		10.0				19.2		29.2	3
NON-SYSTEMIC ORGANOPHOSPHATES									
Chlorfenvinphos					208.6			208.6	19
Chlorpyrifos		26.5			10.8		180.5	217.8	20
Fenitrothion							38.2	38.3	3
Triazophos	22.6					18.7	180.5	221.3	20
Trichlorfon					38.2			38.2	4
CARBAMATES									
Carbofuran					496.9			523.4	47
Pirimicarb	619.2	51.3	26.5					670.5	50
MOLLUSCICIDE									
Methiocarb				66.3				66.3	5
Total	1611.0	600.6	26.5	66.3	754.5	555.4	760.2	4374.5	

Crop area = 1077.8 ha

TABLE 17: Calabrese: usage of fungicides on calabrese, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Mildew	Soft rot	Unspecified	Total spray area	% of crop treated
Benomyl	5.4	.	.	5.4	+
Chlorothalonil/metalaxyl	478.2	.	39.6	517.8	38
Fosetyl-aluminium	28.1	16.3	.	44.4	4
Iprodione	19.2	.	.	19.2	2
Mancozeb/metalaxyl	130.9	.	.	130.9	11
Total	661.8	16.3	39.6	717.7	

TABLE 18: Calabrese: usage of herbicides on calabrese, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Annual weeds	Perennial weeds	Perennial grasses	General weed control	Unspecified	Total spray area	% of crop treated
Chlorthal-dimethyl	215.9	.	.	.	.	215.9	19
Glyphosate	.	.	25.5	.	.	25.5	1
Metazachlor	66.4	.	.	26.5	.	92.9	9
Paraquat	10.8	.	.	21.1	.	31.9	3
Propachlor	583.7	16.0	.	369.9	63.0	1032.6	90
Quizalofop-ethyl	.	.	28.1	.	.	28.1	3
Tebutam	56.2	.	.	.	.	56.2	3
Trifluralin	528.9	.	.	283.3	79.9	910.1	79
Total	1461.9	16.0	53.6	718.8	142.9	2393.2	

Crop area = 1077.8 ha

'+' = less than 0.5%

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

	Aphids	Aphids/ caterp.	Slugs	Root fly	Cater- pillar	Total spray area	% of crop treated
PYRETHROIDS							
Deltamethrin	61.0	17.7	.	16.3	216.9	311.9	36
Fenvalerate	50.3	.	.	.	49.0	99.3	6
Permethrin	.	28.0	.	.	.	28.0	2
SYSTEMIC ORGANOPHOSPHATES							
Demeton-S-methyl	419.6	51.2	.	.	.	470.8	42
Dimethoate	345.3	7.5	.	.	18.5	371.3	29
Quinalphos/thiometon	18.7	44.7	.	.	.	63.4	8
NON-SYSTEMIC ORGANOPHOSPHATES							
Chlorpyrifos	8.7	.	.	38.4	.	47.1	7
CARBAMATES							
Carbofuran	.	.	.	328.0	.	328.0	54
Pirimicarb	425.2	.	.	.	.	425.2	59
MOLLUSCICIDE							
Methiocarb	.	.	17.7	.	.	17.7	3
Total	1328.8	149.1	17.7	382.7	284.4	2162.7	

Crop area = 570.7 ha

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

	Mildew	Total spray area	% of crop treated
Chlorothalonil/metalaxyl	72.0	72.0	12
Total	72.0	72.0	

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

	Annual weeds	General weed control	Mixed grasses	Unspecified	Total spray area	% of crop treated
Glyphosate	.	18.5	11.7	.	30.2	5
Metazachlor	.	73.6	.	.	73.6	12
Propachlor	152.3	151.9	.	11.7	315.9	52
Trifluralin	313.4	142.9	.	30.4	486.7	81
Total	465.7	386.9	11.7	42.1	906.4	

Crop area = 570.7 ha

TABLE 22: 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 beetle	Root fly	Leather jackets	Caterpillar	Slugs	Unspecified	Total spray area	% of crop treated
PYRETHROIDS									
Cyfluthrin	247.6	.	.	.	.	.	.	247.6	17
Deltamethrin	97.0	.	.	.	.	.	.	97.0	7
Fenvalerate	.	.	.	.	.	.	243.0	243.0	16
Permethrin	.	20.2	.	.	243.0	.	.	263.2	18
SYSTEMIC ORGANOPHOSPHATES									
Demeton-S-methyl	63.6	.	.	.	.	.	.	63.6	4
Dimethoate	288.9	.	.	.	.	.	275.0	563.9	39
NON-SYSTEMIC ORGANOPHOSPHATES									
Chlorfenvinphos	.	.	1731.2	.	.	.	492.0	2223.2	67
Chlorpyrifos	6.7	2.0	32.5	20.2	.	.	32.0	93.4	5
CARBAMATES									
Carbofuran	.	320.7	1102.1	.	.	.	.	1422.8	76
Pirimicarb	261.1	62.5	.	.	.	.	.	323.6	22
MOLLUSCICIDES									
Metaldehyde	.	.	.	.	.	251.2	.	251.2	13
Methiocarb	.	.	.	.	.	283.7	.	283.7	14
Total	964.9	405.4	2865.8	20.2	243.0	534.9	1042.0	6076.2	

Crop area = 1391.2 ha

TABLE 23: Turnips and swedes: usage of fungicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Mildew	Unspec- ified	Total spray area	% of crop treated
Carbendazim	.	1214.8	1214.8	16
Chlorothalonil	.	728.9	728.9	16
Iprodione	.	485.9	485.9	16
Mancozeb	.	575.9	575.9	16
Mancozeb/metalaxyl	.	485.9	485.9	16
Sulphur	78.8	247.6	326.4	16
Triadimenol	.	485.9	485.9	16
Tridemorph	267.6	.	267.6	18
Total	346.4	4224.9	4571.3	

Crop area = 1391.2 ha

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

	Annual weeds	Perennial grasses	General weed control	Unspecified	Total spray area	% of crop treated
Alloxydim-sodium	.	2.3	.	.	2.3	+
Benazolin/clopyralid	90.0	.	.	.	90.0	3
Chlorthal-dimethyl	6.7	.	.	.	6.7	+
Glyphosate	.	39.0	183.3	.	222.3	16
Metazachlor	175.4	.	350.5	8.5	534.4	36
Propachlor	273.3	.	45.3	104.3	422.9	26
Quizalofop-ethyl	.	45.0	.	.	45.0	3
TCA-sodium	.	7.9	.	.	7.9	1
Tebutam	88.8	.	5.9	.	94.7	6
Trifluralin	701.5	.	355.4	140.3	1197.2	82
Total	1335.7	94.2	940.4	253.1	2623.4	

'+' = less than 0.5%

Crop area = 1391.2 ha

TABLE 25: Peas: usage of insecticides the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Aphids	Aphids caterp.	Total spray area	% of crop treated
PYRETHROIDS				
Deltamethrin	181.7	41.4	223.1	6
Fenvalerate	678.8	.	678.8	18
SYSTEMIC ORGANOPHOSPHATE				
Demeton-S-methyl	1317.8	80.5	1398.3	36
Total	2178.3	121.9	2300.2	

Crop area = 3750.1

TABLE 26: Peas: usage of fungicides on, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Mildew	Botrytis	Unspec- ified	Total spray area	% of crop treated
Chlorothalonil	801.2	.	641.2	1442.4	38
Iprodione	.	801.2	641.2	1442.4	38
Total	801.2	801.2	1282.4	2884.8	

TABLE 27: Peas: usage of herbicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Annual weeds	Perennial grasses	General weed control	Unspec- ified	Total spray area	% of crop treated
Bentazone	104.1	.	.	.	104.1	3
Bentazone/MCPB	136.1	.	.	.	136.1	4
Cyanazine	1923.7	.	845.1	854.7	3623.5	92
Glyphosate	.	98.5	.	.	98.5	2
MCPA/MCPB	210.7	.	.	.	210.7	6
Simazine/trietazine	30.6	.	.	.	30.6	1
Terbutylazine/terbutryn	1024.8	.	801.2	.	1024.8	27
Terbutryn/trietazine	.	.	801.2	.	801.2	21
Total	2628.8	98.5	2447.5	854.7	6029.5	

Crop area = 3750.1 ha

TABLE 28: Broad beans: usage of insecticides the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Aphids	Unspec- ified	Total spray area	% of crop treated
PYRETHROID				
Fenvalerate	254.2	22.6	276.8	45
SYSTEMIC ORGANOPHOSPHATE				
Demeton-S-methyl	17.3	.	17.3	3
CARBAMATE				
Pirimicarb	120.0	.	120.0	18
Total spray area	391.5	22.6	414.1	

TABLE 29: Broad beans: usage of fungicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Mildew	Botrytis	Unspec- ified	Total spray area	% of crop treated
Carbendazim	.	236.5	.	236.5	20
Chlorothalonil	17.3	236.5	276.7	530.5	67
Iprodione	.	17.3	276.7	294.0	48
Total spray area	17.3	490.3	553.4	1061.0	

Crop area = 596.0 ha

TABLE 30: Broad beans: usage of herbicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Annual weeds	General weed control	Unspecified	Total spray area	% of crop treated
Cyanazine	.	17.3	276.7	294.0	48
Simazine	118.2	.	.	118.2	20
Terbutylazine/terbutryn	197.3	17.3	.	214.6	34
Terbutryn/trietazine	.	17.3	.	17.3	3
Total spray area (ha)	315.5	51.9	276.7	644.1	

Crop area = 596.0 ha

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

	Aphids	Cutworm	Unspec- ified	Total spray area	% crop treated
SYSTEMIC ORGANOPHOSPHATE					
Demeton-S-methyl	21.6	.	.	21.6	11
NON-SYSTEMIC ORGANOPHOSPHATE					
Chlorpyrifos	.	1.1	.	1.1	+
Triazophos	.	.	13.9	13.9	6
Total	21.6	1.1	13.9	36.6	

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

	Rust	White tip	Unspec- ified	Total spray area	% crop treated
Chlorothalonil/metalaxyl					
Fenpropimorph	236.9	14.9	72.7	324.5	64
Ferbam/maneb/zineb	237.7	16.6	.	254.3	50
Total	474.6	70.5	72.7	617.8	

Crop area = 195.8 ha

'+' = less than 0.5%

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

	Annual weeds	Perennial grasses	General weed control	Mixed grasses	Unspecified	Total spray area	% of crop treated
Alloxydim-sodium	.	7.2	.	.	.	7.2	4
Chlorbufam/chloridazon	22.1	.	.	.	5.7	27.8	10
Chlorpropham/fenuron	.	.	8.8	.	8.8	8.8	4
Chlorthal-dimethyl	104.0	.	.	.	.	104.0	50
Chlorthal-dimethyl/propachlor	17.6	.	14.9	.	.	32.5	15
Clopyralid	.	.	21.4	.	.	21.4	9
Cyanazine	2.3	.	1.6	.	13.1	17.0	5
Glyphosate	.	.	7.5	.	.	7.5	3
Ioxynil	39.0	.	14.9	.	.	53.9	10
Paraquat	80.2	.	36.3	21.4	23.4	161.3	67
Prometryne	7.2	.	.	.	.	7.2	3
Propachlor	95.9	.	36.5	.	13.9	146.3	59
Trifluralin	34.8	.	.	.	.	34.8	11
Total	403.1	7.2	141.9	21.4	64.9	638.5	

Crop area = 195.8 ha

TABLE 34: Carrots: usage of insecticides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Aphids	Carrot fly	C. Fly/cutworm	C. Fly/aphid	Unspecified	Total spray ha.	% crop treated
PYRETHROIDS							
Deltamethrin	61.5	.	.	.	.	61.5	6
SYSTEMIC ORGANOPHOSPHATES							
Demeton-S-methyl	71.5	.	.	.	.	71.5	7
Dimethoate	.	26.4	.	.	.	26.4	3
Phorate	.	349.1	.	.	.	349.1	37
NON-SYSTEMIC ORGANOPHOSPHATES							
Chlorfenvinphos	.	147.4	.	.	.	147.4	10
Chlorpyrifos	.	.	.	1.6	.	1.6	+
Pirimiphos-methyl	.	236.5	.	.	.	236.5	3
Triazophos	73.0	528.7	2.3	.	126.0	730.0	46
CARBAMATES							
Aldicarb	.	.	.	.	126.0	126.0	14
Carbofuran	.	8.9	.	.	.	8.9	+
Total	206.0	1297.0	2.3	1.6	252.0	1758.9	

Crop area = 910.0 ha

'+' = less than 0.5% of crop area

TABLE 35: Carrots: usage of fungicide, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Cavity spot	Unspecified	Total Spray area	% crop treated
Mancozeb/metalaxyl	470.4	65.1	535.5	57
Total	470.4	65.1	535.5	

Crop area = 910.0 ha

TABLE 36: Carrots: usage of herbicides, the reasons for their use (spray hectares of formulations) and the percentage of the crop treated

	Annual weeds	Annual grasses	Perennial grasses	General weed control	Unspecified	Total spray area	% of crop treated
Alloxydim-sodium	.	.	.	122.0	132.4	254.4	13
Chlorpropham/pentachlor	21.0	.	.	36.5	132.4	189.9	20
Diquat/paraquat	31.1	.	.	.	.	31.1	3
Fluazifop-P-butyl	28.6	.	48.2	126.0	.	202.8	22
Glyphosate	.	.	62.0	.	.	62.0	7
Linuron	739.3	8.9	.	582.2	196.5	1526.9	91
Metoxuron	279.0	.	132.4	604.9	96.2	1112.5	93
Paraquat	28.6	.	.	36.5	.	65.1	7
Pendimethalin	.	.	.	126.0	.	126.0	14
Prometryne	126.8	.	.	54.5	132.4	313.7	33
Sethoxydim	.	54.7	.	.	.	54.7	6
Total	1254.4	63.6	242.6	1688.6	689.9	3939.1	

Crop area = 910.0 ha

TABLE 37: Other vegetable crops: usage of insecticides, the reasons for their use (spray hectares of formulations).

	Aphids	Root fly	Cutworm	Total spray area
NON-SYSTEMIC ORGANOPHOSPHATE				
Chlorpyrifos	0.7	0.7	1.0	1.0
CARBAMATES				
Carbofuran	0.7	0.7		0.7
Pirimicarb	0.7			0.7

TABLE 38: Usage of fungicides on 'other vegetable crops', the reasons for their use (spray hectares of formulations).

None used

TABLE 39: Other vegetable crops: usage of herbicides, the reasons for their use (spray hectares of formulations).

	Annual weeds	Perennial grasses	General weed control	Total spray area
Chlorthal-dimethyl	32.6			32.6
Clopyralid	2.7			2.7
Ethofumesate			63.1	63.1
Glyphosate		31.5		31.5
Linuron	1.3			1.3
Metamitron	2.7			2.7
Metoxuron	1.3			1.3
Paraquat	31.6		126.1	128.8
Phenmedipham	157.0			157.0
Prometryne	1.3		31.5	31.5
Propachlor	33.3			33.3
Trifluralin	0.7			0.7

Crop area = 108.2 ha

TABLE 40: Areas (ha) and proportions (%) of vegetable crops treated with seed dressings

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Calabrese	Cauli-flower	Turnip & swede	Peas	Broad Beans	Leeks	Carrots	Other veg.	ALL CROPS
Benomyl	.	.	.	.	.	.	.	.	21 (11)	.	.	21 (+)
Captan/Gamma-HCH	59 (23)	16 (6)	26 (12)	21 (2)	13 (2)	583 (42)	.	.	.	.	1 (+)	719 (8)
Drazoxolon	.	.	.	.	.	.	748 (20)	277 (46)	.	.	.	1025 (11)
Iprodione	.	.	.	.	.	266 (19)	.	.	117 (60)	.	32 (28)	415 (4)
Metalaxyl/thiabendazole	.	.	.	.	.	.	1606 (43)	.	.	.	.	1606 (17)
etalaxyl/thiabendazole/thiram	.	.	.	.	.	.	155 (4)	.	.	.	.	155 (2)
Thiram	.	.	8 (4)	104 (10)	.	.	.	197 (33)	29 (15)	+	4 (3)	342 (4)
Unknown seed dressing	17 (6)	.	.	113 (10)	4 (+)	149 (11)	493 (13)	118 (20)	34 (17)	366 (40)	48 (42)	1342 (14)

'+' = Trace quantity

TABLE 41: Quantities of active ingredients (kg) used in seed dressings

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Calabrese	Cauli-flower	Turnip & swede	Peas	Broad Beans	Leeks	Other veg.	ALL CROPS
Benomyl	.	.	.	.	.	.	.	.	0.49	.	0.49
Captan	0.07	0.03	0.06	0.06	0.02	1.62	.	.	.	.	1.86
Drazoxolon	.	.	.	.	.	.	94.05	0.31	.	.	94.36
Gamma-HCH	0.54	0.23	0.48	0.43	0.15	12.12	.	.	.	+	13.95
Iprodione	.	.	.	.	.	1.12	.	.	11.78	0.78	13.68
Metalaxyl	.	.	.	.	.	.	299.52	.	.	.	299.52
Thiabendazole	.	.	.	.	.	.	159.24	.	.	.	159.24
Thiram	.	.	0.08	0.26	.	.	11.70	0.46	1.30	0.86	14.66

+ = Trace quantity

TABLE 42: Usage of insecticides and molluscicides on vegetable crops (spray hectares of formulations)

	Brussels sprouts	Cabbage summer/ autumn	Cabbage (other)	Calabrese	Cauli- flower	Turnip & swede	Peas	Broad			Other veg.	ALL CROPS
								Beans	Leeks	Carrots		
INSECTICIDES												
PYRETHROIDS												
Cyfluthrin	.	10	.	.	.	248	.	.	.	.	.	258
Cypermethrin	.	.	180	.	.	.	.	.	.	.	.	180
Deltamethrin	129	81	21	863	312	97	223	.	.	62	.	1788
Fenvalerate	379	87	163	385	99	243	679	277	.	.	.	2312
Permethrin	.	61	.	.	28	263	.	.	.	.	.	352
SYSTEMIC ORGANOPHOSPHATES												
Demeton-S-methyl	544	66	165	578	471	64	1398	17	22	72	.	3397
Dimethoate	169	165	26	354	371	564	.	.	.	26	.	1675
Phorate	.	.	.	.	.	.	.	.	.	349	.	349
Quinalphos/thiometon	64	.	5	29	63	.	.	.	.	.	.	161
NON-SYSTEMIC ORGANOPHOSPHATES												
Chlorfenvinphos	.	71	98	209	.	2223	.	.	.	147	.	2748
Chlorpyrifos	77	17	83	218	47	93	.	.	1	2	1	539
Fenitrothion	.	.	.	38	.	.	.	.	.	.	.	38
Pirimiphos-methyl	.	.	.	.	.	.	.	.	.	237	.	237
Triazophos	79	42	.	222	.	.	.	.	14	730	.	1087
Trichlorfon	.	10	163	38	.	.	.	.	.	.	.	211
CARBAMATES												
Aldicarb	.	.	.	.	.	.	.	.	.	126	.	126
Carbofuran	207	89	42	523	328	1423	.	.	.	9	1	2622
Pirimicarb	76	143	191	671	425	324	.	120	.	.	1	1951
OTHER												
Unknown insecticide	.	.	33	.	.	.	.	.	.	.	.	33
Total spray area	1724	842	990	4308	2144	5542	2300	414	37	1760	3	20064
MOLLUSCICIDES												
Metaldehyde	.	.	.	.	.	251	.	.	.	.	.	251
Methiocarb	371	16	42	66	18	284	.	.	.	.	.	797
All molluscicides	371	16	42	66	18	535	.	.	.	.	.	1048

TABLE 43: Usage of fungicides on vegetable crops (spray hectares of formulations)

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Calabrese	Cauli-flower	Turnip & swede	Peas	Broad Beans	Leeks	Carrots	Other veg.	ALL CROPS
Benomyl	.	.	21	5	.	.	.	.	.	.	.	26
Carbendazim	.	.	.	.	.	1215	.	236	.	.	.	1451
Chlorothalonil	.	.	.	.	.	729	1442	530	.	.	.	2701
Chlorothalonil/metalaxyl	310	.	.	518	72	.	.	.	39	.	.	939
Fenpropimorph	.	.	.	.	.	.	.	.	325	.	.	325
Ferbam/maneb/zineb	.	.	.	.	.	.	.	.	254	.	.	254
Fosetyl-aluminium	.	.	.	44	.	.	.	.	.	.	.	44
Iprodione	349	72	106	19	.	486	1442	294	.	.	.	2768
Iprodione/thiophanate-methyl	78	.	.	.	.	.	.	.	.	.	.	78
Mancozeb	.	.	.	.	.	576	.	.	.	.	.	576
Mancozeb/metalaxyl	.	.	.	131	.	486	.	.	.	536	.	1153
Metalaxyl/thiram	.	.	163	.	.	.	.	.	.	.	.	163
Sulphur	.	.	.	.	.	326	.	.	.	.	.	326
Triadimenol	284	16	.	.	.	486	.	.	.	.	.	786
Tridemorph	.	.	.	.	.	268	.	.	.	.	.	268
All fungicides	1021	88	290	717	72	4572	2884	1060	618	536	.	11858

TABLE 44: Usage of herbicides on vegetable crops (spray hectares of formulations)

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Calabrese	Cauli-flower	Turnip & swede	Peas	Broad Beans	Leeks	Carrots	Other veg.	ALL CROPS
Alloxydim-sodium	2	.	.	7	132	.	141
Benazolin/clopyralid	90	.	.	.	.	.	90
Bentazone	104	.	.	.	.	104
Bentazone/MCPB	136	.	.	.	.	136
Chlorbufam/chloridazon	28	.	.	28
Chlorpropham/fenuron	9	.	.	9
Chlorpropham/pentachlor	190	.	190
Chlorthal-dimethyl	.	17	16	216	.	7	.	.	104	.	33	393
Chlorthal-dimethyl/propachlor	32	.	.	32
Clopyralid	21	.	3	24
Cyanazine	3624	294	17	.	.	3935
Desmetryne	.	.	16	.	.	.	.	.	.	.	.	16
Diquat/paraquat	31	.	31
Ethofumesate	63	63
Fluazifop-P-butyl	203	.	203
Glyphosate	.	.	.	25	30	222	99	.	7	62	32	477
Ioxynil	54	.	.	54
Linuron	1527	1	1528
MCPA/MCPB	211	.	.	.	.	211
Metamitron	129	129
Metazachlor	66	82	22	93	74	534	.	.	.	.	.	871
Metoxuron	1113
Paraquat	.	.	16	32	.	.	.	.	161	65	63	337
Pendimethalin	126	.	126
Phenmedipham	157	157
Prometryne	7	314	1	322
Propachlor	103	139	118	1033	316	423	.	.	146	.	33	2311
Quizalofop-ethyl	.	17	.	28	.	45	.	.	.	.	.	90
Sethoxydim	55	.	55
Simazine	118	.	.	.	118

TABLE 44 (Cont'd): Usage of herbicides on vegetable crops (spray hectares of formulations)

	Brussels sprouts	Cabbage summer/ autumn	Cabbage (other)	Calabrese	Cauli- flower	Turnip & swede	Peas	Broad Beans	Leeks	Carrots	Other veg.	ALL CROPS
Simazine/trietazine	.	.	.	.	.	.	31	.	.	.	.	31
TCA-sodium	.	.	.	.	.	8	.	.	.	.	.	8
Tebutam	.	.	.	56	.	95	.	.	.	.	.	151
Terbuthylazine/terbutryn	.	.	.	.	.	.	1025	215	.	.	.	1240
Terbutryn/trietazine	.	.	.	.	.	.	801	17	.	.	.	818
Trifluralin	240	188	224	910	487	1197	.	.	35	.	1	3282
All herbicides	409	443	412	2393	907	2623	6031	644	628	3817	517	18824

TABLE 45: Chemical usage on vegetable crops (spray hectares of active ingredients)

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Calabrese	Cauli-flower	Turnip & swede	Peas	Broad Beans	Leeks	Carrots	Other veg.	ALL CROPS
INSECTICIDES												
PYRETHROIDS												
Cyfluthrin	.	10	.	.	.	248	.	.	.	.	.	258
Cypermethrin	.	.	.	180	.	.	.	.	.	.	.	180
Deltamethrin	129	81	21	863	312	97	223	.	.	62	.	1788
Fenvalerate	379	87	163	385	99	243	679	277	.	.	.	2312
Permethrin	.	61	.	.	28	263	.	.	.	.	.	352
SYSTEMIC ORGANOPHOSPHATES												
Demeton-S-methyl	544	66	165	578	471	64	1398	17	22	72	.	3397
Dimethoate	169	165	26	354	371	564	.	.	.	26	.	1675
Phorate	.	.	.	.	.	.	.	.	.	349	.	349
Thiometon	64	.	5	29	63	.	.	.	.	.	.	161
NON-SYSTEMIC ORGANOPHOSPHATES												
Chlorfenvinphos	.	71	98	209	.	2223	.	.	.	147	.	2748
Chlorpyrifos	77	17	83	218	47	93	.	.	1	2	1	539
Fenitrothion	.	.	.	38	.	.	.	.	.	.	.	38
Pirimiphos-methyl	.	.	.	.	.	.	.	.	.	237	.	237
Quinalphos	64	.	5	29	63	.	.	.	.	.	.	161
Triazophos	79	42	.	222	.	.	.	.	14	730	.	1087
Trichlorfon	.	10	163	38	.	.	.	.	.	.	.	211
CARBAMATES												
Aldicarb	.	.	.	.	.	.	.	.	.	129	.	126
Carbofuran	207	89	42	523	328	1423	.	.	.	9	1	2622
Pirimicarb	76	143	191	671	425	324	.	120	.	.	1	1951
OTHER												
Unknown insecticide	.	.	33	.	.	.	.	.	.	.	.	33
Total spray area	1724	842	990	4308	2144	5542	2300	414	37	1760	3	20064
MOLLUSCICIDES												
Metaldehyde	.	.	.	.	.	251	.	.	.	.	.	251
Methiocarb	371	16	42	66	18	284	.	.	.	.	.	797
Total spray area	371	16	42	66	18	535	.	.	.	.	.	1048

TABLE 45 (Cont'd): Chemical usage on vegetable crops (spray hectares of active ingredients)

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Calabrese	Cauli-flower	Turnip & swede	Peas	Broad Beans	Leeks	Carrots	Other veg.	ALL CROPS
FUNGICIDES												
Benomyl	.	.	21	5	.	.	.	.	.	.	.	26
Carbendazim	.	.	.	.	1215	.	.	236	.	.	.	1451
Chlorothalonil	310	.	.	518	729	1442	530	39	39	.	.	3640
Fenpropimorph	.	.	.	.	.	.	.	325	325	.	.	325
Ferbam	.	.	.	.	.	.	.	254	254	.	.	254
Fosetyl-aluminium	.	.	.	44	.	.	.	.	.	.	.	44
Iprodione	427	72	106	19	486	1442	294	.	.	.	.	2846
Mancozeb	.	.	.	131	1062	.	.	.	.	536	.	1729
Maneb	.	.	.	44	.	.	.	.	.	.	.	44
Metalaxyl	310	.	163	649	486	.	.	.	39	536	.	2255
Sulphur	.	.	.	.	326	.	.	.	.	.	.	326
Thiophanate-methyl	78	.	.	.	.	.	.	.	.	.	.	78
Thiram	.	.	163	.	.	.	.	.	.	.	.	163
Triadimenol	284	16	.	.	486	.	.	.	.	.	.	786
Tridemorph	.	.	.	.	268	.	.	.	.	.	.	268
Zineb	.	.	.	.	.	.	.	.	254	.	.	254
Total spray area	1409	88	453	1310	144	5058	2884	1060	657	1072	.	14279
HERBICIDES												
Alloxydim-sodium	.	.	.	.	.	2	.	.	7	132	.	141
Benazolin	.	.	.	.	90	.	240	.	.	.	.	90
Bentazone	.	.	.	.	.	.	.	.	.	.	.	240
Chlorbufam	.	.	.	.	.	.	.	.	28	.	.	28
Chloridazon	.	.	.	.	.	.	.	.	28	.	.	28
Chlorpropham	.	.	.	.	.	.	.	.	9	190	.	199
Chlorthal-dimethyl	.	17	16	216	7	7	.	.	136	.	33	425
Clopyralid	.	.	.	.	90	.	.	.	21	.	3	114
Cyanazine	.	.	.	.	.	.	294	3624	17	.	.	3935

TABLE 45 (Cont'd): Chemical usage on vegetable crops (spray hectares of active ingredients)

	Brussels sprouts	Cabbage summer/ autumn	Cabbage (other)	Calabrese	Cauli- flower	Turnip & swede	Peas	Broad Beans	Leeks	Carrots	Other veg.	ALL CROPS
Desmetryne	.	.	16	.	.	.	.	.	.	.	.	16
Diquat	31	.	31
Ethofumesate	63	63
Fenuron	9	.	.	9
Fluazifop-P-butyl	203	.	203
Glyphosate	.	.	.	25	30	222	99	.	7	62	32	477
Ioxynil	54	.	.	54
Linuron	1527	1	1528
MCPA	211	.	.	.	.	211
MCPB	347	.	.	.	.	347
Metamitron	129	129
Metazachlor	66	82	22	93	74	534	.	.	.	.	.	871
Metoxuron	1112	1	1113
Paraquat	.	.	16	32	.	.	.	.	161	96	63	368
Pendimethalin	126	.	126
Pentachlor	190	.	190
Phenmedipham	157	157
Prometryne	7	314	1	322
Propachlor	103	139	118	1033	316	423	.	.	178	.	33	2343
Quizalofop-ethyl	.	17	.	28	.	45	.	.	.	.	.	90
Sethoxydim	55	.	55
Simazine	31	118	.	.	.	149
TCA-sodium	8	.	.	.	.	.	8
Tebutam	.	.	.	56	.	95	.	.	.	.	.	151
Terbuthylazine	1025	215	.	.	.	1240
Terbutryn	1826	232	.	.	.	2058
Trietazine	832	17	.	.	.	849
Trifluralin	240	188	224	910	487	1197	.	.	35	.	1	3282
Total spray area	409	443	412	2393	907	2713	8235	876	697	4038	517	21640

TABLE 46: Quantity of active ingredient used (kg)

	Brussels sprouts	Cabbage summer/ autumn	Cabbage (other)	Calabrese	Cauli-flower	Turnip & swede	Peas	Broad Beans	Leeks	Carrots	Other veg.	ALL CROPS
INSECTICIDES												
PYRETHROIDS												
Cyfluthrin	.	.	.	.	.	3	.	.	.	.	.	3
Cypermethrin	.	.	.	3	.	.	.	.	.	.	.	3
Deltamethrin	2	1	.	12	4	1	3	.	.	1	.	24
Fenvalerate	11	2	5	10	3	7	14	8	.	.	.	58
Permethrin	.	3	.	.	1	13	.	.	.	.	.	17
SYSTEMIC ORGANOPHOSPHATES												
Demeton-S-methyl	132	16	41	149	116	17	214	4	5	17	.	711
Dimethoate	56	49	8	110	114	427	.	.	.	8	.	772
Phorate	.	.	.	.	.	.	.	.	.	597	.	597
Thiometon	12	.	1	6	12	.	.	.	.	.	.	31
NON-SYSTEMIC ORGANOPHOSPHATES												
Chlorfenvinphos	.	167	230	346	.	2257	.	.	.	395	.	3395
Chlorpyrifos	42	9	44	193	25	60	.	.	1	1	1	376
Fenitrothion	.	.	.	21	.	.	.	.	.	.	.	21
Pirimiphos-methyl	.	.	.	.	.	.	.	.	.	331	.	331
Quinalphos	12	.	1	6	12	.	.	.	.	.	.	31
Triazophos	73	31	.	99	.	.	.	.	13	649	.	865
Trichlorfon	.	8	130	31	.	.	.	.	.	.	.	169
CARBAMATES												
Aldicarb	.	.	.	.	.	.	.	.	.	71	.	71
Carbofuran	264	124	62	709	432	1658	.	.	.	13	1	3263
Pirimicarb	14	20	27	94	63	45	.	17	.	.	.	280
OTHER												
Unknown insecticide	.	.	33	.	.	.	.	.	.	.	.	33
Total	618	430	582	1789	782	4488	231	29	19	2082	2	11052
MOLLUSCICIDES												
Metaldehyde	.	.	.	.	.	118	.	.	.	.	.	118
Methiocarb	69	3	9	15	4	35	.	.	.	.	.	135
Total	69	3	9	15	4	153	.	.	.	.	.	253

TABLE 46 (Cont'd): Quantity of active ingredient used (kg)

	Brussels sprouts	Cabbage summer/autumn	Cabbage (other)	Calabrese	Cauli-flower	Turnip & swede	Peas	Broad Beans	Leeks	Carrots	Other veg.	ALL CROPS
FUNGICIDES												
Benomyl	.	.	12	3	.	.	.	.	.	.	.	15
Carbendazim	.	.	.	.	.	668	.	130	.	.	.	798
Chlorothalonil	310	.	.	518	72	182	658	399	39	.	.	2178
Fenpropimorph	.	.	.	.	.	.	.	.	231	.	.	231
Ferbam	.	.	.	.	.	.	.	.	38	.	.	38
Fosetyl-aluminium	.	.	.	133	.	.	.	.	.	.	.	133
Iprodione	296	57	81	14	.	243	1082	221	.	.	.	1994
Mancozeb	.	.	.	177	.	878	.	.	.	3085	.	4140
Maneb	.	.	.	.	.	.	.	.	245	.	.	245
Metalaxyl	46	.	24	97	11	36	.	.	6	643	.	863
Sulphur	.	.	.	.	.	909	.	.	.	.	.	909
Thiophanate-methyl	34	.	.	.	.	.	.	.	.	.	.	34
Thiram	.	.	122	.	.	.	.	.	.	.	.	122
Triadimenol	36	2	.	.	.	61	.	.	.	.	.	99
Tridemorph	.	.	.	.	.	111	.	.	.	.	.	111
Zineb	.	.	.	.	.	.	.	.	38	.	.	38
Total	722	59	239	942	83	3088	1740	750	597	3728	.	11948
HERBICIDES												
Alloxydim-sodium	.	.	.	.	.	4	.	.	11	199	.	214
Benazolin	.	.	.	.	.	27	.	.	.	.	.	27
Bentazone	.	.	.	.	.	.	159	.	.	.	.	159
Chlorbufam	.	.	.	.	.	.	.	.	25	.	.	25
Chloridazon	.	.	.	.	.	.	.	.	31	.	.	31
Chlorpropham	.	.	.	.	.	.	.	.	19	91	.	110
Chlorthal-dimethyl	.	113	53	1349	.	43	.	.	547	.	110	2215
Clopyralid	.	.	.	.	.	5	.	.	2	.	.	7
Cyanazine	.	.	.	.	.	.	4430	506	20	.	.	4956
Desmetryne	.	.	4	.	.	.	.	.	.	.	.	4
Diquat	.	.	.	.	.	.	.	.	.	17	.	17

TABLE 46 (Cont'd): Quantity of active ingredient used (kg)

	Brussels sprouts	Cabbage summer/ autumn	Cabbage (other)	Calabrese	Cauli- flower	Turnip & swede	Peas	Broad Beans	Leeks	Carrots	Other veg.	All CROPS
Ethofumesate	126	126
Fenuron	5	.	.	5
Fluazifop-P-butyl	32	.	32
Glyphosate	.	.	.	49	42	141	161	.	4	119	61	577
Ioxynil	34	.	.	34
Linuron	1382	1	1383
MCPA	16	.	.	.	.	16
MCPB	211	.	.	.	.	211
Metamitron	285	285
Metazachlor	82	96	28	116	92	511	.	.	.	.	.	925
Metoxuron	3901	4	3905
Paraquat	.	.	4	9	.	.	.	.	56	36	18	123
Pendimethalin	146	.	146
Pentachlor	181	.	181
Phenmedipham	45	45
Prometryne	10	439	2	451
Propachlor	444	599	478	4246	1292	1737	.	.	565	.	76	9437
Quizalofop-ethyl	.	2	.	4	.	6	.	.	.	.	.	12
Sethoxydim	18	.	18
Simazine	5	106	.	.	.	111
TCA-sodium	166	.	.	.	.	.	166
Tebutam	.	.	.	202	.	341	.	.	.	.	.	543
Terbutylazine	430	90	.	.	.	520
Terbutryn	1505	221	.	.	.	1726
Trietazine	538	11	.	.	.	549
Trifluralin	265	207	246	961	515	1313	.	.	38	.	1	3546
Total	791	1017	813	6936	1941	4294	7455	934	1367	6561	729	32838

TABLE 47: Estimated area (spray ha) treated with the 25 most extensively used active ingredients, on all the vegetable crops surveyed, excluding seed dressings.

1	Cyanazine	3935
2	Chlorothalonil	3640
3	Demeton-S-methyl	3397
4	Trifluralin	3282
5	Iprodione	2846
6	Chlorfenvinphos	2748
7	Carbofuran	2622
8	Propachlor	2343
9	Fenvalerate	2312
10	Metalaxyl	2255
11	Terbutryn	2058
12	Pirimicarb	1951
13	Deltamethrin	1788
14	Mancozeb	1729
15	Dimethoate	1675
16	Linuron	1528
17	Carbendazim	1451
18	Terbuthylazine	1240
19	Metoxuron	1113
20	Triazophos	1087
21	Metazachlor	871
22	Trietazine	849
23	Methiocarb	797
24	Triadimenol	786
25	Chlorpyrifos	539

TABLE 48: Estimated amount of (kg) the 25 active ingredients most used, by weight, on all the vegetable crops surveyed, excluding seed dressings.

1	Propachlor	9437
2	Cyanazine	4956
3	Mancozeb	4140
4	Metoxuron	3905
5	Trifluralin	3546
6	Chlorfenvinphos	3395
7	Carbofuran	3263
8	Chlorthal-dimethyl	2215
9	Chlorthalonil	2178
10	Iprodione	1994
11	Terbutryn	1726
12	Linuron	1383
13	Metazachlor	925
14	Sulphur	909
15	Triazophos	865
16	Metalaxyl	925
17	Carbendazim	798
18	Dimethoate	772
19	Demeton-S-methyl	711
20	Phorate	597
21	Glyphosate	577
22	Trietazine	549
23	Tebutam	543
24	Terbuthylazine	520
25	Prometryne	451

TABLE 49: Areas of vegetable crops treated with grouped pesticides in each region (spray hectares of formulations)

	Highlands & Islands	Caith & Orkney	Moray Firth	Aber- deen	Angus	East Fife	Lothian	Central Lowlands	Tweed Valley	Southern Uplands	Solway	Scotland
Insecticides/mollusc.	77	0	361	2123	4030	7506	3127	338	4462	161	0	21195
Fungicides	24	0	0	3990	1198	3376	672	362	2236	0	0	11858
Herbicides	62	0	1471	922	5786	5956	1829	1151	1683	48	0	5712
Seed dressings	0	0	0	0	3330	0	549	112	1682	40	0	5712
Any pesticides	163	0	1832	7035	14345	16838	5188	1963	10063	249	0	57675

No vegetable crops were surveyed in Caithness/Orkney and Solway regions.

TABLE 50: Comparison of pesticide usage on vegetables for human consumption 1977, 1982 and 1989 - spray ha. of active ingredients and amount used kg.

	1977		1982		1989	
	ha	kg	ha	kg	ha	kg
INSECTICIDES						
Pyrethroids	-	-	1,259	36	4,890	105
Systemic organophosphates	2,322	1,477	2,237	1,486	5,582	2,111
Non-systemic organophosphates	1,299	2,932	2,401	914	4,860	5,188
Organochlorines	2,597	1,725	318	300	*	*
Carbamates	674	830	1,944	1,472	4,699	3,614
Others	40	1	24	2	33	33
Total insecticides	6,932	6,965	8,358	4,328	20,064	11,052
MOLLUSCICIDES						
	*	*	674	148	1,048	253
SEED TREATMENTS						
	6,435	654	8,881	13,239	6,918**	598**
FUNGICIDES						
	220	359	2,614	2,180	14,279	11,948
HERBICIDES						
	10,791	25,590	12,192	18,495	21,640	31,838
Area grown	8,214	7,928				9,313

** = These figures exclude 1,342 ha where the seed dressing was not known

* = None recorded

