PESTICIDE USAGE IN SCOTLAND

SURVEY REPORT 75

EDIBLE PROTECTED CROPS 1987

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SUMMARY

This was the third survey of pesticide usage on protected edible crops in Scotland. The quantities and areas treated of formulations and active ingredients of pesticides used were estimated from quantitative data supplied by 122 growers. Of the 5 crop groups which can be compared with the 1981 survey (Tomato, lettuce, vegetables, herb and brassica seedlings and cucumber) there has been an overall 41% decrease in crop areas. Pesticide usage of all categories has changed substantially.

Insecticide usage decreased in area by 20% and the quantity of active ingredients used fell by 79% due to a marked reduction in carbamate and organochlorine use. The main reasons for the more widespread use of insecticides were for the control of cabbage root fly and aphids on brassica seedlings, a crop which, against the general trend increased in area 4-fold.

Fungicide spray area increased by 16% and the quantity of active ingredients used doubled. The major increase was on brassica seedlings against mildew. Dichlofluanid displaced iprodione as the principal fungicide.

Overall herbicide spray area increased by 2.4 times and the quantity of active ingredient used by 2.3 times. As in 1981 propyzamide was the most widely used herbicide which was mainly used to control chickweed in the lettuce crop.

Soil sterilant use declined by 43% in terms of area treated and 46% by quantity of active ingredients used. As previously, dazomet followed by methyl bromide were the main chemicals used and in both surveys head the ranking for quantity of active ingredient used.

INTRODUCTION

This was the third survey of pesticide usage on protected edible crops in Scotland. It follows similar reports for 1981 (Reference 1) and 1976 (Reference 2) which also covered non-edible crops. Crops surveyed included tomato, lettuce, brassica seedlings, cucumber, strawberries, vegetables and herbs.

Since the last survey the structure of the industry had changed substantially resulting in fewer of the smaller holdings.

DEFINITIONS AND NOTES

Basic area (or basic square m) 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 square m) 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 two compounds.

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

METHOD

Using the 1986 Agricultural Census (Reference 3), a sample was drawn representing the whole of Scotland. The country was divided into 11 land-use regions (Fig 1, Reference 5). The sample was stratified by land use region and by holding size (Table 1). Sampling fractions within size groups were based on area of crops grown rather than number of holdings, so that smaller size groups would not dominate the sample. The survey regions used differ from the 1981 survey, which were based on 9 local authority regions.

The information presented in this report was collected almost entirely by interviews with the growers during pre-arranged visits to their holdings. In total, 122 holdings supplied data on their pesticide usage.

The survey period was the calendar year 1987 and included preparatory treatments to growing media and structural fabric carried out at the end of the preceding year.

For all crops the sample data were raised to give national estimates of pesticide usage. For tomatoes raising factors were based on the area returned in the 1987 Agricultural Census (Reference 4). The remaining crops not counted individually in the census were raised proportionately to the areas in the sample.

PESTICIDE USAGE

The surveyed area of each crop is shown in Table 2 together with the census figure for the area of tomatoes grown.

The proportions of crops not treated with pesticide groups are given in Table 3.

For the bulk of this text pesticide usage is discussed by actual survey crop grouping. However for the comparison with the previous survey (Tables 59-62) vegetables, herbs and brassica seedlings were amalgamated to give a set of data comparable with the earlier survey. Within these comparison tables there is an approximation as the 1981 kg's of active ingredients have been apportioned to individual crops according to area grown. This takes no account of application rate. In the earlier survey formulation data were not presented, so in this text, spray area comparisons have been made for spray square m of active ingredient.

TOMATO

Since the previous survey the area grown had decreased from 302,959 to 125,565 square m, a 59% reduction.

Insecticides and molluscicides (Tables 4, 49)

The proportion of the crop treated had decreased from 63% in 1981 to 57% in 1987, and the total spray area decreased by 30% to 410,652 spray square m of active ingredients.

The main insecticide use was against aphids and whitefly. A wide range of chemical groups was encountered of which 45% was pyrethroids, some of which were used up to 10 times per crop (Table 8). Deltamethrin (23% of total spray area) was the most widely used. Red spider mite control accounted for the bulk of the remainder of insecticide usage for which fenbutatin oxide (17%) and cyhexatin (14%) were used. In 1981

organochlorines and carbamates predominated and were mainly used against red spider mite.

The tomato crop was the only one on which biological control was recorded. Bacillus thuringiensis, on 1,785 spray square m, was used against caterpillars and Encarsia formosa, on 1,396 square m, against white fly. No Phytoseiulus persimilis was found unlike in 1981 when 14,122 square m were treated against red spider mite and Bacillus thuringiensis was applied to 11,648 square m to control tomato moth.

Trace quantities only of molluscicides were found, in 1981 none was recorded.

Fungicides (Table 5, 50)

The proportion of crop treated increased from 67% to 82% so that despite a 59% reduction in crop area grown, spray area only decreased by 36% to 706,501 spray square m of active ingredient.

Seventy-eight per cent of the fungicide use was for 'unspecified reasons', in other words for prophylaxis. Control of Botrytis accounted for virtually all of the remainder.

Iprodione, as in 1981, was the most widely used fungicide accounting for 40% of the spray area of active ingredients (60% in 1981). Dichlofluanid was, as in 1981, the second most used fungicide representing 22% of the spray area of active ingredients (9% in 1981).

Whilst repeated use was not as great as for insecticides, a small proportion of the fungicides were used up to 10 times per crop (table 9).

Herbicides (Tables 6, 51)

A small quantity of paraquat was recorded for general weed control, similar to the situation in 1981.

Disinfectants, growth regulators, smokes and soil sterilants (Tables 7, 52)

Formaldehyde was used in dilute solution as a structural wash on 9% of the crop area. One growth regulator 2-chloroethylphosphonic acid (6% crop treated) and a trace quantity of gamma-HCH/tecnazene smoke were recorded. The soil sterilants methyl bromide (9% of crop treated) and dazomet (5% of crop treated) were the main chemicals used, other usages being relatively minor. Since 1981 there had been a 77% reduction in use of chemical soil sterilants to 19,561 spray square m of active ingredients. The use of steam had declined by 97% to 1,151 square m.

LETTUCE

The decline of protected lettuce has paralleled that of tomatoes, dropping from 246,599 square m in 1981 to an estimated 118,737 square m a 52% reduction.

Insecticides and molluscicides (Tables 10, 49)

The proportion of the crop treated has increased from 57% to 71% so that usage only fell to 184,007 spray square m of active ingredient despite a halving of crop area.

Insecticide use was mainly against aphids for which pirimicarb accounted for 50% of the total usage followed by heptenophos at 9%. Permethrin against caterpillars was 20% of insecticide usage and chlorpyrifos for leather jacket control, 3%. In 1981 pirimicarb was the main insecticide followed by equal proportions of demeton-S-methyl, dimethoate and parathion.

Metaldehyde was used on 12% of the crop for slug control. In 1981 metaldehyde, (3% of crop treated) and methiocarb (3%) were both recorded.

Fungicides (Tables 11, 50)

Fungicide usage had increased to 96% of crop treated from 80% in 1981.

The total spray area, 590,618 spray square m of active ingredients, had increased slightly since 1981 while the crop area had declined by 52%.

Prophylactic spraying accounted for 53% of the spray area, followed by mildew (37%), Botrytis (7%) and Rhizoctonia (3%).

There were 3 main fungicides used in nearly equal proportions, vinclozolin 20% of the spray area, zineb (19%) and iprodione (18%). In 1981 iprodione was 42% of usage followed by metalaxyl (18%) and mancozeb (14%).

Herbicides (Tables 12, 51)

The proportion of usage had increased from 14% of the crop treated in 1981 to 50% of crop treated in 1987. The magnitude of this increase has meant that even with a marked reduction in crop area, the total spray area of active ingredients increased by 4.4 times to 66,475 spray square m.

The main reason for use was against chickweed (52% of the spray area), followed by general weed control (38%) and ground clearance (9%). In 1981 individual reasons for use were not recorded.

The main herbicides used were propyzamide, (52% of spray area) and chlorpropham (40)%.

Disinfectants, growth regulators, smokes and soil sterilants (Tables 13, 52)

Dazomet (25% crop treated) was the only significant soil sterilant recorded. Formaldehyde was used in dilute solution as a structural wash on 9% of the crop area. No usage of either growth regulators or smokes was found.

Since 1981 usage of chemical soil sterilants had increased 6-fold to 29,653 spray square m of active ingredient, steam remained very little used.

BRASSICA SEEDLINGS

There was a very marked increase in the area of this crop from 16,651 square m in 1981 (a figure for vegetables, herbs and brassicas) to 68,876 square m in 1987 (a figure for the brassicas only).

Insecticides and molluscicides (Tables 15, 49)

The proportion of crop treated went up from 17% to 80% in 1987, a 19-fold increase in spray area to 59,916 spray square m of active ingredients (using the figure for vegetables, leeks and brassica seedlings). Most of the insecticide use was against cabbage root fly, the bulk of which was chlorpyrifos,which amounted to 82% of total insecticide spray area. No specific reasons for use were given in 1981 so no comparison can be made.

Metaldehyde was used on 1% of the crop for slug control. No molluscicide usage was recorded in 1981.

Fungicides (Tables 16, 50)

The proportion of crop treated with fungicides went up from 39% to 98% 1981-87. The spray area of active ingredients increased 36-fold to 444,236 square m (vegetables, herbs and brassica seedlings).

Seven different diseases were specified of which mildew (on 70% of the spray area), Rhizoctonia (11%) and Botrytis (4%) were the commonest. Unspecified reasons accounted for 14% of the spray area.

Dichlofluanid and propamocarb hydrochloride were each used on 95% of the crop. In 1981 quintozene (29% of crop area treated) was the most widely used fungicide whereas in this survey it was used on only small areas.

Herbicides

No herbicide usage was recorded. In 1981 aziprotryn was used on 15% of the crop followed by cyanazine (7%).

Soil sterilants (Tables 18, 52)

A very small quantity of dazomet only was found. In 1981 23% of the crop was treated.

CUCUMBER

The crop area had increased 3-fold from 3,970 square m to 11,669 square m.

Insecticides and molluscicides (Tables 20, 49)

The proportion of the crop treated had decreased from 98% to 89% and the total spray area decreased by 32% to 52,386 square m of active ingredients.

Most of the insecticide usage was against aphids and whitefly for which cypermethrin (58% of the total spray area) was used. Of the balance, thrips were controlled by deltamethrin and red spider mite by fenbutatin oxide, each accounting for 20% of the total spray area.

Metaldehyde was used against slugs on less than 0.5% of the crop.

Fungicides (Tables 21, 50)

The proportion of crop treated (96%) had changed little from the 1981 survey (97%). Spray area increased 7-fold to 113,442 square m of active ingredients.

Wilt was the only disease specified and it accounted for 9% of the total spray area. The rest was all used for unspecified reasons.

Iprodione was the most widely used fungicide (36% of total spray area) followed by dichlofluanid and vinclozolin each used on 27% of the total spray area.

Herbicides

No herbicide usage was recorded in either the 1981 or 1987 surveys.

Soil sterilants and disinfectants (Tables 23, 52)

The soil sterilant dazomet was used on 1% of the crop area and a tar oils based disinfectant (Jeyes fluid) used on less than 1%. No soil sterilants or disinfectants were recorded in 1981.

OTHER SEEDLINGS

This grouping mainly comprised tomato seedlings (2,194 square m) and lettuce seedlings (1,625 square m). In 1981 all edible seedling data was amalgamated.

Insecticides and molluscicides (Tables 25, 49)

The proportion of the crop treated was 39%. Half the insecticide use was for unspecified reasons and the other half for aphid and white fly control.

Permethrin (on 69% of total spray area) was the main insecticide used, followed by resmethrin (25% of total spray area). No heptenophos was recorded despite its widespread use on mature lettuce.

Metaldehyde was used on 2% of the crop.

Fungicides (Tables 26, 50)

The proportion of the crop treated was 66%. Botrytis (71% total spray area) and downy mildew (19% total spray area) were the main reasons for use and iprodione and tolclofos-methyl respectively the chemicals used.

Herbicides

None were recorded

Soil sterilants

Dazomet was used on 5% of the crop

STRAWBERRIES

The crop area was 18,949 square m. No comparable data exists for the 1981 survey.

Insecticides (Tables 30, 49)

All the crop was treated with insecticides. Their use was mostly for unspecified prophylactic reasons. Aphid and white fly control accounted for 7% of usage.

Insecticides and molluscicides (Tables 40, 49)

The proportion of the crop treated was 52%. All insecticide usage was against aphids (82% total spray area). The main insecticides used were permethrin (on 44% total spray area) and pirimicarb (31%).

Methiocarb was used on 18% of the total spray area.

Fungicides (Tables 41, 50)

The proportion of the crop treated was 40% and Botrytis was the only disease specified. Benomyl (on 47% of the total spray area), carbendazim (32%) and iprodione (21%) were used to control it.

Herbicides (Tables 42, 51)

The proportion of the crop treated was 30% and all was used for pre-emergence weed control. Prometryn (97% of the total spray area) and glyphosate (3%) were the herbicides used.

Soil sterilants (Tables 43, 52)

The proportion of crop treated with a soil sterilant was 13%. Dazomet was the only chemical used.

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Malathion (80% of total spray area) was the main insecticide used followed by permethrin (8% of total spray area).

No molluscicide use was found.

Fungicides (Tables 31, 50)

Fungicides were used on 79% of the crop. No diseases were specified. Iprodione (89% of the total spray area), dichlofluanid (5%) and vinclozolin (5%) were the chemicals used.

Herbicides

No herbicide usage was found

Soil sterilants (Tables 33, 52)

Dazomet was used on less than 0.5% of the crop area.

MIXED VEGETABLES

This group included celery, choisam, courgettes, french beans, leeks and pakchoi.

The area of the crops grown amounted to 13,152 square m. No comparable data exists for 1981 as this category was amalgamated with herbs and brassicas in that survey.

Insecticides and molluscicides (Tables 35, 49)

The proportion of the crop treated was 17%, a total spray area of 7,853 square m.

All the insecticide usage was against aphids and whitefly (70% of total spray area). Permethrin (37% of total spray area), cypermethrin (20%) and dimethoate (13%) were the insecticides used.

Methiocarb (30% of total spray area) was used for slug control.

Fungicides (Tables 36, 50)

The proportion of the crop treated was 5%. The one reason specified was Botrytis (93% of total spray area) and iprodione the chemical used to treat it.

Herbicides (Tables 37, 51)

The proportion of the crop treated with herbicides was 54%. All the herbicide used was for pre-planting ground clearance. Paraquat and propachlor were the only chemicals used, each on 34% of the crop.

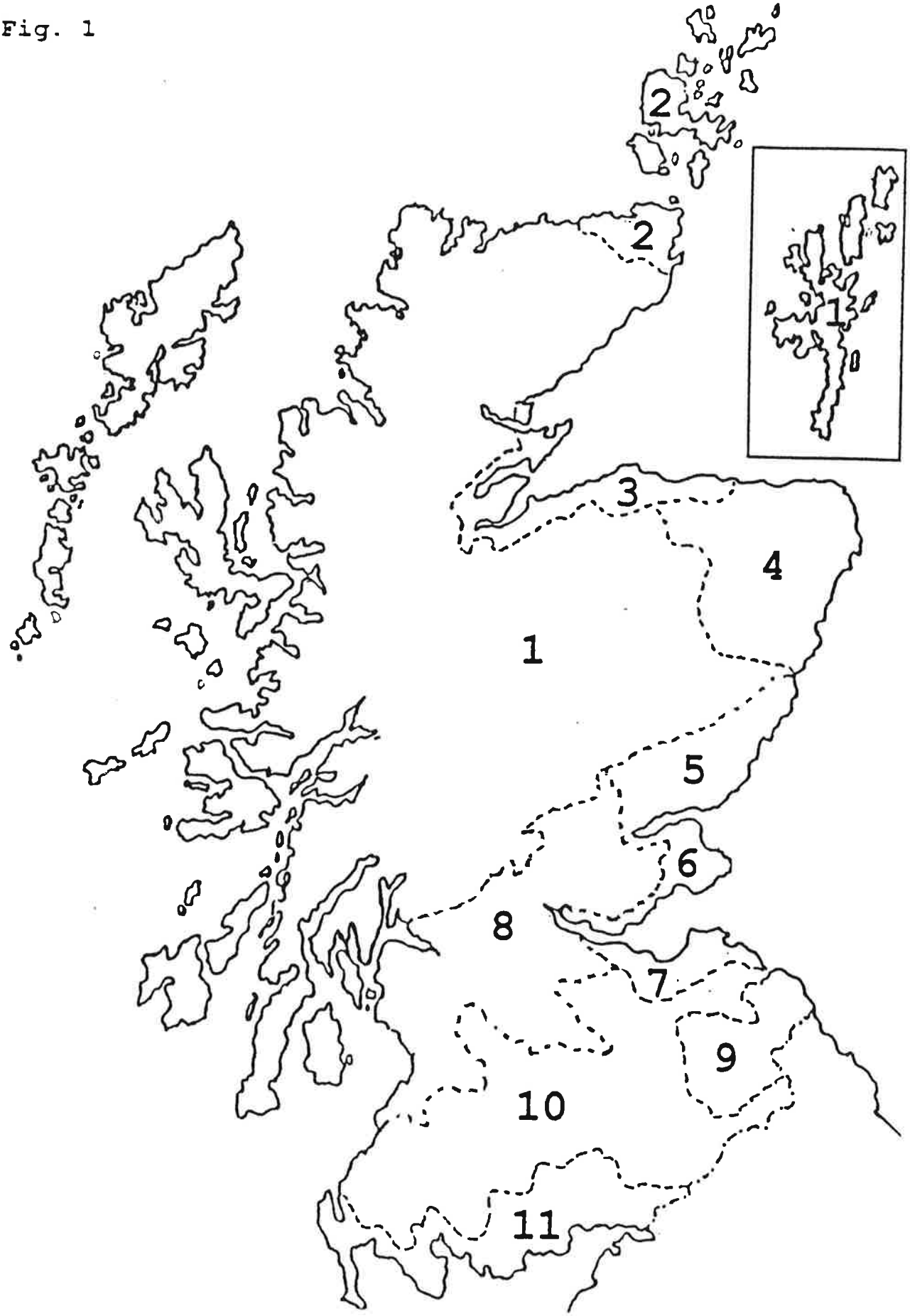
Disinfectants and soil sterilants (Tables 38, 52)

Dazomet was used on 36% of the crop area. Tar oils (Jeyes fluid) were used as a disinfectant on 2% of the crop area.

HERBS

The crop area was 488 square m. In the 1981 survey these crops were amalgamated with vegetables and brassicas.

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

	Highlands and Islands	Caithness and Orkney	Moray Firth	Aberdeen	Angus	East Fife	Lothian	Central Lowland	Tweed Valley	Southern Uplands	Solway	Scotland
0-99	0	0	2	0	2	0	0	0	0	2	0	6
100-999	3	2	6	8	5	4	4	18	3	1	3	57
1000-4999	1	0	4	1	3	3	8	28	0	1	2	51
5000-9999	0	0	0	1	0	0	0	5	0	0	0	6
10000+	0	0	0	0	0	0	0	2	0	0	0	2
All	4	2	12	10	10	7	12	53	3	4	5	122

TABLE 2 Area of crops in sample

	Surveyed area (square m)	Census area (square m)
Tomato	116200	125565
Lettuce	108737	.
Brassica seedlings	58508	.
Cucumber	10287	.
Other seedlings	4014	.
Strawberries	2101	.
Vegetables	2064	.
Herbs	496	.
All crops	302404	.

TABLE 3 Proportions of crop grown not treated with pesticides (%)

	Tomato	Lettuce	Brassica seedlings	Cucumber	Other seedlings	Strawberries	Mixed Vegetables	Herbs
Insecticides molluscicides, etc	43	29	20	11	61	0	83	48
Fungicides	18	4	2	4	34	21	95	60
Herbicides	100	50	100	100	100	100	46	70
Growth regulators	94	100	100	100	100	100	100	100
Other pesticides	75	75	100	99	94	100	62	87
Any pesticides	5	3	2	3	14	0	46	13

TABLE 4 Tomatoes: usage of insecticides, molluscicides and nematicides, the reasons for their use (spray square m of formulations) and the percentage of crop treated.

	Aphids/ whitefly	Caterpillar	Nematodes	Red spider mite	Slugs	Thrips	Unspecified	Total spray area	% of crop treated
ORGANOCHLORINES									
Dicofol	.	.	.	841	.	.	.	841	*
Dicofol/tetradifon	.	.	.	1642	.	.	.	1642	1
Gamma-HCH	3095	.	.	.	.	.	1542	4637	2
PYRETHROIDS									
Cypermethrin	13961	.	.	.	.	.	.	13961	1
Deltamethrin	85548	.	.	.	.	.	.	85548	5
Permethrin	18680	4250	.	.	.	.	712	23642	8
Pyrethrins/resmethrin	31878	.	.	.	.	.	.	31878	4
Resmethrin	11157	.	.	.	.	.	.	11157	2
SYSTEMIC ORGANOPHOSPHATES									
Dimethoate	12683	.	.	.	.	.	.	12683	5
Heptenophos	3755	.	.	.	.	.	.	3755	*
Heptenphos/permethrin	236	.	.	.	.	.	.	236	*
NON-SYSTEMIC ORGANOPHOSPHATES									
Malathion	14055	947	.	.	.	.	265	15266	6
Pirimiphos-methyl	8377	.	.	.	.	.	.	8377	1
CARBAMATES									
Aldicarb	244	.	.	.	.	.	2125	2369	2
Oxamyl	.	.	.	1063	.	.	475	1538	2
Pirimicarb	34065	.	.	.	.	.	.	34065	27
Propoxur	504	.	.	.	.	.	.	504	*
OTHER INSECTICIDES									
Cyhexatin	.	.	.	53000	.	.	.	53000	36
Fenbutatin oxide	.	.	.	63764	.	.	.	63764	25
Nicotine	246	.	.	.	.	3755	.	4001	1
MOLLUSCICIDES									
Metaldehyde	.	.	.	.	569	.	.	569	*
Methiocarb	.	.	.	.	15	.	.	15	*
UNSPECIFIED CHEMICALS									
Insecticide	88	.	.	.	.	.	.	88	*
Nematicide	.	.	178	.	.	.	.	178	*
BIOLOGICAL AGENTS									
Bacillus thuringiensis	.	1785	.	.	.	.	.	1785	1
Encarsia formosa	1396	.	.	.	.	.	.	1396	1
Total spray area	239967	6982	178	120310	584	3755	5118	376893	.

TABLE 5 Tomatoes: usage of fungicides, the reasons for their use (spray square m of formulations) and the percentage of the crops treated.

	Botrytis	Downy mildew	Wilts	Unspecified	Total spray area	% of crop treated
Benomyl	73730	.	.	20821	94551	22
Captan	0	121	.	0	121	*
Creosote	433	.	.	0	433	*
Dichlofluanid	20887	.	.	133310	154197	41
Etridiazole	0	.	.	33053	33053	18
Iodophor/thiabendazole	0	.	.	1558	1558	1
Iprodione	36653		187	246697	283537	53
Propamocarb hydrochloride	0	.	.	12901	12901	7
Triforine	0	.	.	131	131	*
Vinclozolin	24564	.	.	99897	124461	34
Total spray area	156267	121	187	548368	704944	.

TABLE 6 Tomatoes: usage of herbicides, the reasons for their use (spray square m of formulations) and the percentage of the crop treated.

	General weed control	Total spray area	% of crop treated
Paraquat	69	69	*
Total spray area	69	69	.

TABLE 7 Tomatoes: usage of disinfectants, growth regulators, smokes and soil sterilants

	Disinfection	Growth regulator	Fungicide/ insecticide smoke	Soil sterilisation	Total treated area	% of crop treated
Formaldehyde	11293	.	.	.	11293	9
Tar oils	94	.	.	.	94	*
2-chloroethylphosphonic acid	.	6922	.	.	6922	6
Gamma-HCH/tecnazene	.	.	356	.	356	*
Dazomet	.	.	.	5846	5846	5
Metham-sodium	.	.	.	1707	1707	1
Methyl bromide	.	.	.	10853	10853	9
Steam	.	.	.	1155	1155	1
Total treated area	11387	6922	356	19561	38226	.

Crop area = 125,565 square m

* = less than 0.5%

TABLE 8 Repeated use of pesticides on tomatoes (percentage of basic area treated one or more times)

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	Basic Area Sq m
INSECTICIDES											
Aldicarb	95	5	.	.	.	.	.	.	.	.	2247
Cyhexatin	84	16	.	.	.	.	.	.	.	.	45793
Cypermethrin	.	.	.	.	.	.	.	.	.	100	1396
Deltamethrin	3	.	.	.	1	.	.	.	.	96	6331
Dicofol	61	.	39	.	.	.	.	.	.	.	474
Dicofol/tetradifon	79	21	.	.	.	.	.	.	.	.	1352
Dimethoate	1	97	.	.	.	.	.	.	.	.	6238
Fenbutatin oxide	.	100	.	.	.	.	.	.	.	.	31882
Gamma-HCH	36	50	.	3	.	.	11	.	.	.	2079
Heptenophos	.	.	.	.	.	.	100	.	.	.	536
Heptenophos/permehtrin	.	100	.	.	.	.	.	.	.	.	118
Malathion	13	87	.	.	.	.	.	.	.	.	8034
Nicotine	31	.	.	.	.	.	69	.	.	.	783
Oxamyl	65	35	.	.	.	.	.	.	.	.	2376
Permethrin	.	93	1	2	.	.	.	3	.	1	10078
Pirimicarb	98	2	.	.	.	.	.	.	.	.	33498
Pirimiphos-methyl	.	.	.	.	.	100	.	.	.	.	1396
Propoxur	67	33	.	.	.	.	.	.	.	.	378
Pyrethrins/resmethrin	.	.	.	.	.	100	.	.	.	.	5313
Resmethrin	.	.	13	74	.	8	.	.	.	.	2615
Unspecified Insecticide	100	.	.	.	.	.	.	.	.	.	88
Unspecified Nematicide	100	.	.	.	.	.	.	.	.	.	178
BIOLOGICAL AGENTS											
Bacillus thuringiensis	100	.	.	.	.	.	.	.	.	.	1785
Encarsia formosa	100	.	.	.	.	.	.	.	.	.	1396
MOLLUSCICIDES											
Metaldehyde	100	.	.	.	.	.	.	.	.	.	569
Methiocarb	100	.	.	.	.	.	.	.	.	.	15

TABLE 9 Repeated use of pesticides on tomatoes (percentage of basic area treated one or more times)

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	Basic Area Sq m
FUNGICIDES											
Benomyl	64	10	3	.	.	.	.	.	.	22	28032
Captan	100	.	.	.	.	.	.	.	.	.	121
Creosote	100	.	.	.	.	.	.	.	.	.	433
Dichlofluanid	5	5	82	2	6	.	.	.	.	.	51492
Etridiazole	85	.	.	15	.	.	.	.	.	.	22973
Iodophor/thiabendazole	100	.	.	.	.	.	.	.	.	.	1558
Iprodione	10	6	4	51	26	.	.	.	.	4	66573
Propamocarb hydrochloride	58	42	.	.	.	.	.	.	.	.	9108
Triforine	100	.	.	.	.	.	.	.	.	.	131
Vinclozolin	.	8	91	.	.	1	.	.	.	.	42207
HERBICIDES											
Paraquat	100	.	.	.	.	.	.	.	.	.	69
DISINFECTANTS, GROWTH REGULATORS, SMOKES AND SOIL STERILANTS											
Formaldehyde	100	.	.	.	.	.	.	.	.	.	11293
Jeyes fluid	100	.	.	.	.	.	.	.	.	.	94
2-chloroethyl phosphonic acid	100	.	.	.	.	.	.	.	.	.	6922
Gamma-HCH/tecnazene	.	100	.	.	.	.	.	.	.	.	178
Dazomet	100	.	.	.	.	.	.	.	.	.	5846
Metham-sodium	100	.	.	.	.	.	.	.	.	.	1707
Methyl bromide	100	.	.	.	.	.	.	.	.	.	10853
Steam	100	.	.	.	.	.	.	.	.	.	1155

TABLE 10 Lettuce: usage of insecticides and molluscicides, the reasons for their use (spray square m of formulations) and percentage of crop treated.

	Aphids/ whitefly	Caterpillars	Leather jackets	Slugs	Total spray area	% of crop treated
PYRETHROIDS						
Permethrin	10071	37189	.	.	47260	40
Pyrethrins/resmethrin	374	.	.	.	374	*
SYSTEMIC ORGANOPHOSPHATES						
Demeton-S-methyl	1040	.	.	.	1040	1
Heptenophos	17164	.	.	.	17164	4
Heptenophos/permethrin	736	.	.	.	736	*
NON-SYSTEMIC ORGANOPHOSPHATES						
Chlorpyrifos	.	.	5250	.	5250	4
CARBAMATES						
Pirimicarb	92218				92218	58
MOLLUSCICIDES						
Metaldehyde	.	.	.	19230	19230	12
Total spray area	121602	37189	5250	19230	183271	.

TABLE 11 Lettuce: usage of fungicides, the reasons for their use (spray square m of formulations) and percentage of crop treated.

	Botrytis	Mildew	Rhizoctonia	Unspecified	Total spray area	% of crop treated
Benomyl	8608	5404	.	55667	69680	26
Dichlofluanid	18	.	.	21774	21792	5
Iprodione	13223	.	4200	78698	96120	31
Mancozeb/metalaxyl	.	39289	.	30284	69573	25
Quintozene			420	.	420	*
Tecnazene	78	.	.	.	78	*
Tolclofos-methyl	4250		12726	45642	62619	53
Vinclozolin	11210	48875	.	42504	102590	49
Zineb	.	97753	.	420	98173	42
Total spray area	37387	191321	17346	274989	521044	

TABLE 12 Lettuce: usage of herbicides, the reasons for their use (spray square m of formulations) and percentage of crop treated.

	Chickweed	Clear ground	General weed control	Total spray area	% of crop treated
Chlorpropham	5796	2125	18594	26516	22
Paraquat	.	3971	.	3971	3
Propyzamide	27730	.	6907	34637	29
Unspecified herbicide	1351	.	.	1351	1
Total spray area	34878	6096	25501	66475	.

TABLE 13 Lettuce: usage of disinfectants and soil sterilants

	Disinfection	Soil sterilisation	Total spray area	% of crop treated
Dazomet	.	29545	29545	25
Formaldehyde	10626	.	10626	9
Steam	.	108	108	*
Total spray area	10626	29653	40279	.

Crop area = 118,737 square m

* = less than 0.5%

TABLE 14 Repeated use of pesticides on lettuce (percentage of the basic area treated one or more times)

	X1	X2	X3	X4	X5	X6	Basic Area Sq m
INSECTICIDES							
Chlorpyrifos	100	.	.	.	.	.	5250
Demeton-S-methyl	100	.	.	.	.	.	1040
Heptenophos	.	50	.	.	.	50	4291
Heptenophos/permethrin	.	100	.	.	.	.	368
Permethrin	100	.	.	.	.	.	47259
Pirimicarb	83	6	5	5	.	.	69385
Pyrethrins/resmethrin	.	100	.	.	.	.	187
MOLLUSCICIDES							
Metaldehyde	62	38	.	.	.	.	13980
FUNGICIDES							
Benomyl	8	55	37	.	.	.	30518
Dichlofluanid	.	1	.	98	.	.	5501
Iprodione	17	22	49	12	1	.	37116
Macozeb/metalaxyl	3	71	13	13	.	.	29728
Quintozene	100	.	.	.	.	.	420
Tecnazene	100	.	.	.	.	.	78
Tolclofos-methyl	100	.	.	.	.	.	62619
Vinclozolin	44	34	22	.	.	.	57657
Zineb-poly complex	1	99	.	.	.	.	49296
HERBICIDES							
Chlorpropham	100	.	.	.	.	.	26516
Paraquat	100	.	.	.	.	.	3971
Propyzamide	100	.	.	.	.	.	34637
Unspecified Herbicide	100	.	.	.	.	.	1351
DISINFECTANTS & SOIL STERILANTS							
Dazomet	100	.	.	.	.	.	29545
Formaldehyde	100	.	.	.	.	.	10626
Steam	100	.	.	.	.	.	108

TABLE 15 Brassica seedlings: usage of insecticides and molluscicides, the reasons for their use (spray square m of formulations) and the percentage of crop treated.

	Aphids/ whitefly	Cabbage Root Fly	Slugs	Total Spray Area	% of crop treated
PYRETHROIDS					
Permethrin	2909	.	.	2909	1
NON-SYSTEMIC ORGANOPHOSPHATES					
Chlorfenvinphos	.	27	.	27	*
Chlorpyrifos	.	48883	.	48883	71
Fonofos	.	4249	.	4249	6
Malathion	1848	.	.	1848	1
MOLLUSCICIDE					
Metaldehyde	.	.	1382	1382	1
Total spray area	4757	53159	1382	59298	.

TABLE 16 Brassica seedlings: usage of fungicides, the reasons for their use (spray sq m of formulations) and the percentage of the crop treated.

	Alternaria	Botrytis	Blackleg	Downy Mildew	Mildew	Phytopthora	Rhizoctonia	Unspecified	Total Spray Area	% of crop treated
Benomyl	.	.	.	.	.	.	.	158	158	*
Dichlofluanid	.	.	.	6755	293296	.	.	52116	325167	95
Etridiazole	.	.	.	.	.	.	.	121	121	*
Iprodione	1121	2909	.	.	.	.	.	961	4992	3
Propamocarb hydrochloride	.	.	106	.	12748	561	48883	3487	65784	95
Quintozene	.	.	.	.	.	.	.	158	158	*
Tolclofos-methyl	.	12748	.	.	.	561	.	3476	16785	24
Total spray area	1121	15658	106	6755	306044	1121	48883	60476	440165	.

TABLE 17 Brassica seedlings: usage of herbicides

None used

TABLE 18 Brassica seedlings: usage of soil sterilants

	Soil sterilant	Total spray area	% of crop treated
Dazomet	11	11	*
Total spray area	11	11	

Crop area = 68,876 sq m
* = less than 0.5%

TABLE 19 Repeated use of pesticides on brassica seedlings - (percentage of the basic area treated one or more times)

	X1	X2	X3	X4	X5	X6	Basic Area Sq m
INSECTICIDES							
Chlorfenvinphos	100	.	.	.	.	.	27
Chlorpyrifos	100	.	.	.	.	.	48883
Fonofos	100	.	.	.	.	.	4249
Malathion	.	100	.	.	.	.	924
Permethrin	.	.	.	.	100	.	584
MOLLUSCICIDES							
Metaldehyde	25	.	75	.	.	.	553
FUNGICIDES							
Benomyl	100	.	.	.	.	.	158
Dichlofluanid	.	1	13	10	2	74	65668
Etridiazole	100	.	.	.	.	.	121
Iprodione	46	27	.	.	28	.	2104
Propamocarb hydrochloride	100	.	.	.	.	.	65784
Quintozene	100	.	.	.	.	.	158
Tolclofos-methyl	100	.	.	.	.	.	16785
SOIL STERILANTS							
Dazomet	100	.	.	.	.	.	11

TABLE 20 Cucumbers: usage of insecticides and molluscicides, the reasons for their use (spray sq m of formulations) and the percentage of crop treated.

	Aphids/ whitefly	Red spider mite	Slugs	Thrips	Total spray area	% of crop treated
PYRETHROIDS						
Cypermethrin	30605	.	.	.	30605	87
Deltamethrin	.	.	.	10202	10202	87
SYSTEMIC ORGANOPHOSPHATES						
Dimethoate	468	.	.	.	468	1
Heptenophos	223	.	.	.	223	*
CARBAMATES						
Aldicarb	.	36	.	.	36	*
OTHER INSECTICIDES						
Fenbutatin oxide	.	10202	.	.	10202	87
Nicotine	427	.	.	223	650	1
MOLLUSCICIDE						
Metaldehyde	.	.	32	.	32	*
Total spray area	31723	10237	32	10424	52417	.

TABLE 21 Cucumbers: usage of fungicides, the reasons for their use (spray sq m of formulations) and the percentage of the crop treated.

	Wilts	Unspecified	Total spray area	% of crop treated
Carbendazim	10202	.	10202	87
Dichlofluanid	.	30763	30763	88
Etridiazole	.	851	851	7
Iodophor thiabendazole	.	28	28	*
Iprodione	.	40965	40965	88
Vinclozolin	.	30605	30605	87
Total spray area	10202	103211	113413	.

TABLE 22 Cucumbers: usage of herbicides

None found

TABLE 23 Cucumbers: usage of disinfectants and soil sterilants

	Disinfection	Soil sterilisation	Total spray area	% of crop treated
Dazomet	.	67	67	1
Tar oils	94	.	94	*
Total spray area	.	.	161	.

Crop area = 11,669 sq m

* = less than 0.5%

TABLE 24 Repeated use of pesticides on cucumber (percentage of basic area treated one or more times)

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	Basic Area Sq m
INSECTICIDES											
Aldicarb	100	.	.	.	.	.	.	.	.	.	36
Cypermethrin	.	100	.	.	.	.	.	.	.	.	10202
Deltamethrin	100	.	.	.	.	.	.	.	.	.	10202
Dimethoate	.	.	.	.	100	.	.	.	.	.	94
Fenbutatin oxide	100	.	.	.	.	.	.	.	.	.	10202
Heptenophos	.	.	.	.	.	.	100	.	.	.	32
Nicotine	.	.	.	.	.	.	47	.	.	53	67
MOLLUSCICIDES											
Metaldehyde	100	.	.	.	.	.	.	.	.	.	32
FUNGICIDES											
Carbendazim	100	.	.	.	.	.	.	.	.	.	10202
DISINFECTANTS & SOIL STERILANTS											
Dazomet	100	.	.	.	.	.	.	.	.	.	67
	100	.	.	.	.	.	.	.	.	.	94

TABLE 25 Other seedlings: usage of insecticides and molluscicides, the reasons for their use (spray sq m of formulations) and percentage of crop treated.

	Aphids/ whitefly	Slugs	Unspecified	Total spray area	% of crop treated
PYRETHROIDS					
Permethrin	6466	.	3759	10225	31
Resmethrin	.	.	3680	3689	5
CARBAMATES					
Pirimicarb	770			770	8
MOLLUSCICIDES					
Metaldehyde	.	108	.	108	2
Total spray area	7236	108	7439	14783	.

TABLE 26 Other seedlings: usage of fungicides, the reasons for their use (spray sq m of formulations) and percentage of crop treated.

	Alternaria	Botrytis	Downy mildew	Phytophthora	Unspecified	Total spray area	% of crop treated
Benomyl	.	.	.	.	37	37	1
Chlorothalonil	.	.	.	.	79	79	1
Dichlofluanid	.	.	.	.	62	62	1
Etridiazole	.	.	.	.	231	231	5
Fosetyl-aluminium	.	.	.	.	222	222	5
Iprodione	62	5819	.	.	18	5899	24
Propamocarb hydrochloride	.	.	.	31	.	31	1
Tolclofos-methyl	.	.	1558	31	.	1590	32
Total spray area	62	5819	1558	62	650	8153	.

TABLE 27 Other seedlings: usage of herbicides

None found

TABLE 28 Other seedlings: usage of soil sterilants

Soil sterilant	Total spray area	% of crop treated
Dazomet	267	267	5
Steam	18	18	*
Total spray area	285	285	

Crop area = 4,930 sq m

* = less than 0.5%

TABLE 29 Repeated use of pesticides on other seedlings (percentage of basic area treated one or more times)

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	Basic Area Sq m
INSECTICIDES											
Permethrin	.	.	2	.	76	7	.	.	.	15	1528
Pirimicarb	.	100	.	.	.	.	.	.	.	.	385
Resmethrin	.	.	.	.	.	.	.	.	.	100	230
MOLLUSCICIDES											
Methiocarb	100	.	.	.	.	.	.	.	.	.	108
FUNGICIDES											
Benomyl	100	.	.	.	.	.	.	.	.	.	37
Chlorothalonil	.	.	100	.	.	.	.	.	.	.	26
Dichlofluanid	.	100	.	.	.	.	.	.	.	.	31
Etridiazole	96	4	.	.	.	.	.	.	.	.	222
Fosetyl-aluminium	100	.	.	.	.	.	.	.	.	.	222
Iprodione	.	3	.	.	97	.	.	.	.	.	1204
Propamocarb hydrochloride	100	.	.	.	.	.	.	.	.	.	31
Tolclofos-methyl	100	.	.	.	.	.	.	.	.	.	1590
HERBICIDES											
None Found	.	.	.	.	.	.	.	.	.	.	.
SOIL STERILANTS											
Dazomet	100	.	.	.	.	.	.	.	.	.	267
Steam	.	100	.	.	.	.	.	.	.	.	9

TABLE 30 Strawberries: usage of insecticides, the reasons for their use (spray sq m of formulations) and percentage of crop treated.

	Aphids/ whitefly	Unspecified	Total spray area	% of crop treated
PYRETHROIDS				
Deltamethrin	.	92	92	*
Permethrin	.	2892	2892	8
NON-SYSTEMIC ORGANOPHOSPHATES				
Chlorpyrifos	.	1150	1150	6
Malathion	.	27420	27420	72
Pirimiphos-methyl	2551	.	2551	13
OTHER INSECTICIDES				
Nicotine	.	185	185	*
Total spray area	2551	31739	34291	.

TABLE 31 Strawberries: usage of fungicides, the reasons for their use (spray square m of formulations) and percentage of crop treated.

	Unspecified	Total spray area	% of crop treated
Benomyl	277	277	*
Dichlofluanid	2300	2300	6
Iprodione	41130	41130	72
Vinclozolin	2300	2300	6
Total spray area	46007	46007	

TABLE 32 Strawberries: usage of herbicides

None found

TABLE 33 Strawberries: usage of soil sterilants

	Soil sterilant	Total spray area	% of crop treated
Dazomet	92	92	*
Total spray area	92	92	

Crop area = 18,949 square m

* = less than 0.5%

TABLE 34 Repeated use of pesticides on strawberries (percentage of basic area treated one or more times)

	X1	X2	X3	Basic Area Sq m
INSECTICIDES				
Chlorpyrifos	100	.	.	1150
Deltamethrin	100	.	.	92
Malathion	.	100	.	13710
Nicotine	.	100	.	92
Permethrin	.	100	.	1446
Pirimiphos-methyl	100	.		2551
MOLLUSCICIDES				
None Found	.	.	.	.
FUNGICIDES				
Benomyl	.	.	100	92
Dichlofluanid	.	100	.	1150
Iprodione	.	.	100	13710
Vinclozolin	.	100	.	1150
HERBICIDES				
None Found	.	.	.	.
SOIL STERILANTS				
Dazomet	100	.	.	92

TABLE 35 Mixed Vegetables: usage of insecticides, molluscicides, the reasons for their use (spray square m of formulations) and the percentage of crop treated.

	Aphids/ whitefly	Slugs	Total spray area	% of crop treated
PYRETHROIDS				
Cypermethrin	1552	.	1552	4
Permethrin	2909	.	2909	5
SYSTEMIC ORGANOPHOSPHATES				
Dimethoate	1053	.	1053	2
MOLLUSCICIDES				
Methiocarb	.	2338	2338	6
Total spray area	5515	2338	7853	.

TABLE 36 Mixed Vegetables: usage of fungicides, the reasons for their use (spray square m of formulations and the percentage of crop treated.

	Botrytis	Insurance	Total spray area	% of crop treated
Benomyl	.	130	130	*
Etridiazole	.	29	29	*
Iprodione	2909	38	2947	5
Propamocarb hydrochloride	.	33	33	*
Total spray area	2909	230	3139	.

TABLE 37 Mixed Vegetables: usage of herbicides, the reasons for their use (spray square m of formulations) and the percentage of crop treated.

	Clear ground	Total spray area	% of crop treated
Paraquat	4249	4249	34
Propachlor	4249	4249	34
Total spray area	8499	8499	

TABLE 38 Mixed Vegetables: usage of disinfectants and soil sterilants

	Disinfection	Soil Sterilisation	Total spray area	% of crop treated
Dazomet	.	4536	4536	36
Tar oils	211	.	211	2
Total spray area	211	4536	4747	.

Crop area = 13,152 square m

* = less than 0.5%

TABLE 39 Repeated use of pesticides on Mixed Vegetables (percentage of basic area treated one or more times)

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	Basic Area Sq m
INSECTICIDES											
Cypermethrin	.	.	100	.	.	.	.	.	.	.	517
Dimethoate	.	.	.	.	100	.	.	.	.	.	211
Permethrin	.	.	.	.	100	.	.	.	.	.	582
MOLLUSCICIDES											
Methiocarb	.	.	100	.	.	.	.	.	.	.	779
FUNGICIDES											
Benomyl	.	.	.	100	.	.	.	.	.	.	32
Etridiazole	100	.	.	.	.	.	.	.	.	.	29
Iprodione	.	.	.	.	99	.	.	.	.	1	585
Propamochlor hydrochloride	100	.	.	.	.	.	.	.	.	.	33
HERBICIDES											
Paraquat	100	.	.	.	.	.	.	.	.	.	4249
Propachlor	100	.	.	.	.	.	.	.	.	.	4249
DISINFECTANTS, GROWTH REGULATORS, SMOKES AND SOIL STERILANTS											
Dazomet	100	.	.	.	.	.	.	.	.	.	4536
Jeyes fluid	100	.	.	.	.	.	.	.	.	.	211

TABLE 40 Herbs: usage of insecticides and molluscicides, the reasons for their use (spray square m of formulations) and percentage of crop treated.

	Aphids/ whitefly	Slugs	Total spray area	% of crop treated
PYRETHROIDS				
Permethrin	483	.	483	23
SYSTEMIC ORGANOPHOSPHATES				
Dimethoate	71	.	71	6
CARBAMATES				
Pirimicarb	336	.	336	29
MOLLUSCICIDES				
Methiocarb	.	198	198	17
Total spray area	890	198	1089	.

TABLE 41 Herbs: usage of fungicides, the reasons for their use (spray square m of formulations) and percentage of crop treated.

	Botrytis	Unspecified	Total spray area	% of crop treated
Benomyl	236	198	434	27
Carbendazim	300	.	300	13
Iprodione	.	198	198	17
Total spray area	536	397	933	.

TABLE 42 Herbs: usage of herbicides, the reasons for their use (spray square m of formulations) and percentage of crop treated.

	General weed control	Total spray area	% of crop treated
Glyphosate	12	12	1
Prometryn	336	336	29
Total spray area	348	348	.

TABLE 43 Herbs: usage of soil sterilants

	Soil sterilant	Total spray area	% of crop treated
Dazomet	151	151	13
Total spray area	151	151	.

Crop area = 488 square m

TABLE 44 Repeated use of pesticides on herbs (percentage of basic area treated one or more times)

	X1	X2	X3	X4	Basic Area Sq m
INSECTICIDES					
Dimethoate	100	.	.	.	71
Permethrin	74	.	.	26	270
Pirimicarb	100	.	.	.	336
MOLLUSCICIDES					
Methiocarb	100	.	.	.	198
FUNGICIDES					
Benomyl	63	37	.	.	316
Carbendazim	.	100	.	.	150
Iprodione	100	.	.	.	198
HERBICIDES					
Glyphosate	100	.	.	.	12
Prometryn	100	.	.	.	336
SOIL STERILANTS					
Dazomet	100	.	.	.	151

TABLE 45 Usage of insecticides and molluscicides on glasshouse crops (spray square m of formulations)

	Tomato	Lettuce	Brassica Seedlings	Cucumber	Other Seedlings	Strawberries	Mixed Vegetables	Herbs	**All Crops**
INSECTICIDES									
ORGANOCHLORINES									
Dicofol	841	.	.	.	.	.	.	.	**841**
Dicofol/tetradifon	1642	.	.	.	.	.	.	.	**1642**
Gamma-HCH	4637	.	.	.	.	.	.	.	**4637**
PYRETHROIDS									
Cypermethrin	13961	.	.	30605	.	.	1552	.	**46118**
Deltamethrin	85548	.	.	10202	.	92	.	.	**95842**
Permethrin	23642	47259	2909	.	10225	2892	.	483	**87410**
Pyrethrins/resmethrin	31878	374	.	.	.	.	.	.	**32252**
Resmethrin	11157	.	.	.	3680	.	2909	.	**17746**
SYSTEMIC ORGANO PHOSPHATES									
Demeton-S-methyl	.	1040	.	.	.	.	.	.	**1040**
Dimethoate	12684	.	.	468	.	.	1053	71	**14276**
Heptenophos	3755	17164	.	223	.	.	.	.	**21142**
Heptenophos/Permethrin	236	736	.	.	.	.	.	.	**972**
NON-SYSTEMIC ORGANOPHOSPHATES									
Chlorfenvinphos	.	.	27	.	.	.	.	.	**27**
Chlorpyrifos	.	5250	48883	.	.	1150	.	.	**55283**
Fonofos	.	.	4249	.	.	.	.	.	**4249**
Malathion	15266	.	1848	.	.	.	.	.	**17114**
Pirimiphos-methyl	8377	.	.	.	.	2551	.	.	**10928**
CARBAMATES									
Aldicarb	2369	.	.	36	.	.	.	.	**2405**
Oxamyl	1536	.	.	.	.	.	.	.	**3216**
Pirimicarb	34065	92218	.	.	770	.	336	.	**127389**
Propoxur	504	.	.	.	.	.	.	.	**504**
OTHER INSECTICIDES									
Cyhexatin	53000	.	.	.	.	.	.	.	**53000**
Fenbutatin oxide	63764	.	.	10202	.	.	.	.	**73966**
Nicotine	4001	.	.	650	.	185	.	.	**4836**
MOLLUSCICIDES									
Metaldehyde	569	19230	1382	32	108	.	.	.	**21321**
Methiocarb	15	.	.	.	.	.	2338	198	**2551**
BIOLOGICAL AGENTS									
Bacillus thuringiensis	1785	.	.	.	.	.	.	.	**1785**
Encarsia formosa	1396	.	.	.	.	.	.	.	**1396**
UNSPECIFIED CHEMICALS									
Insecticide	88	.	.	.	.	.	.	.	**88**
Nematicide	178	.	.	.	.	.	.	.	**178**
Total spray area	378574	183271	59298	52418	14783	6870	8188	752	**704154**

TABLE 46 Usage of fungicides on glasshouse crops (spray square m of formulations)

	Tomato	Lettuce	Brassica Seedlings	Cucumber	Other Seedlings	Strawberries	Mixed Vegetables	Herbs	**All Crops**
Benomyl	94551	69680	158		37	277	130	434	**165267**
Captan	121								**121**
Carbendazim				10202				300	**10502**
Chlorothalonil					79				**79**
Creosote	433								**433**
Dichlofluanid	154197	21792	352167	30763	62	2300			**561281**
Etridiazole	33053		121	851	231		29		**34285**
Fosetyl-aluminium					222				**222**
Iodophor/thiabendazole	1558			28					**1586**
Iprodione	283537	96120	4992	40965	5899	41130	2947	198	**475788**
Macozeb/metalaxyl		69573							**69573**
Propamocarb hydrochloride	12901		65784		31		33		**78749**
Quintozene		420	158						**578**
Tecnazene		78							**78**
Tolclofos-methyl		62619	16785		1590				**80994**
Triforine	131								**131**
Vinclozolin	124461	102590		30605		2300			**259956**
Zineb		98173							**98173**
Total spray area	704943	521045	440165	113414	8151	46007	3139	932	**1837796**

TABLE 47 Usage of herbicides on glasshouse crops (spray square m of formulations)

	Tomato	Lettuce	Brassica Seedlings	Cucumber	Other Seedlings	Strawberries	Mixed Vegetables	Herbs	**All Crops**
Chlorpropham	.	26516	.	.	.	.	.	.	**26516**
Glyphosate	.	.	.	.	.	.	.	12	**12**
Paraquat	69	3971	.	.	.	.	4249	.	**8289**
Prometryn	.	.	.	.	.	.	.	336	**336**
Propachlor	.	.	.	.	.	.	4249	.	**4249**
Propyzamide	.	34637	.	.	.	.	.	.	**34637**
Unspecified herbicide	.	1351	.	.	.	.	.	.	**1351**
Total spray area	69	66475	.	.	.	.	8498	348	**75390**

TABLE 48 Usage of disinfectants, growth regulators, smokes and soil sterilants on glasshouse crops (spray square m of formulations)

	Tomato	Lettuce	Brassica Seedlings	Cucumber	Other Seedlings	Strawberries	Mixed Vegetables	Herbs	**All Crops**
2-Chloroethyl phosphonic acid	6921	.	.	.	.	.	.	.	**6921**
Dazomet	5846	29545	11	67	267	92	4536	151	**40515**
Formaldehyde	11293	10626	.	.	.	.	.	.	**21919**
Gamma-HCH/tecnazene smoke	356	.	.	.	.	.	.	.	**356**
Tar oils	94	.	.	94	.	.	211	.	**399**
Metham-sodium	1707	.	.	.	.	.	.	.	**1707**
Methyl bromide	10853	.	.	.	.	.	.	.	**10853**
Steam	1155	108	.	.	18	.	.	.	**1281**
Total spray area	38225	40279	11	161	285	92	4747	151	**83951**

TABLE 49 Usage of insecticides and molluscicides on glasshouse crops (spray square m of active ingredients)

	Tomato	Lettuce	Brassica Seedlings	Cucumber	Other Seedlings	Strawberries	Mixed Vegetables	Herbs	**All Crops**	All Crops 1981
INSECTICIDES										
ORGANOCHLORINES										
Dicofol	2483	.	.	.	.	.	.	.	**2483**	105579
Gamma-HCH	4637	.	.	.	.	.	.	.	**4637**	21554
Tetradifon	1642	.	.	.	.	.	.	.	**1642**	86524
PYRETHROIDS										
Cypermethrin	13961	.	.	30605	.	.	1552	.	**46118**	.
Deltamethrin	85548	.	.	10202	.	92	.	.	**95842**	.
Permethrin	23878	47995	2909	.	10225	2892	.	483	**88382**	26150
Pyrethrins	31878	374	.	.	.	.	.	.	**32252**	.
Resmethrin	43035	.	.	.	3680	.	2909	.	**49624**	.
SYSTEMIC ORGANO PHOSPHATES										
Demeton-S-methyl	.	1040	.	.	.	.	.	.	**1040**	33497
Dimethoate	12684	.	.	468	.	.	1053	71	**14276**	32359
Heptenophos	3991	17900	.	223	.	.	.	.	**22114**	10826
NON-SYSTEMIC ORGANOPHOSPHATES										
Chlorfenvinphos	.	.	27	.	.	.	.	.	**27**	.
Chlorpyrifos	.	5250	48883	.	.	1150	.	.	**55283**	1593
Fonofos	.	.	4249	.	.	.	.	.	**4249**	.
Malathion	15266	.	1848	.	.	.	.	.	**17114**	48705
Pirimiphos-methyl	8377	.	.	.	.	2551	.	.	**10928**	.
CARBAMATES										
Aldicarb	2369	.	.	36	.	.	.	.	**2405**	.
Oxamyl	1538	.	.	.	.	.	.	.	**1538**	65034
Pirimicarb	34065	92218	.	.	770	.	336	.	**127389**	115366
Propoxur	504	.	.	.	.	.	.	.	**504**	.
OTHER INSECTICIDES										
Cyhexatin	53000	.	.	.	.	.	.	.	**53000**	78671
Fenbutatin oxide	63764	.	.	10202	.	.	.	.	**73966**	.
Nicotine	4001	.	.	650	.	185	.	.	**4836**	15860
MOLLUSCICIDES										
Metaldehyde	569	19230	1382	32	108	.	.	.	**21321**	7333
Methiocarb	15	.	.	.	.	.	2338	198	**2551**	6855
BIOLOGICAL AGENTS										
Bacillus thuringiensis	1785	.	.	.	.	.	.	.	**1785**	15577
Encarsia formosa	1396	.	.	.	.	.	.	.	**1396**	.
UNSPECIFIED CHEMICALS										
Insecticide	88	.	.	.	.	.	.	.	**88**	.
Nematicide	178	.	.	.	.	.	.	.	**178**	.
Total spray area	410652	184007	59298	52418	14783	6870	8188	752	736232	890845

TABLE 50 Usage of fungicides on glasshouse crops (spray square m of active ingredients)

	Tomato	Lettuce	Brassica Seedlings	Cucumber	Other Seedlings	Strawberries	Mixed Vegetables	Herbs	**All Crops**	All Crops 1981
Benomyl	94551	69680	158	.	37	277	130	434	**165267**	297072
Captan	121	.	.	.	.	.	.	.	**121**	20500
Carbendazim	.	.	.	10202	.	.	.	300	**10502**	.
Chlorothalonil	.	.	.	.	79	.	.	.	**79**	.
Creosote	433	.	.	.	.	.	.	.	**433**	.
Dichlofluanid	154197	21792	352167	30763	62	2300	.	.	**561281**	92421
Etridiazole	33053	.	121	851	231	.	29	.	**34285**	52257
Fosetyl-aluminium	.	.	.	.	222	.	.	.	**222**	9000
Iodophor	1558	.	.	28	.	.	.	.	**1586**	.
Iprodione	283537	96120	4992	40965	5899	41130	2947	198	**475788**	883023
Mancozeb	.	69573	.	.	.	.	.	.	**69573**	74036
Metalaxyl	.	69573	.	.	.	.	.	.	**69473**	94660
Propamocarb hydrochloride	12901	.	65784	.	31	.	33	.	**78749**	.
Quintozene	.	420	158	.	.	.	.	.	**578**	26271
Tecnazene	.	78	.	.	.	.	.	.	**78**	3422
Thiabendazole	1558	.	.	28	.	.	.	.	**1586**	.
Tolclofos-methyl	.	62619	16785	.	1590	.	.	.	**80994**	.
Triforine	131	.	.	.	.	.	.	.	**131**	.
Vinclozolin	124461	102590	.	30605	.	2300	.	.	**259956**	26241
Zineb	.	98173	.	.	.	.	.	.	**98173**	20812
Total spray area	706501	590618	440165	113442	8151	46007	3139	932	1837796	1655527

TABLE 51 Usage of herbicides on glasshouse crops (spray square m of active ingredients)

	Tomato	Lettuce	Brassica Seedlings	Cucumber	Other Seedlings	Strawberries	Mixed Vegetables	Herbs	**All Crops**	All Crops 1981
Chlorpropham	.	26516	.	.	.	.	.	.	**26516**	8353
Glyphosate	.	.	.	.	.	.	.	12	**12**	.
Paraquat	69	3971	.	.	.	.	4249	.	**8289**	462
Prometryn	.	.	.	.	.	.	.	336	**336**	579
Propachlor	.	.	.	.	.	.	4249	.	**4249**	.
Propyzamide	.	34637	.	.	.	.	.	.	**34637**	32976
Unspecified herbicide	.	1351	.	.	.	.	.	.	**1351**	.
Total spray area	69	66475	.	.	.	.	8498	348	75390	60897

TABLE 52 Usage of disinfectants, growth regulators, smokes and soil sterilants on glasshouse crops (spray square m of active ingredients)

	Tomato	Lettuce	Brassica Seedlings	Cucumber	Other Seedlings	Strawberries	Mixed Vegetables	Herbs	**All Crops**	All Crops 1981
2-Chloroethyl phosphonic acid	6921	.	.	.	.	.	.	.	**6921**	.
Dazomet	5846	29545	11	67	267	92	4536	151	**40515**	102921
Formaldehyde	11293	10626	.	.	.	.	.	.	**21919**	16491
Gamma-HCH smoke	356	.	.	.	.	.	.	.	**356**	.
Tar oils	94	.	.	94	.	.	211	.	**399**	.
Tecnazene smoke	356	.	.	.	.	.	.	.	**356**	.
Metham-sodium	1707	.	.	.	.	.	.	.	**1707**	2537
Methyl bromide	10853	.	.	.	.	.	.	.	**10853**	12335
Steam	1155	108	.	.	18	.	.	.	**1281**	22714
Total spray area	38581	40279	11	161	285	92	4747	151	84307	23035

TABLE 53 Usage of insecticides and molluscicides on glasshouse crops (kg of active ingredients)

	Tomato	Lettuce	Brassica Seedlings	Cucumber	Other Seedlings	Strawberries	Mixed Vegetables	Herbs	**All Crops**
INSECTICIDES									
ORGANOCHLORINES									
Dicofol	0.1	.	.	.	.	.	.	.	**0.1**
Gamma-HCH	0.4	.	.	.	.	.	.	.	**0.4**
Tetradifon	*	.	.	.	.	.	.	.	*****
PYRETHROIDS									
Cypermethrin	.	.	.	0.2	.	.	.	.	**0.2**
Deltamethrin	0.2	.	.	0.8	.	.	.	.	**1.0**
Permethrin	0.2	0.2	.	.	0.1	.	.	.	**0.5**
Pyrethrins	0.1	.	.	.	.	.	.	.	**0.1**
Resmethrin	0.3	.	.	.	.	.	.	.	**0.3**
SYSTEMIC ORGANOPHOSPHATES									
Demeton-S-methyl	.	*	.	.	.	.	.	.	*****
Dimethoate	0.1	.	.	.	.	.	0.1	.	**0.2**
Heptenophor	0.2	0.9	.	.	.	.	.	.	**1.1**
NON-SYSTEMIC ORGANOPHOSPHATES									
Chlorfenvinphos	.	.	*	.	.	.	.		*****
Chlorpyrifos	.	0.2	1.6	.	.	.	.	.	**1.8**
Fonofos	.	.	0.2	.	.	.	.	.	**0.2**
Malathion	3.7	.	0.2	.	.	3.1	.	.	**7.0**
Pirimiphos-methyl	*	.	.	.	.	*	.	.	*****
CARBAMATES									
Aldicarb	1.0	.	.	.	.	.	.	.	**1.0**
Oxamyl	1.0	.	.	.	.	.	.	.	**1.0**
Pirimicarb	1.9	2.3	.	.	.	.	.	.	**4.2**
Propoxur	*	.	.	.	.	.	.	.	*****
OTHER INSECTICIDES									
Cyhexatin	4.0	.	.	.	.	.	.	.	**4.0**
Fenbutatin oxide	3.7	.	.	0.6	.	.	.	.	**4.3**
Nicotine	1.9	.	.	0.3	.	0.1	.	.	**2.3**
MOLLUSCICIDES									
Metaldehyde	0.1	1.8	0.1	.	.	.	.	.	**2.0**
Methiocarb				.	.	.	0.1	.	**0.1**
UNSPECIFIED CHEMICALS									
Insecticide	*	.	.	.	.	.	.	.	*****
Nematicide	*	.	.	.	.	.	.	.	*****
Total spray area	19.1	5.4	2.1	1.9	0.1	3.2	0.2	.	**32.0**

'*' = less than 0.05kg

TABLE 54 Usage of fungicides on glasshouse crops (kg of active ingredients)

	Tomato	Lettuce	Brassica Seedlings	Cucumber	Other Seedlings	Strawberries	Mixed Vegetables	Herbs	All Crops
Benomyl	8.0	3.8	.	.	.	.	.	.	11.8
Captan	*	.	.	.	.	.	.	.	*
Carbendazim	.	.	.	1.2	.	.	.	.	1.2
Chlorothalonil	.	.	.	.	.	*	.	.	*
Creosote	*	.	.	.	.	.	.	.	*
Dichlofluanid	15.7	1.1	23.7	2.9	.	0.1	.	.	43.5
Etridiazole	53.3	.	0.2	0.4	0.4	.	0.1	.	54.4
Fosetyl-aluminium	.	.	.	.	.	0.9	.	.	0.9
Iodophor	0.5	.	.	.	.	.	.	.	0.5
Iprodione	27.2	7.2	1.1	3.4	0.2	2.1	0.1	.	41.3
Mancozeb	.	9.4	.	.	.	.	.	.	9.4
Metalaxyl		1.0	.	.	.	.	.	.	1.0
Propamocarb hydrochloride	65.7	.	334.8	.	.	0.2	0.2	.	400.9
Quintozene	.	2.9	1.1	.	.	.	.	.	4.0
Tecnazene	0.2	.	.	.	.	.	.	.	0.2
Thiabendazole	0.5	.	.	.	.	.	.	.	0.5
Tolclofos-methyl	.	62.6	16.8	.	.	1.6	.	.	81.0
Triforine	*	.	.	.	.	.	.	.	*
Vinclozolin	7.2	7.1	.	1.1	.	0.1	.	.	15.5
Zineb	.	15.1	.	.	.	.	.	.	15.1
Totals	178.3	110.2	377.7	9.0	3.3	2.3	0.4	.	681.2

'*' = less than 0.05

TABLE 55 Usage of herbicides on glasshouse crops (kg of active ingredients)

	Tomato	Lettuce	Brassica Seedlings	Cucumber	Other Seedlings	Strawberries	Mixed Vegetables	Herbs	**All Crops**
Chlorpropham	.	5.1	.	.	.	.	.	.	**5.1**
Glyphosate	.	.	.	.	.	.	.	*	*****
Paraquat	*	0.1	.	.	.	.	0.1	.	**0.2**
Prometryn	.	.	.	.	.	.	.	*	*****
Propachlor	.	.	.	.	.	.	1.8	.	**1.8**
Propyzamide	.	4.9	.	.	.	.	.	.	**4.9**
Unspecified herbicide	.	0.1	.	.	.	.	.	.	**0.1**
Total spray area	.	10.2	.	.	.	.	1.9	.	**12.1**

TABLE 56 Usage of disinfectants, growth regulators, smokes and soil sterilants on glasshouse crops (kg of active ingredients)

	Tomato	Lettuce	Brassica Seedlings	Cucumber	Other Seedlings	Strawberries	Mixed Vegetables	Herbs	**All Crops**
2-Chloroethyl phosphonic acid	0.3	.	.	.	.	.	.	.	**0.3**
Dazomet	409.8	1121.0	0.4	5.1	10.0	7.0	174.9	5.7	**1733.9**
Formaldehyde	24.4	21.3	.	.	.	.	.	.	**45.7**
Gamma-HCH smoke	*	.	.	.	.	.	.	.	*****
Tar oils	*	.	.	*	.	.	*	.	*****
Tecnazene smoke	0.2	.	.	.	.	.	.	.	**0.2**
Metham-sodium	22.9	.	.	.	.	.	.	.	**22.9**
Methyl bromide	542.6	.	.	.	.	.	.	.	**542.6**
Steam	.	.	.	.	.	.	.	.	.
Total spray area	1000.2	1142.3	0.4	5.1	10.0	7.0	174.9	5.7	**2345.6**

'*' = less than 0.05

TABLE 57 Estimated area (square m) treated with the 10 most extensively used active ingredients, on all crops surveyed, excluding seed dressings

1	Dichlofluanid	561281
2	Iprodione	475789
3	Vinclozolin	259956
4	Benomyl	165267
5	Pirimicarb	127389
6	Zineb	98173
7	Deltamethrin	95843
8	Permethrin	90321
9	Tolclofos-methyl	80993
10	Propamocarb hydrochloride	78749

TABLE 58 Estimated amount (kg) of the 10 active ingredients most used on all crops surveyed, excluding seed dressings

1	Dazomet	1733.8
2	Methyl bromide	542.6
3	Propamocarb hydrochloride	400.8
4	Tolclofos-methyl	81.0
5	Etridiazole	54.4
6	Formaldehyde	45.7
7	Dichlofluanid	43.5
8	Iprodione	41.1
9	Metham-sodium	22.9
10	Vinclozolin	15.5

TABLE 59 Comparison of pesticide usage on tomato 1981-1987, spray square m of formulations, spray square m of active ingredients and quantities used (kg)

	1981		1987		
	Spray square m of a.i.'s	Kg	Spray square m of formulations	Spray square m of a.i.'s	Kg
INSECTICIDES					
Pyrethroids	92796	0.4	166186	198300	0.8
Systemic organophosphates	6423	0.2	16675	16675	0.3
Non-systemic organophosphates	76436	5.1	23643	23643	3.7
Organochlorines	208079	12.6	7120	8762	0.5
Carbamates	117649	45.4	38476	38476	3.9
Other insecticides	81811	19.7	120765	120765	9.6
Total insecticides	583194	83.4	372865	406621	18.3
MOLLUSCICIDES	.	.	584	584	0.1
BIOLOGICAL AGENTS	32227	.	3181	3181	.
UNSPECIFIED CHEMICALS	.	.	266	266	.
FUNGICIDES	1045713	228.8	704943	706501	178.3
HERBICIDES	9374	1.8	69	69	*
OTHER PESTICIDES					
Disinfectants	16491	45.9	11387	11387	24.4
Growth regulators	3085	0.1	6921	6921	0.3
Smokes	.	.	356	356	*
Soil sterilants	86632	3259.1	19561	19561	975.4
Total other pesticides	1876608	3305.1	38225	38581	1000.1

'*' = less than 0.05

TABLE 60 Comparison of pesticide usage on lettuce 1981-1987, spray square m of formulations, spray square m of active ingredients and quantities used (kg)

	1981		1987		
	Spray square m of a.i.'s	Kg	Spray square m of formulations	Spray square m of a.i.'s	Kg
INSECTICIDES					
Pyrethroids	2494	*	47633	48369	0.2
Systemic organophosphates	69900	1.9	18940	18940	0.9
Non-systemic organophosphates	32023	2.1	5250	5250	0.2
Organochlorines	1488	0.1	.	.	.
Carbamates	84008	32.4	92218	92218	2.3
Other insecticides	.	.	.	.	.
Total insecticides	189913	36.5	164041	164777	3.6
MOLLUSCICIDES	14188	0.9	1382	19230	1.8
BIOLOGICAL AGENTS	3929	.	.	.	.
FUNGICIDES	529618	110.3	521045	590618	110.2
HERBICIDES	15077	2.9	66475	66475	10.2
OTHER PESTICIDES					
Disinfectants	3459	9.6	10626	10626	21.3
Growth regulators	.	.			
Smokes	.	.	.	.	.
Soil sterilants	4993	862.3	29653	29653	1121.0
Total other pesticides	8452	871.9	40279	40279	1142.3

'*' = less than 0.05

TABLE 61 Comparison of pesticide usage on vegetables, herbs and brassica seedlings 1981-1987, spray square m of formulations, spray square m of active ingredients and quantities used (kg)

	1981		1987		
	Spray square m of a.i.'s	Kg	Spray square m of formulations	Spray square m of a.i.'s	Kg
INSECTICIDES					
Pyrethroids	.	.	2909	2909	*
Systemic organophosphates	306	*	.	.	0.1
Non-systemic organophosphates	1073	0.1	55007	55007	2.0
Organochlorines	.	.	.	.	.
Carbamates	1600	0.6	.	.	*
Other insecticides	.	.	.	.	.
Total insecticides	2979	0.7	57916	57916	2.1
MOLLUSCICIDES	.	.	1382	1382	0.2
BIOLOGICAL AGENTS	.	.	1785	.	.
FUNGICIDES	12427	2.6	444236	444236	378.1
HERBICIDES	6766	1.3	8846	8846	3.8
OTHER PESTICIDES	.	.			
Disinfectants	.	.	211	211	*
Growth regulators	.	.	.	.	.
Smokes	.	.	.	.	.
Soil sterilants	3882	146.0	4698	4698	181.0
Total other pesticides	3882	146.0	4909	4909	181.0

'*' = less than 0.05

TABLE 62 Comparison of pesticide usage on cucumber 1981-1987, spray square m of formulations, spray sq m of active ingredients and quantities used (kg)

	1981		1987		
	Spray square m of a.i.'s	Kg	Spray square m of formulations	Spray square m of a.i.'s	Kg
INSECTICIDES					
Pyrethroids	15360	0.2	40807	40807	1.0
Systemic organophosphates	53	*	691	691	*
Non-systemic organophosphates	106	*	.	.	.
Organochlorines	30720	1.9	.	.	.
Carbamates	3840	1.5	36	36	.
Other insecticides	1412	0.3	10852	10852	0.9
Total insecticides	76938	3.9	52386	52386	1.9
MOLLUSCICIDES	.	.	32	32	*
BIOLOGICAL AGENTS	.	.	.	.	.
FUNGICIDES	15360	3.2	113413	113442	9.0
HERBICIDES	.	.	.	.	.
OTHER PESTICIDES					
Disinfectants	.	.	94	94	*
Growth regulators	.	.	.	.	.
Smokes	.	.	.	.	.
Soil sterilants	.	.	67	67	5.1
Total other pesticides	.	.	161	161	5.1

'*' = less than 0.05