

PESTICIDE USAGE IN SCOTLAND

SURVEY REPORT 88

SOFT FRUIT 1990

SOAFD EDINBURGH 1992

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SUMMARY

Since the last survey in 1986 the areas of raspberries and blackcurrants had increased by 5% and 65% respectively. Strawberry areas had decreased by 7%.

Fenitrothion was still the most used insecticide although the area treated had declined by 21%.

Dichlofluanid was again by far the most used fungicide followed by vinclozolin, triadimefon and benomyl.

Simazine was still the principal herbicide followed by paraquat, either alone or formulated with diquat. Isoxaben, new since the last survey, was widely used.

INTRODUCTION

This is the fourth report of pesticide usage on soft fruits in Scotland, the previous ones being in 1975, 1980 and 1986 (references 1, 2 and 3). The methods were broadly similar but where differences occur they are noted in the text.

DEFINITIONS AND NOTES

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

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

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

The reasons given for the uses of pesticides were those given by growers and may sometimes be inappropriate.

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

METHOD

Using the June 1989 Agricultural census (reference 4), samples were drawn which represented the whole of Scotland. For purposes of sampling the country was divided into the 11 land-use regions shown in figure 1 (reference 5). These were later amalgamated into 4 regions: North, which included the fruit growing areas bordering the Moray Firth; East Central which included the main Scottish soft fruit growing areas; West Central; and South which included Lothian, Tweed Valley and the South-west. Three separate samples were used. These differed somewhat from those used in previous surveys, the better to reflect the increase in blackcurrant areas which are now recorded in the Census. The first sample represented those holdings which grew raspberries only, the second represented those which grew blackcurrants only whilst the third represented the remaining soft fruit growers. In addition, holdings were stratified into size groups. Holdings growing less than 0.1 of a

hectare were omitted. Details of the numbers of holdings sampled, the areas surveyed and the Census areas are given in Tables 1 and 2.

With a few exceptions, each grower was visited by a surveyor, following an introductory letter and telephone call. A small number of growers in remote areas had to be interviewed by telephone, again by prior arrangement. In all, information was obtained from 80 holdings.

The period of the survey was the 12 months from 1 October 1989 to 30 September 1990.

Raising factors were calculated using information from the June 1990 Agricultural census (reference 6).

RESULTS

DISTRIBUTION OF CROPS (Table 3)

The areas of all soft fruits had increased by slightly less than 5% from 3,126 hectares to 3,281 hectares since the previous survey. Raspberry areas increased by about 5% to 2,316 hectares whilst strawberries declined by about 7% to 649 hectares. The blackcurrant plantings continued to increase, from about 155 hectares to 256 hectares, a rise of 65%.

TRENDS IN PESTICIDE USAGE (Tables 4, 5 and 30)

The proportions (Table 4) of both raspberries and strawberries treated with insecticides (including acaricides) declined by around 10% to 75% and 60% of the respective crops. Their use on blackcurrants increased by about 5% to 98% of the crop. The proportions of both raspberries and strawberries treated with fungicides also declined, by around 5% to 88% of raspberries and to 76% of strawberries. Usage on blackcurrants remained constant at around 98% of crop area treated. The proportion of the raspberry crop treated with herbicides increased to 97% from 94% since the last survey whilst their use on the strawberry area showed a slight decline from 99% to 96%. Herbicide use on blackcurrants was 93% of the crop in 1986 but this increased to 99% in this survey.

Regional usage of grouped pesticides is shown in Table 5. The overall usage of insecticides, acaricides and molluscicides on all the soft fruits amounted to 4,646 spray hectares of active ingredients compared with 4,733 spray hectares in 1986 and 6,882 spray hectares in 1980 (Table 30). The quantities (kg) of active ingredients found in the same surveys were 5,354 kg in 1990, 4,731 kg in 1986 and 18,235 kg in 1980. If the "mainly tar oil" (which has a comparatively high rate of application) is removed, the total quantities (kg) per hectare of crop becomes 0.80 for 1990 compared with 0.84 for 1986 and 0.86 for 1980.

Fungicides accounted for the largest spray area of any pesticide group and both area sprayed and quantities of active ingredients have increased over the last 10 years. The quantities (kg) of active ingredients per hectare were 3.5 in 1980 and 4.6 and 5.8 in the later surveys. If, however, the quantities of metalaxyl and mancozeb used to treat phytophthora root rot in 1990 are removed the 5.8 kg of active ingredient/hectare reduces to 4.7 kg of active ingredient/hectare.

The usage of herbicides increased somewhat in terms of spray area since the last survey from about 6,400 to 7,650 spray hectares of formulations, slightly more than can be accounted for by the increase in crop area.

However, the weight of herbicides and desiccants used per hectare dropped considerably from 3.3 to 1.8 kg of active ingredient per hectare of crop. There were probably several reasons for this, including the withdrawal of dinoseb-in-oil (3,192 kg on 1,347 spray hectares in 1986), and also the introduction of isoxaben, a herbicide used at a comparatively low rate of application.

Soil sterilant usage (dazomet only) had declined considerably in the last 10 years from 50 spray hectares in 1980 to 26 in 1986 to 4 spray hectares in 1990, from 16 tonnes in 1980 to 1.6 tonnes in 1990.

The percentages of basic area treated more than once with each formulation are shown in Tables 9, 13, 17 and 21. A summary of the areas of each crop treated with each formulation is shown in Tables 22, 23 and 24, and the estimated quantities applied in Tables 25, 26 and 27. The principal 20 chemicals ordered both by total spray area and by kg of active ingredient are shown in Tables 28 and 29.

RASPBERRIES

Insecticides (Table 6)

As in the previous 2 surveys, fenitrothion was the most used insecticide but its usage had declined by about a quarter to 1,896 spray hectares from 2,556 spray hectares in 1986 and was applied to 62% of the crop as against 70% in 1986. It was used mostly against raspberry beetle and raspberry cane midge. Chlorpyrifos (300 spray hectares) on 12% of the crop was the second most used chemical, as it was in 1986. Again it was used mainly against raspberry beetle. Treatments against aphids were applied to about 8% of the crop and chlorpyrifos and fenitrothion were the most used aphicides. Carbaryl, on 119 spray hectares was the most widely used chemical against clay coloured weevil as compared with azinphos-methyl/demeton-S-methyl sulphone in the previous survey.

Again, if the weight of tar oil is removed from the total quantities of active ingredients found in both this and the previous survey, the quantities of insecticides used increased by about 3.5% compared with a 5% rise in crop area.

Fungicides (Table 7)

Overall fungicide use had increased by 30% whilst the crop area was only 5% larger. As in 1986, dichlofluanid remained the most used fungicide and was applied to 83% of crop area, but the overall spray area treated was 17% larger, indicating more frequent treatments. Usage of benomyl, the second most used fungicide was reduced from 1,300 to 755 spray hectares. Vinclozolin usage remained fairly constant at 550 spray hectares.

Triadimefon, against mildew, used on nearly 350 spray hectares showed an increase from 100 spray hectares in 1986.

Phytophthora root rot, a disease which had just appeared in 1986 and had received little treatment, had increased during the intervening 4 years to the extent that 480 spray hectares had been treated with a metalaxyl/mancozeb formulation.

Herbicides (Table 8)

The increase in the total spray area of herbicides and desiccants used was approximately in line with the increase in crop area although this does not take into account the withdrawal of dinoseb-in-oil as an approved product. In 1986 it was used on about 1,200 spray hectares, largely for spawn control on vigorous cultivars. In 1990, only 44 spray hectares were treated for this purpose, mostly with diquat/paraquat.

Simazine remained the most popular herbicide, used on 1,304 spray hectares or 56% of the crop, the same proportion as in 1986. Usage of paraquat increased to 1749 spray hectares (69% of crop) from 1,127 spray hectares (48% of crop). Atrazine usage declined, from 410 to 230 spray hectares, whilst that of bromacil increased from 549 to 760 spray hectares, a third of the crop. New since 1986 was isoxaben, used to control mainly annual weeds on 561 spray hectares or 22% of the crop.

STRAWBERRIES

Insecticides, acaricides and molluscicides (Table 10)

The total spray area of insecticides and acaricides increased by just over 30% since 1986 whilst the area of crop grown had decreased by 7%. The main single reason for the increase was the incidence of red spider mites which were treated mostly with chlorpyrifos or dicofol. Aphids were not considered to be a problem. The proportion of the crop treated with methiocarb decreased from 41% in 1986 to 14% in 1990.

Fungicides (Table 11)

There had been an increase of nearly 20% in the overall use of fungicides although the crop area had risen by just 5%. Most (79%) of the spray area was treatment against botrytis, a broadly similar proportion to that found in 1986. Dichlofluanid was the main treatment used on 70% of the crop and vinclozolin was applied to 26% of the crop for the same reason. Some 18% of the crop was treated with triadimefon against mildew. Small areas were treated against red core, all with fosetyl-aluminium.

Herbicides (Table 12)

As in previous surveys, simazine was the main herbicide. It was applied to 616 spray hectares or 62% of the crop, the same proportion as in the previous survey. Paraquat, used alone or in formulations with diquat was used on just over 300 spray hectares, either for weed or runner control. Phenmedipham was used on 415 spray hectares (28% of the crop) and applied mostly in split doses. Lenacil and napropamide were each used on around a quarter of the crop.

BLACKCURRANTS

Insecticides, acaricides and molluscicide (Table 14)

The principal pest was big bud mite and endosulfan (578 spray hectares on 98% of the crop) was the only acaricide used to control it. Most holdings used either 2 or 3 applications (Table 17a). Aphids were not generally considered important and most of the area treated was confined to several applications on one holding.

Fungicides (Table 15)

Compared with other soft fruits, blackcurrants receive relatively more fungicide. In 1980, 93 hectares of crop was treated with 255 spray hectares of fungicide or 2.7 spray hectares per hectare of crop. In 1986 this latter figure was 7.7 spray hectares per hectare of crop. In this survey it was 9.8 spray hectares per hectare. This was due to the comprehensive disease control measures against botrytis and American gooseberry mildew on the newer more extensive plantations.

Herbicides (Table 16)

The main herbicides used were simazine and isoxaben, on 83% and 81% of the crop. They were usually tank mixed and applied at reduced rates. Paraquat, either with or without diquat, and oxadiazon were used on smaller areas.

OTHER CROPS

These consisted largely of gooseberries together with smaller areas of redcurrants, tayberries and other hybrid berries, amounting to 61 hectares in all.

Insecticides and acaricides (Table 18)

The only insecticide usage of note was the 27 hectares of gooseberries treated, mostly with fenitrothion, to control gooseberry sawfly.

Fungicides (Table 19)

Some 44% of the crops were treated with dichlofluanid to control botrytis, and 54% with triadimefon to control powdery mildews.

Herbicides (Table 20)

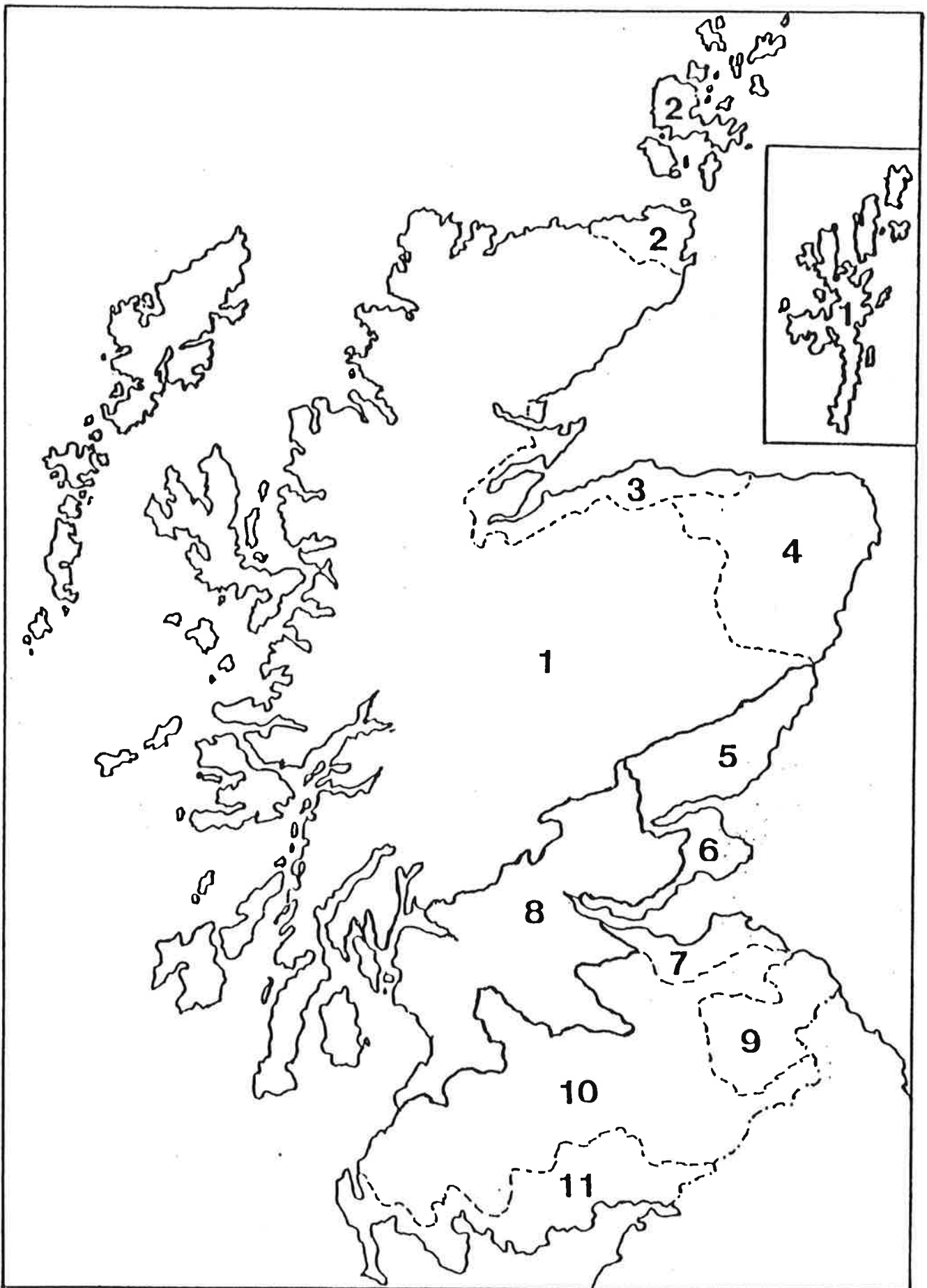
Simazine was the most used, on 51 spray hectares or 84% of the crop, followed by diquat/paraquat formulations, dichlobenil and isoxaben.

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- | | | |
|--------------------------|------------|----------------------|
| 1. Highlands and Islands | 5. Angus | 8. Central Lowlands |
| 2. Caithness/Orkney | 6. E Fife | 9. Tweed Valley |
| 3. Moray Firth | 7. Lothian | 10. Southern Uplands |
| 4. Aberdeen | | 11. Solway |

Regions were amalgamated for this survey as follows

North 1+2+3+4	East Central 5+6	West Central 8	South 7+9+10+11
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TABLE 4 Proportions (%) of the area of each crop treated with each pesticide group in each region

	North	East Central	West Central	South	Scotland
Raspberries					
Insecticides	86	74	69	93	75
Fungicides	82	88	77	92	88
Herbicides	64	99	100	97	97
Soil sterilant	*	3	*	*	+
Any pesticide	100	100	100	97	100
Strawberries					
Insecticides	48	63	47	69	60
Fungicides	74	78	68	71	76
Herbicides	80	100	86	100	96
Soil sterilant	1	*	*	*	7
Any pesticide	97	100	87	100	98
Blackcurrants					
Insecticides	30	100	100	63	98
Fungicides	40	99	100	64	98
Herbicides	80	100	100	82	99
Any pesticide	80	100	100	100	100
Other soft fruits					
Insecticides	*	22	100	89	52
Fungicides	67	88	100	84	89
Herbicides	100	100	100	100	100
Any pesticide	100	100	100	100	100

* = less than 0.5% of the crop area

TABLE 5 Regional usage of pesticides in Scotland (spray hectares of formulations)

	North	East Central	West Central	South	Scotland
Raspberries					
Insecticides/molluscicide	145	2403	92	47	2687
Fungicides	360	6595	290	138	7383
Herbicides	205	4303	184	65	4756
Soil sterilant	.	3	.	.	3
Strawberries					
Insecticides/molluscicide	85	624	43	137	890
Fungicides	268	1478	116	268	2130
Herbicides	213	1686	120	186	2204
Soil sterilant	1	.	.	.	.
Blackcurrants					
Insecticides/molluscicide	1	839	12	4	856
Fungicides	3	2490	18	14	2525
Herbicides	6	500	12	10	528
Other soft fruits					
Insecticides/molluscicide	.	3	20	12	35
Fungicides	5	67	59	27	158
Herbicides	16	54	79	18	168
All soft fruits					
Insecticides/molluscicide	231	3869	168	200	4468 *
Fungicides	637	10631	483	447	12198 **
Herbicides	441	6543	395	278	7657 ***
Soil sterilant	1	3	.	.	4

* 4646 spray hectares of active ingredients

** 12698 spray hectares of active ingredients

*** 8717 spray hectares of active ingredients

TABLE 6 Raspberries: Usage of insecticides, acaricides and molluscicides, the reasons for their use (spray hectares of formulation) and the percentage of the crop treated

	Raspberry beetle	Rasp cane midge	Rasp beetle & midge	Aphids	Clay coloured weevil	No reason given	All reasons	% crop treated	All reasons 1986
INSECTICIDES									
SYNTHETIC PYRETHROID									
Deltamethrin	33	.	.	.	.	.	33	1	(.)
SYSTEMIC ORGANOPHOSPHATES									
Azinphos methyl	.	.	66	11	23	.	100	4	(183)
/demeton-S-methyl sulphone	49	.	.	17	.	.	66	3	(.)
Demeton-S-methyl									
NON SYSTEMIC ORGANOPHOSPHATES									
Chlorpyrifos	167	.	20	78	.	35	300	12	(313)
Fenitrothion	965	302	559	70	.	.	1896	62	(2556)
Malathion	86	.	.	.	.	.	86	3	(199)
CARBAMATE									
Carbaryl	.	.	.	.	119	.	119	5	(.)
OTHER INSECTICIDES									
Tar oil	.	.	.	.	.	65	65	3	(30)
Other insecticides	.	.	4	13	4	.	21	.	(.)
All insecticides/acaricides	1300	302	649	189	146	100	2686	.	(3278)

Other insecticides used on less than 0.5% of the total spray area were fenvalerate, pirimicarb.

Area planted 1990 2316 ha

Area planted 1986 2206 ha

TABLE 7 Raspberries: Usage of fungicides and soil sterilant, the reasons for their use (spray hectares of formulation) and the percentage of the crop treated

	Botrytis	Mildew	Phytophthora root rot	Rust	No reason given	All reasons	% Crop treated	All reasons 1986
FUNGICIDES								
Benomyl	755	.	.	.	.	755	30	(1276)
Chlorothalonil	79	23	.	.	.	103	4	(.)
Dichlofluanid	4751	150	.	.	53	4955	83	(4240)
Fenarimol	.	102	.	.	.	102	4	(.)
Iprodione	37	.	.	.	.	37	2	(72)
Mancozeb/metalaxyl	.	.	470	.	10	480	12	(.)
Triadimefon	.	349	.	.	.	349	10	(100)
Vinclozolin	546	.	.	.	.	546	15	(548)
Other fungicides	.	18	21	6	12	57	.	(.)
All fungicides	6168	642	491	6	75	7384	.	(6295)

Other fungicides and soil sterilant used on less than 0.5% of the total spray area were benodanil, bupirimate, carbendazim, copper oxychloride/metalaxyl, dazomet, mancozeb.

Area planted 1990 2316 ha
Area planted 1986 2206 ha

TABLE 8 Raspberries: Usage of herbicides and desiccants, the reasons for their use (spray hectares of formulation) and the percentage of the crop treated

HERBICIDES	Mainly annual broad leaved weeds	Mainly perennial broad leaved weeds	Mainly grass weeds	General weed control	Vigour control (spawn)	Land preparation	All reasons	% crop treated	All reasons 1986
Atrazine	50	.	.	180	.	.	230	10	(408)
Bromacil	48	.	8	704	.	.	760	33	(549)
Clopyralid	.	63	.	.	.	.	63	3	(66)
Diquat/paraquat	24	4	94	652	28	55	857	32	(107)
Isoxaben	561	.	.	.	.	.	561	22	(.)
Paraquat	166	2	.	716	8	.	892	37	(1020)
Simazine	213	.	127	964	.	.	1304	56	(1157)
Other herbicides	19	20	11	20	8	11	89	.	(.)
All herbicides	1081	89	240	3236	44	66	4756	.	(4475)

13. Other herbicides used on less than 0.5% of the total spray area were asulam, clopyralid/triclopyr, dicamba/mecoprop, dichlobenil, diquat, fluzifop-P-butyl, glyphosate, lenacil.

Area planted 1990 2316 ha
 Area planted 1986 2206 ha

TABLE 9a Repeated use of pesticides on raspberries (percentage of basic area treated more than once)

	Once	Twice	Three times	Four times
INSECTICIDES				
Chlorpyrifos	88	12	.	.
Fenitrothion	71	26	3	.
Malathion	95	5	.	.
Pirimicarb	87	13	.	.
FUNGICIDES				
Benomyl	90	10	.	.
Bupirimate	.	.	100	.
Copper oxychloride/metalaxyl	.	100	.	.
Dichlofluanid	12	22	63	3
Mancozeb/metalaxyl	40	56	.	4
Triadimefon	64	27	6	3
Vinclozolin	55	35	10	.
HERBICIDES				
Diquat	52	48	.	.
Diquat/paraquat	87	11	2	.
Isoxaben	90	10	.	.
Paraquat	97	3	.	.

TABLE 9b Repeated use of types of pesticides (percentage of basic area treated a given number of times)

	1	2	3	4	5	6	7	8	9
Insecticides	59	33	4	4	.	.	.	.	.
Fungicides	3	11	51	16	7	7	3	.	3
Herbicides	21	55	19	3	2	.	.	.	.

TABLE 10 Strawberries: Usage of insecticides, acaricides and molluscicide, the reasons for their use (spray hectares of formulation) and the percentage of the crop treated

	Aphids	Red spider mites	Leaf hoppers	Tortrix moths	Blossom weevil	RSM Aphids capsids	Slugs	No reason given	All reasons	% of crop treated	All reasons 1986
INSECTICIDES/ACARICIDES											
SYNTHETIC PYRETHROID											
Fenprothrin	.	6	.	.	.	.	.	.	6	1	(26)
ORGANOCHLORINE											
Dicofol	.	182	.	.	.	.	.	.	182	14	(16)
SYSTEMIC ORGANOPHOSPHATE											
Demeton-S-methyl	9	.	.	.	.	.	.	37	46	7	(53)
NON-SYSTEMIC ORGANOPHOSPHATES											
Chlorpyrifos	2	185	12	5	64	59	.	115	442	52	(278)
Fenitrothion	7	.	.	9	.	.	.	.	16	2	(50)
CARBAMATE											
Pirimicarb	7	.	.	.	.	.	.	.	7	1	(.)
OTHER INSECTICIDES & ACARICIDES											
Dicofol/tetradifon	.	10	.	.	.	.	.	.	10	2	(.)
Unspecified formulation	.	30	.	.	.	.	.	.	30	5	(1)
Other insecticides	.	.	.	.	.	.	.	5	5	1	(1)
All insecticides/acaricides	26	413	12	14	64	59	.	156	744	.	(568)
Other insecticides used on less than 0.5% of the spray area were deltamethrin, pirimicarb and rotenone.											
MOLLUSCICIDE											
Methiocarb	.	.	.	.	.	.	145	.	145	14	(310)
All molluscicides	.	.	.	.	.	.	145	.	145	.	(310)
Area planted 1990 648 ha											
Area planted 1986 697 ha											

TABLE 11 Strawberries: Usage of fungicides and soil sterilant, the reasons for their use (spray hectares of formulation) and the percentage of the crop treated

FUNGICIDES	Botrytis	Mildew	Red core	No reason given	All reasons	% crop treated	All reasons 1986
Benomyl	88	.	.	.	88	14	(155)
Bupirimate	.	22	.	.	22	1	(10)
Carbendazim	.	.	.	22	22	3	(.)
Dichlofluanid	1308	.	.	.	1308	70	(1075)
Fosetyl-aluminium	.	.	92	.	92	14	(102)
Iprodione	24	.	.	.	24	4	(42)
Triadimefon	.	318	.	.	318	18	(24)
Vinclozolin	255	.	.	.	255	26	(376)
All fungicides	1675	340	92	22	2129	.	(1783)

Soil sterilant used on less than 0.5% of the total spray area was dazomet.

Area planted 1990 648 ha

Area planted 1986 697 ha

TABLE 12 Strawberries: Usage of herbicides, the reasons for their use (spray hectares of formulation) and the percentage of the crop treated

HERBICIDES	Mainly annual broad leaved weeds	Mainly perennial broad leaved weeds	General weed control	Runner control	Land preparation	Crop destruction	All reasons	% crop treated	All reasons 1986
Chlorthal-dimethyl	26	.	.	.	.	.	26	4	(21)
Clopyralid	3	20	.	.	.	.	22	3	(68)
Diquat/paraquat	97	.	38	.	.	.	135	21	(64)
Ethofumesate	.	.	68	.	.	.	68	9	(13)
Glyphosate	.	1	2	.	42	13	57	8	(42)
Isoxaben	76	.	.	.	.	.	76	12	(.)
Lenacil	96	.	59	.	.	.	155	24	(127)
Napropamide	77	.	87	.	.	.	164	25	(49)
Paraquat	3	3	31	131	2	1	172	21	(172)
Pendimethalin	10	.	7	.	.	.	17	3	(151)
Phenmedipham	415	.	.	.	.	.	415	28	(87)
Propachlor	70	.	22	.	.	.	91	12	(50)
Propyzamide	.	.	125	.	.	.	125	8	(34)
Simazine	145	9	462	.	.	.	616	62	(523)
Trifluralin	24	.	20	.	.	.	44	7	(25)
Other herbicides	.	.	15	5	.	.	20	.	.
All herbicides	1042	33	936	136	44	14	2203		(1605)

Other herbicides used on less than 0.5% of the spray area were alloxym-sodium, diquat, fluazifop-P-butyl.

Area planted 1990 648 ha

Area planted 1986 697 ha

TABLE 13a Repeated use of pesticides on strawberries (percentage of basic area treated more than once)

	Once	Twice	Three times	Four times	Five times
INSECTICIDES AND MOLLUSCICIDE					
Chlorpyrifos	74	21	5	.	.
Dicofol	.	100	.	.	.
Methiocarb	59	16	25	.	.
FUNGICIDES					
Bupirimate	.	.	.	100	.
Dichlofluanid	4	22	56	18	.
Triadimefon	.	25	74	1	.
Vinclozolin	49	51	.	.	.
HERBICIDES					
Ethofumesate	93	.	7	.	.
Paraquat	76	22	2	.	.
Phenmedipham	26	47	14	13	13
Propachlor	86	6	7	.	.
Propyzamide	29	.	71	.	.
Simazine	65	25	.	10	.

TABLE 13b Repeated use of types of pesticides (percentage of basic area treated a given number of times)

	1	2	3	4	5	6	7	8	9	10	11
Insecticides	48	12	14	20	2	4	.	.	.	.	.
Fungicides	10	4	30	22	9	3	16	2	4	.	.
Herbicides	5	37	31	9	6	6	1	.	3	.	3

TABLE 14 Blackcurrants: Usage of insecticides, acaricides and molluscicide, the reasons for their use (spray hectares of formulation) and the percentage of the crop treated

	Aphids	Red spider mite	Big bud mite	Tortrix moth	Slugs	No reason given	All reasons	% crop treated	All reasons 1986
INSECTICIDES/ACARICIDES									
ORGANOCHLORINE									
Endosulfan	.	.	578	.	.	.	578	98	(231)
SYSTEMIC ORGANOPHOSPHATE									
Azinphos-methyl /demeton-S-methyl sulphone	.	.	.	65	.	.	65	13	(2)
NON-SYSTEMIC ORGANOPHOSPHATES									
Chlorpyrifos	.	.	.	.	.	3	3	1	(+)
Fenitrothion	118	3	.	.	.	1	122	17	(+)
OTHER INSECTICIDES AND ACARICIDES									
Tetradifon	.	41	.	.	.	.	41	16	(.)
All insecticides/acaricides	118	44	578	65	.	4	809		
MOLLUSCICIDE									
Methiocarb	.	.	.	.	45	.	45	18	(44)

'+' = less than 0.5% of the crop treated

Area planted 1990 256 ha

Area planted 1986 155 ha

TABLE 15 Blackcurrants: Usage of fungicides, the reasons for their use (spray hectares of formulation) and the percentage of the crop treated

	Botrytis	Mildew	Leaf spot	No reason given	All reasons	% crop treated	All reasons 1986
FUNGICIDES							
Benomyl	74	.	.	2	76	29	(268)
Bupirimate	.	391	.	.	391	68	(.)
Carbendazim	.	45	.	.	45	18	(.)
Chlorothalonil	274	.	292	.	565	60	(+)
Dichlofluanid	301	3	.	.	304	40	(129)
Dinocap	.	41	.	.	41	16	(+)
Fenarimol	.	350	.	.	350	60	(.)
Triadimefon	.	244	.	.	244	24	(358)
Triforine	.	107	.	5	112	25	(.)
Vinclozolin	389	.	.	.	389	55	(44)
Other fungicides	.	.	5	3	8		
All fungicides	1038	1181	297	10	2525		(1236)

Other formulations used on less than 0.5% of the spray area were propineb, zineb.

'+' = less than 0.5% of the crop was treated.

Area planted 1990 256 ha

Area planted 1986 155 ha

TABLE 16 Blackcurrants: Usage of herbicides, the reasons for their use (spray hectares of formulation) and the percentage of the crop treated

	Mainly annual broad leaved weeds	General weed control	Mainly grass weeds	All reasons	% crop treated	All reasons 1986
HERBICIDES						
Diquat/paraquat	.	4	6	10	2	(.)
Isoxaben	209	.	.	209	81	(.)
Oxadiazon	.	41	.	41	16	(.)
Paraquat	3	42	.	45	16	(38)
Simazine	3	150	61	214	83	(138)
Other herbicides	.	7	.	7		
All herbicides	215	244	67	526		(243)

Other herbicides used on less than 0.5% of the spray area were dichlobenil, glyphosate, lenacil.

Area planted 1990 256 ha
 Area planted 1986 155 ha

TABLE 17a Repeated use of pesticides on blackcurrants (percentage of basic area treated more than once)

	Once	Twice	Three times	Four times	Five times
INSECTICIDES					
Azinphos-methyl /demeton-S-methyl sulphone	.	100	.	.	.
Chlorpyrifos	76	24	.	.	.
Endosulfan	13	46	36	5	.
Fenitrothion	9	.	91	.	.
FUNGICIDES					
Bupirimate	46	10	19	26	.
Chlorothalonil	26	.	10	8	56
Dichlofluanid	4	.	96	.	.
Fenarimol	40	.	53	7	.
Triadimefon	1	.	4	95	.
Triforine	26	71	.	2	.
Vinclozolin	.	57	11	32	.

TABLE 17b Repeated use of types of pesticides (percentage of basic area treated a given number of times)

	1	2	3	4	5	6	7	8	9	10	11	12
Insecticides	2	29	14	40	16	.	.	.	.	.	.	.
Fungicides	.	.	.	13	.	1	23	5	1	22	.	34
Herbicides	16	64	19	1	.	.	.	.	.	.	.	.

TABLE 18 Other soft fruits: Usage of insecticides and acaricides, the reasons for their use (spray hectares of formulation) and the percentage of the crop treated

	Red spider mite	Raspberry beetle	Gooseberry sawfly	No reason given	All reasons	% crop treated
INSECTICIDES/ACARICIDES						
SYNTHETIC PYRETHROIDS						
Cypermethrin	.	.	.	6	6	2
Deltamethrin	.	1	.	.	1	1
SYSTEMIC ORGANOPHOSPHATES						
Azinphos-methyl /demeton-S-methyl sulphone	.	.	3	.	3	5
NON-SYSTEMIC ORGANOPHOSPHATES						
Chlorpyrifos	.	.	4	2	6	8
Fenitrothion	.	2	20	.	22	34
Malathion	1	.	.	.	1	1
All insecticides and acaricides	1	3	27	8	39	
Area planted 1990	61 ha					
Area planted 1986	38 ha					

TABLE 19 Other soft fruits: Usage of fungicides, the reasons for their use (spray hectares of formulation) and the percentage of the crop treated

FUNGICIDES	Botrytis	Mildew	No reason given	All reasons	% crop treated
Benomyl	.	.	1	1	1
Bupirimate	.	2	5	7	4
Carbendazim	.	.	1	1	1
Dichlofluanid	50	4	3	57	44
Triadimefon	.	82	3	85	54
Triadimenol	.	.	1	1	1
Triforine	.	.	5	5	4
Vinclozolin	2	.	.	2	3
All fungicides	52	88	19	159	
Area planted 1990	61 ha				
Area planted 1986	38 ha				

TABLE 20 Other soft fruits: Usage of herbicides, the reasons for their use (spray hectares) and the percentage of the crop treated

HERBICIDES	Annual broad leaved weeds	Grass weeds	General weed control	All weeds	% crop treated
Dichlobenil	18	.	10	29	47
Diquat/paraquat	.	39	4	43	36
Glyphosate	.	.	1	1	2
Isoxaben	28	.	.	28	43
Lenacil	.	.	2	2	4
Paraquat	.	.	11	11	9
Simazine	20	.	31	51	84
All herbicides	66	39	59	165	

Area planted 1990 61 ha
 Area planted 1986 38 ha

TABLE 21a Repeated use of pesticides on other soft fruits (percentage of basic area treated more than once)

	Once	Twice	Three times	Four or more times
INSECTICIDES				
Chlorpyrifos	85	15	.	.
Cypermethrin	.	.	.	100
Fenitrothion	96	4	.	.
FUNGICIDES				
Bupirimate	.	38	62	.
Dichlofluanid	3	76	21	.
Triadimefon	18	10	72	.
Triforine	.	84	16	.
HERBICIDES				
Diquat/paraquat	4	96	.	.
Isoxaben	95	5	.	.

TABLE 21b Repeated use of types of pesticides (percentage of basic area treated a given number of times)

	1	2	3	4	5	6	7	8	9
Insecticides	91	5	.	5	.	.	.	.	.
Fungicides	11	33	38	6	1	11	.	.	1
Herbicides	10	47	7	34	2	.	.	.	.

TABLE 22 Usage of insecticides, acaricides, molluscicide and soil sterilant on all soft fruits (spray hectares of formulations)

	Raspberries	Strawberries	Blackcurrants	Other soft fruits	All soft fruits
INSECTICIDES					
SYNTHETIC PYRETHROIDS					
Cypermethrin	.	.	.	6	6
Deltamethrin	33	3	.	1	37
Fenprothrin	.	6	.	.	6
Fenvalerate	4	.	.	.	4
ORGANOCHLORINES					
Dicofol	.	182	.	.	182
Endosulfan	.	.	578	.	578
SYSTEMIC ORGANOPHOSPHATES					
Azinphos-methyl	100	.	65	3	168
/demeton-S-methyl sulphone	66	46	.	.	112
Demeton-S-methyl	301	441	3	6	751
Chlorpyrifos	1896	16	122	22	2056
Fenitrothion	86	.	.	1	87
Malathion	.	.	.	.	.
CARBAMATES					
Aldicarb	.	1	.	.	1
Carbaryl	119	.	.	.	119
Carbofuran	4	.	.	.	4
Pirimicarb	13	7	.	.	20
OTHER INSECTICIDES AND ACARICIDES					
Dicofol/tetradiifon	.	10	.	.	10
Rotenone	.	1	.	.	1
Tar oil	65	.	.	.	65
Tetradiifon	.	.	41	.	41
Unspecified insecticide	.	30	1	.	31
All insecticides	2687	743	810	39	4278
MOLLUSCICIDES					
Methiocarb	.	145	45	.	190
All insecticides and molluscicides	2687	888	855	39	4468
SOIL STERILANT					
Dazomet	3	1	.	.	4

TABLE 23 Usage of fungicides on all soft fruits (spray hectares of formulations)

FUNGICIDES	Raspberries	Strawberries	Blackcurrants	Other soft fruits	All soft fruits
Benodanil	6	.	.	.	6
Benomyl	755	89	76	.	920
Bupirimate	18	22	391	6	438
Carbendazim	9	22	45	1	77
Chlorothalonil	103	.	565	.	668
Copper oxychloride/metalaxyl	21	.	.	.	21
Dichlofluanid	4955	1308	304	58	6625
Dinocap	.	.	41	.	41
Fenarimol	102	.	350	.	452
Fosetyl-aluminium	.	92	.	.	92
Iprodione	37	24	.	.	61
Mancozeb	3	.	.	.	3
Mancozeb/metalaxyl	480	.	.	.	480
Propineb	.	.	3	.	3
Triadimefon	349	318	245	84	996
Triforine	.	.	112	5	117
Vinclozolin	546	255	389	2	1192
Zineb	.	.	5	.	5
All fungicides	7384	2130	2526	157	12197

TABLE 24 Usage of herbicides on all soft fruits (spray hectares of formulation)

HERBICIDES	Raspberries	Strawberries	Blackcurrants	Other soft fruits	All soft fruits
Alloxydim-sodium	•	4	•	•	4
Asulam	2	•	•	•	2
Atrazine	230	•	•	•	230
Atrazine/cyanazine	1	•	•	•	1
Bromacil	760	•	•	•	760
Chlorthal-dimethyl	•	26	•	•	26
Clopyralid	63	22	•	•	85
Clopyralid/triclopyr	16	•	•	•	16
Dicamba/mecoprop	1	•	•	•	1
Dichlobenil	8	•	4	29	40
Diphenamid	•	2	•	•	2
Diquat	23	5	•	•	28
Diquat/paraquat	857	135	11	43	1047
Ethofumesate	•	68	•	•	68
Fluazifop-P-butyl	17	11	•	•	28
Glyphosate	15	57	•	1	73
Isoxaben	561	76	209	28	874
Lenacil	5	155	3	2	165
Napropamide	•	164	•	•	164
Oxadiazon	•	•	41	•	41
Paraquat	893	172	45	11	1122
Pendimethalin	•	17	•	•	17
Phenmedipham	•	415	•	•	415
Propachlor	•	91	•	•	91
Propyzamide	•	125	•	•	125
Simazine	1304	616	214	51	2184
Trifluralin	•	44	•	•	44
All herbicides	4756	2205	527	165	7653

TABLE 25 Quantities of insecticides, acaricides, molluscicide and soil sterilant active ingredients used on soft fruits (kg)

	Raspberries	Strawberries	Blackcurrants	Other soft fruits	All soft fruits
INSECTICIDES					
SYNTHETIC PYRETHROIDS					
Cypermethrin	.	.	.	.	+
Deltamethrin	.	.	.	.	+
Fenpropathrin	.	1	.	.	1
Fenvalerate	.	.	.	.	+
ORGANOCHLORINES					
Dicofol	.	84	.	.	84
Endosulfan	.	.	542	.	542
SYSTEMIC ORGANOPHOSPHATE					
Demeton-S-methyl	22	11	5	1	39
NON-SYSTEMIC ORGANOPHOSPHATES					
Azinphos-methyl	27	.	18	1	46
Chlorpyrifos	165	248	2	3	418
Fenitrothion	1043	9	67	12	1131
Malathion	82	.	.	1	83
CARBAMATES					
Aldicarb	.	5	.	.	5
Carbaryl	253	.	.	.	253
Carbofuran	2	.	.	.	2
Pirimicarb	2	1	.	.	3
OTHER INSECTICIDES					
Tetradifon	.	1	5	.	6
Tar oil	2701	.	.	.	2701
All insecticides/acaricides	4297	360	639	18	5313
MOLLUSCICIDE					
Methiocarb	.	31	10	.	41
SOIL STERILANT					
Dazomet	1109	540	.	.	1650

+ = less than 0.5 kg

TABLE 26 Quantities of fungicide active ingredients used on soft fruits (kg)

	Raspberries	Strawberries	Blackcurrants	Other soft fruits	All soft fruits
FUNGICIDES					
Benodanil	4	.	.	.	4
Benomyl	553	49	42	.	644
Bupirimate	5	6	98	2	110
Carbendazim	3	7	25	.	35
Chlorothalonil	116	.	886	.	1002
Copper oxychloride	62	.	.	.	62
Dichlofluanid	9329	2264	673	103	12369
Dinocap	.	.	11	.	11
Fenarimol	7	.	16	.	23
Fosetyl-aluminium	.	277	.	.	277
Iprodione	28	28	.	.	56
Mancozeb	3005	.	.	.	3005
Metalaxyl	360	.	.	.	360
Propineb	.	.	4	.	4
Triadimefon	16	20	8	10	55
Triforine	.	.	27	1	28
Vinclozolin	409	177	292	1	879
Zineb	.	.	8	.	8
All fungicides	13897	2828	2090	117	18932

TABLE 27 Quantities of herbicide active ingredients used on soft fruits (Kg)

HERBICIDES	Raspberries	Strawberries	Blackcurrants	Other soft fruits	All soft fruits
Alloxydim-sodium	7	.	.	.	7
Asulam	2	.	.	.	2
Atrazine	220	.	.	.	220
Bromacil	659	.	.	.	659
Chlorthal-dimethyl	10	135	.	.	135
Clopyralid	51	1	.	.	11
Dichlobenil	111	4	10	.	188
Diphenamid	34	1	.	127	4
Diquat	110	3	.	3	149
Ethofumesate	2	103	.	.	110
Fluazifop-P-butyl	26	4	22	2	5
Glyphosate	44	279	5	2	131
Isoxaben	10	482	.	2	72
Lenacil	1	.	.	3	297
Mecoprop	.	.	.	.	1
Napropamide	.	.	.	.	482
Oxadiazon	458	132	31	.	31
Paraquat	.	31	25	7	622
Pendimethalin	.	121	.	.	31
Phenmedipham	.	298	.	.	121
Propachlor	.	161	1	.	298
Propyzamide	1546	261	214	34	162
Simazine	16	36	.	.	2056
Triclopyr	.	.	.	.	16
Trifluralin	.	.	.	.	36
All herbicides	3156	2202	309	178	5845

TABLE 28 Areas treated with the 20 most extensively used active ingredients on all soft fruits

	1986	1990
1 Dichlofluanid	5473	6625
2 Simazine	1826	2184
3 Paraquat	1248	2169
4 Fenitrothion	2615	2056
5 Vinclozolin	969	1192
6 Diquat	174	1075
7 Triadimefon	492	996
8 Benomyl	1708	920
9 Isoxaben	.	874
10 Bromacil	556	760
11 Chlorpyrifos	595	751
12 Chlorothalonil	+	668
13 Endosulfan	231	578
14 Metalaxyl	+	501
15 Mancozeb	.	483
16 Fenarimol	.	452
17 Bupirimate	79	438
18 Phenmedipham	87	415
19 Atrazine	409	231
20 Methiocarb	368	190

TABLE 29 Estimated quantities (kg) of the 20 most used active ingredients, by weight on all soft fruits

	1986	1990
1 Dichlofluanid	11488	12369
2 Mancozeb	.	3005
3 Tar oil	2114	2701
4 Simazine	2589	2056
5 Dazomet	9678	1650
6 Fenitrothion	1433	1131
7 Chlorothalonil	+	1002
8 Vinclozolin	698	879
9 Bromacil	669	659
10 Benomyl	936	644
11 Paraquat	1084	622
12 Endosulfan	170	542
13 Napropamide	154	482
14 Chlorpyrifos	359	418
15 Metalaxyl	20	360
16 Lenacil	250	298
17 Propachlor	213	298
18 Fosetyl-aluminium	298	277
19 Carbaryl	.	253
20 Atrazine	836	220

'+' = less than 0.5% of all crops treated

TABLE 30 Comparisons of pesticide usage on soft fruits 1980-1990 (spray hectares of formulations and kg of active ingredients)

	1980		1986		1990	
	spray hectares	kg	spray hectares	kg	spray hectares	kg
Insecticides/acaricides						
Pyrethroids	17	+	25	2	53	3
Organophosphates	5372	2868	3990	2327	3174	1717
Organochlorines	968	575	231	185	770	626
Carbamates	.	.	.	.	144	260
Others (mainly tar oil)	362	14752	118	2129	138	2707
All insecticides/acaricides	6719	18195	4364	4643	4279	5313
Molluscicides	163	40	368	87	190	41
All insecticides/acaricides/molluscicides	6882	18235	4733	4730	4468	5354
Fungicides	9044	14055	9379	14282	12197	18932
Herbicides/crop control	7347	13869	6393	10338	7657	5846
Soil sterilant	50	16091	26	9678	4	1650
All pesticides	23323	62250	20531	39028	24326	31782
Area of all soft fruits	4036 hectares		3126 hectares		3281 hectares	

'+' = less than 0.5kg

