

**PESTICIDE USAGE IN SCOTLAND**

**SURVEY REPORT 54**

**1983**

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## SUMMARY

This is the third survey on the use of sheep dips in Scotland, the first being in 1973 and the second in 1978. As in 1978, Sheep Scab Orders were in force to control the scab mite. These required that all sheep be dipped with an appropriately licenced chemical during a defined period.

The sheep population in Scotland in 1983 was nearly 8.4 million, an increase of over 12% since 1978. The usage of organochlorine insecticide (HCH) was 9 tonnes (17.5 tonnes in 1978) and that of organophosphorus compounds was 27 tonnes (42 in 1978). The total quantity of dip made up was 61.7 million litres, (79.2 in 1978).

About a third of all dip made up was discharged directly into the environment. One percent of dippers were allowed to drain into ditches or indirectly into watercourses compared with 6% in 1978: 94% drained into soakways or onto the soil directly beside the dipper. The remainder were emptied by tanker and the contents disposed of on waste ground or sprayed on to fields.

Three pollution incidents concerning sheep dips were reported in 1983, each involving fish mortality. All three were caused by malpractices in disposing of surplus dip.

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Since this survey there have been two major changes in the legislation concerning dips and dipping. Both will have had a considerable impact on chemical usage. Firstly, the use of HCH was discontinued as from the end of 1984. This has resulted in manufacturers having to reformulate their scab-approved dips using either diazinon or propetamphos in place of HCH. In 1986 a third compound, flumethrin, was licensed for use against scab. This is the first synthetic pyrethroid to be used as a dip although "pour-on" formulations of cypermethrin and deltamethrin were available and found to be used in very small quantities in 1983.

A further major change was the introduction of a compulsory autumn dipping against scab, in addition to the one in midsummer (Table 7). This would mean that the 39% of holdings which did not give an autumn/winter dip to their adult sheep and the 70% that did not dip their remaining lambs at this time would be required to do so with a scab approved dip. This will appreciably increase the volumes of dips made up and may also restrict the range of chemicals used. It will not be possible therefore to extrapolate chemical usage figures from this survey to any subsequent year.



## 1. Introduction

Surveys of sheep dip usage in 1973 and 1978 (references 1 and 2) showed that substantial quantities of insecticides were used and appreciable quantities had to be disposed of in areas which might be environmentally sensitive. This report is the third in the series and reports changes in chemical usage and clipping practices.

Sheep may be dipped in insecticidal dips to control a variety of ectoparasites. These fall into three groups largely depending on the time of year that they are active. In spring dipping is usually to control ticks (Ixodes ricinus L.), in summer to control blowflies (Lucilia and Calliphora spp.) and in autumn or winter to control lice Damalinia ovis Schrank & Linognathus ovis Neum) and keds (Melophagus ovinus L.). There is no legal obligation to dip against any of these pests.

Dipping against the scab mite (Psoroptes communis Hering) has been and still is a matter for legislation and the time of dipping and the range of chemicals which may be used is regulated.

## 2. Sampling and Computation of Results

The country was divided into the agricultural regions shown in Fig 1. and all the holdings were allocated to one of four size groups according to the numbers of sheep supported by each holding, 1. fewer than 200 sheep; 2. 200-499; 3. 500-999; and 4. 1000 sheep and more. (Data from the June 1982 Agricultural Census of Scotland - Reference 3). A random stratified sample was drawn using variable sampling factors such that the larger holdings were better represented. The numbers of farms visited in each region and size group is shown in Table 1. The data collected in the survey was raised to give estimates of quantities of chemicals used by region and size group. This was done using the raising factors shown in Table 2, which were obtained using data from the June 1983 Agricultural census of Scotland (Reference 4).

The subdivision of holdings into Hill/Upland and Lowland areas which appeared in previous surveys was not used because there were changes in the definition of these areas and valid comparison with earlier surveys would not be possible, also sampling factors in the Lowland category would have become very small.

## 3. Patterns of Dipping

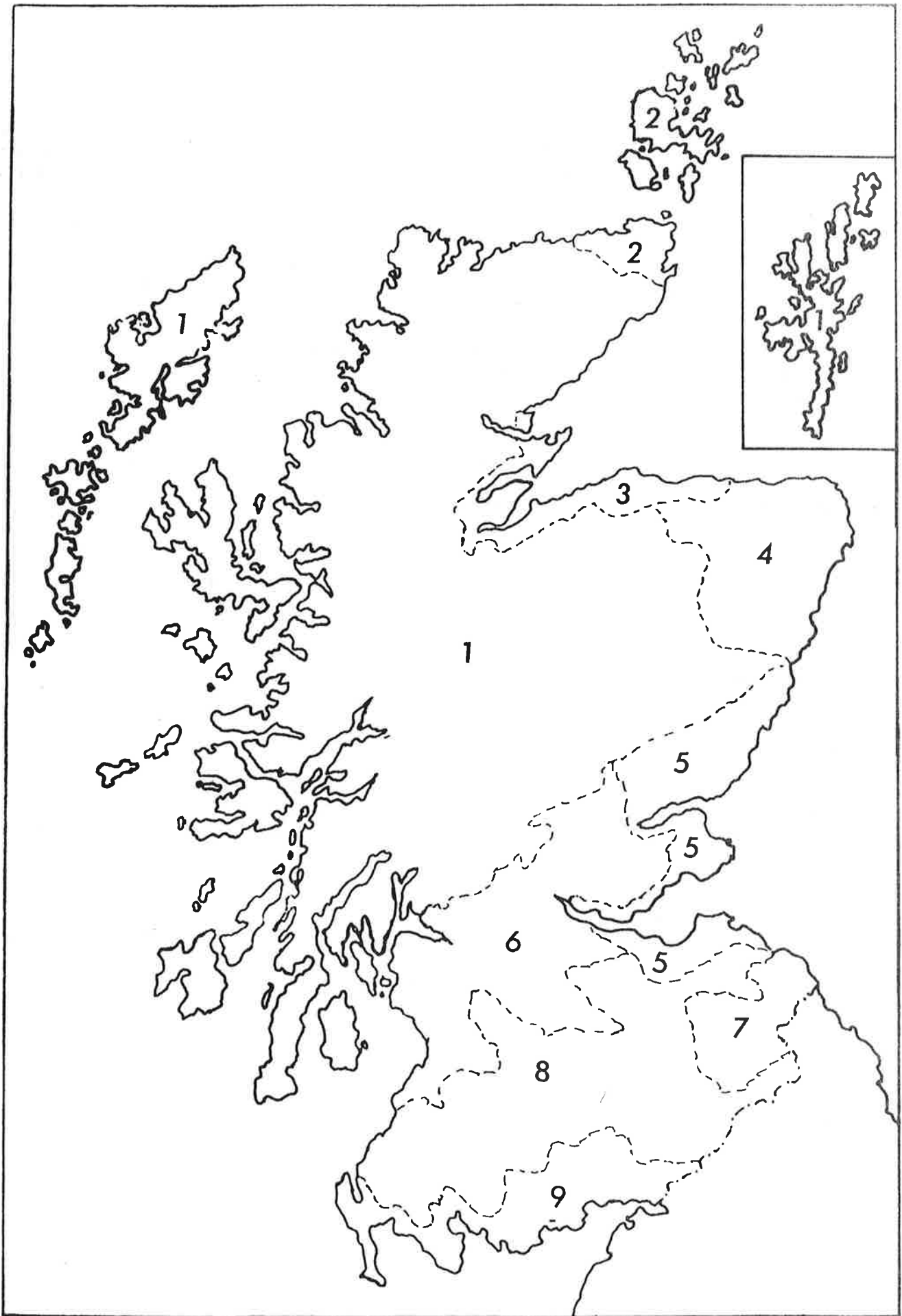
The pattern of dipping through the year had changed considerably since 1978 because of moving the time of the compulsory scab dip from autumn (a conventional time for pre-winter dipping) to summer, a time when a proportion of holdings would be dipping against flies, (69% in 1978).

Information on the frequency of dipping in each region is given in Tables 3 and 4 and similar data relating to use on holdings of different sizes is given in Tables 5 and 6. Some indication of the severity of the incidence of the various pests may be inferred from the proportion of flocks which were dipped more than once against any parasite.

In both this and the earlier surveys, sprays or sheep showers were found to be used by a few farmers to control either ticks or blowflies. This practice is no longer advocated as it is less effective than dipping but it was encountered twice on this survey, once to control ticks and once to control flies. The practice of dipping very young lambs against ticks using small containers was also found on a very few holdings where problems with tick borne diseases were particularly acute.

## 4. Dipping against ticks

Tables 3-6 show that dipping of breeding ewes against ticks was especially prevalent in Highland region, nearly half the holdings giving a specific tick dip to adult sheep although fewer (18%) dipped their lambs. This compared broadly with 1978 although changes in the regional boundaries prevents accurate comparisons. Overall in Scotland the number of holdings using tick dips on adult sheep declined to 24% from 32% since 1978, but lamb dipping remained constant at 13% (14% in 1978). Tick dipping was mostly performed shortly before lambing in March or April but may be in any month; in 1983, 8 holdings dipped in June, 8 in July, 3 in August, 1 in September and 10 in October.



- 1. Highland
- 2. Caithness/Orkney
- 3. Moray coast

- 4. Aberdeen
- 5. East Central
- 6. Central lowlands

- 7. Tweed Valley
- 8. Southern Uplands
- 9. Solway

## 5. Dipping against scab and blowflies

With the exception of the years 1980 and 1981, sheep scab orders have been in force in Scotland since 1976 which have required that all sheep (with a few exceptions) be dipped against the scab mite within certain dates (Table 7) and using a chemical licensed for this purpose (Table 8). The compulsory dipping periods have varied but in 1983 all dippings were to have been between 3 July and 27 August. The Western Isles, Orkney and Shetland were excluded from the regulations.

There was no direct evidence of farmers having evaded the dipping regulations although many found it difficult to keep sheep in a small dipping tank for a full minute and also maintain a reasonable work rate. The holdings referred to in Tables 3 and 4 which did not dip against scab were in the above mentioned areas which were not required to give the dip. Because of the compulsory dipping it was not possible to assess the extent of use of dips against blowflies. Many farmers relied on the scab dipping to ameliorate fly problems in the middle to late part of the fly season. Some idea of the seriousness of fly problems in the various regions may be inferred from the proportions of holdings which gave two or more dips. Fly dips containing a specific to treat mycotic dermatitis were used on three flocks.

## 6. Dipping for other reasons - winter dipping

Some 10% of holdings dipped specifically against lice and/or keds which were known to have been present in the flocks. This compares with 6.5% in the previous survey. Some of these treatments were made to hogs returning to their parent farms in the spring but most were autumn/winter dippings of whole flocks. Nowhere were lice a serious problem although dipping was directed at them more frequently in eastern and southern Scotland.

Keds were known to be present and were treated against on six of the surveyed farms, 3 in Shetland and one each in Caithness, Lochaber and Ayrshire. The reason given for harbouring keds at all was the extreme difficulty in obtaining a complete gather of sheep on very rough ground, cliffs and sea shores.

Most of the autumn/winter dips were given for reasons which were not concerned with specific ectoparasite problems; waterproofing, insurance against parasites and "cleaning up" any parasites which might be present, were the most commonly given reasons for dipping at this time.

## 7. Treatment against headfly

This problem was encountered less frequently than in either the 1973 or the 1978 surveys when, respectively, 39% and 42% of holdings used some type of treatment. In Scotland as a whole in 1983, 10% of farms had infestations that required treatment. The worst affected regions were Central Lowlands and Tweed Valley (14% holdings treated) Solway (16%) and the Southern Uplands (35%). These regions include the worst affected areas which were reported in 1978. About 40% of treatments were with commercial repellents, the remainder consisted of topical application of standard fly dips. A few farmers used very small quantities of deltamethrin and cypermethrin formulations. This compares with the wide range of tar/sulphur/bitumen compounds found in earlier surveys.



## 8. Usage of chemicals and reasons for use

Tables 9 to 11 show the use of organochlorine and organophosphorus chemicals in relation to region, size category of flock and season of use. All the organochlorine was HCH as no DDT was found on this survey, (1 user in 1978). Total usage declined by about a half from nearly 17.5 to nearly 9 tonnes. This decline may in part be due to the increased use of diazinon and the introduction of propetamphos, neither of which is formulated with HCH. Organophosphorus usage declined too, by 36% from 42 to 27 tonnes.

The estimated volumes of dip made up, the estimated quantities of active ingredients and the reasons for their use are given in Table 12. Most chemicals were used for more than one reason so the totals given for all reasons is not necessarily the sum of individual reasons. Compared with 1978 both the volumes of dip made up and the quantities of active ingredients used were less. The reasons for this are not entirely apparent but one likely cause was the change in timing of the compulsory dipping from autumn to summer when fleeces are very short and hold considerably less dip than during the September/October period of compulsory dipping that pertained in 1978. The fleece of an adult blackfaced sheep is estimated to hold about 2.3 litres of liquid in midsummer, increasing to about 3.5 l in autumn and 4.5 litres in spring. The 22% reduction in the total volume of dip made up was largely due to a decline in the amount of winter dip made up (Table 13). Quantities made up in spring declined by about 12% but the amounts made up during the summer were fairly similar for the two surveys. The range of chemicals used was similar to that found in 1978 with the exception of the introduction of propetamphos and the withdrawal of butacarb.

## 9. Surplus dip and its disposal

For the results of the 1978 survey, the amount of dip discarded from dippers was calculated as being the top up level in the dipper less 20%. In this survey farmers were asked how much dip was left in the dipper that had to be disposed of. The estimated figure for 1978 was 36% and the farmers estimate in this survey was 33% (See Table 13.)

Data obtained on the disposal of spent or surplus dip showed that 44% of dippers were emptied immediately after use, a further 44% sometime between dippings and the remaining 12% were left until the dipper was next required. Corresponding figures in 1978 were 37% 28% and 35%. The reason for this change are not known. Table 14 shows the methods of disposal and the distance to the nearest waterway downhill of the dipper. The number of dippers allowed to drain into ditches or drains was 1% compared with 6% in the previous survey. The 5% of farmers who sprayed unwanted remaining dip on to fields or pumped it onto waste ground compare with 8% in 1978. This disposal technique was largely confined to the Tweed Valley region.

## 10. Dipping facilities

Table 15 shows the age of dipping tanks in relation to their capacity. It illustrates the continuation of the trend towards investment in new facilities that was apparent in 1978 when it was found that 13% were less than 5 years old, 5% between 5 and 10 and 81% over 10

years. The majority (79%) of tanks were constructed of concrete on rendered bricks or blocks, 11% were metal, 7% plastics whilst the remainder were of wood on stone. These proportions are very similar to those found in the previous survey.

#### 11. Storage and disposal of containers

Locked storage was used on 28% of holdings (23% in 1978), 70% of farmers stored dips in barns (71% in 1978) and 2% stored drums in the open (6% in 1978).

Empty containers were most frequently burnt or buried in a farm dump, 44% of holdings. Local Authority facilities were used by 30% of holdings. 10% of farmers washed and re-used containers, but they were allowed to disintegrate on site on 16% of holdings. These figures compare with those of 1978.

#### 12. Pollution

Three pollution incidents involving fish mortality were reported by the Clyde River Purification Board. All were caused by deficiencies in the arrangements for disposing of surplus dip from the dipper. The other River Purification Boards in Scotland did not report any similar problems (Reference 5).

### Acknowledgements

The authors wish to thank the farmers who provided the information for this report. Also they gratefully acknowledge the help of Mrs H McNeil and Messrs G Hosie and J Brodie who collected much of the data.

### References

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2. Bowen, H. M., Cutler, J. R., and Craigie, Isobel R., Pestic. Sci. 1982 13, 563-574
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4. Economic Report on Scottish Agriculture 1983 HMSO Edinburgh, 1985
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TABLE 1 The number of holdings sampled in each region, stratified by size

Region	Size group				TOTAL
	1	2	3	4	
Highlands	7	11	18	56	92
Caithness/Orkney	2	2	2	4	10
Moray coast	2	4	3	5	14
Aberdeen	2	5	3	6	16
East Central	2	4	4	8	18
Central Lowlands	3	5	7	20	35
Tweed Valley	2	2	3	24	31
Southern Uplands	1	3	4	57	65
Solway	3	3	11	16	33
Scotland	24	39	55	196	314

Size group 1, fewer than 200 sheep; 2. 200-499 sheep; 3. 500-999 sheep; 4. 1000 sheep and over

**TABLE 2 Raising Factors**

<b>Region</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>Highlands</b>	<b>444.6</b>	<b>115.5</b>	<b>28.8</b>	<b>12.0</b>
<b>Caithness/Orkney</b>	<b>336.0</b>	<b>135.0</b>	<b>61.5</b>	<b>10.5</b>
<b>Moray</b>	<b>242.5</b>	<b>56.0</b>	<b>34.7</b>	<b>14.0</b>
<b>Aberdeen</b>	<b>436.5</b>	<b>93.4</b>	<b>49.7</b>	<b>9.8</b>
<b>East Central</b>	<b>210.0</b>	<b>64.5</b>	<b>33.7</b>	<b>15.2</b>
<b>Central Lowlands</b>	<b>305.3</b>	<b>106.2</b>	<b>52.3</b>	<b>16.5</b>
<b>Tweed Valley</b>	<b>66.0</b>	<b>69.5</b>	<b>44.7</b>	<b>10.8</b>
<b>Southern Uplands</b>	<b>239.0</b>	<b>59.0</b>	<b>64.2</b>	<b>10.3</b>
<b>Solway</b>	<b>132.0</b>	<b>128.3</b>	<b>29.2</b>	<b>13.3</b>

TABLE 3 Percentage of holdings that dipped breeding ewes, the reasons for dipping and the number of times dipped

	Highland	Caithness/ Orkney		Moray coast	Aberdeen	East Central	Central Lowlands	Tweed Valley	Southern		Solway	Scotland
		Highland	Orkney						Uplands	Uplands		
<u>TICKS</u>												
Nil	54	100	71	99	100	83	94	89	82	76		
Once	41	0	29	1	0	17	5	8	14	21		
Twice	3	0	0	0	0	0	2	3	3	2		
>Twice	2	0	0	0	0	0	0	0	1	1		
<u>FLIES, SCAB</u>												
Nil	7	0	0	0	0	0	0	0	0	2		
Once	66	99	78	93	86	98	71	88	95	82		
Twice	19	1	22	1	14	2	17	12	4	12		
>Twice	8	0	0	6	0	0	12	0	1	4		
<u>LICE, KEDS</u>												
Nil	94	99	96	91	77	63	90	74	100	88		
Once	6	1	4	9	23	37	10	26	0	12		
Twice	0	0	0	0	0	0	0	0	0	0		
>Twice	0	0	0	0	0	0	0	0	0	0		
<u>CLEAN UP, WATERPROOFING, INSURANCE</u>												
Nil	32	55	31	77	57	38	40	50	64	45		
Once	68	45	69	23	43	62	58	50	34	55		
Twice	0	0	0	0	0	0	2	0	2	0		
>Twice	0	0	0	0	0	0	0	0	0	0		

TABLE 4 Percentage of holdings that dipped lambs, the reasons for dipping and the number of times dipped

	Highland		Caithness/ Orkney		Moray coast		Aberdeen		East Central		Central Lowlands		Tweed Valley		Southern Uplands		Solway Scotland		
	<u>TICKS</u>																		
Nil	81	100	71	99	100	0	0	0	0	0	0	0	0	0	0	0	0	0	
Once	18	0	29	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Twice	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>Twice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	<u>FLIES, SCAB</u>																		
Nil	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Once	80	100	78	93	81	0	0	0	0	0	0	0	0	0	0	0	0	0	
Twice	6	0	22	1	19	0	0	0	0	0	0	0	0	0	0	0	0	0	
>Twice	8	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	<u>LICE, KEDS</u>																		
Nil	98	99	100	100	90	0	0	0	0	0	0	0	0	0	0	0	0	0	
Once	2	1	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	
Twice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>Twice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	<u>CLEAN UP, WATERPROOFING, INSURANCE</u>																		
Nil	76	61	66	99	77	0	0	0	0	0	0	0	0	0	0	0	0	0	
Once	24	39	34	1	23	0	0	0	0	0	0	0	0	0	0	0	0	0	
Twice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
>Twice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Table 5 Percentage of holdings that dipped their breeding ewes for various reasons in relation to the number of sheep on the holding.

	Number of sheep on the holding				All holdings
	under 200	200-499	500-999	over 999	
<u>Ticks</u>					
Nil	74	87	75	68	76
Once	26	13	16	24	21
Twice	0	0	7	5	2
>Twice	0	0	1	3	1
<u>Flies, scab</u>					
Nil	4	5	2	1	2
Once	78	84	83	83	82
Twice	12	7	16	15	12
>Twice	6	4	0	1	4
<u>Lice, Keds</u>					
Nil	92	88	80	82	88
Once	8	12	20	18	12
Twice	0	0	0	0	0
>Twice	0	0	0	0	0
<u>Clean up, waterproofing, insurance</u>					
Nil	58	43	24	26	45
Once	42	57	75	73	55
Twice	0	0	1	1	+
>Twice	0	0	0	0	0

+ = fewer than 0.5%



Table 6 Percentage of holdings that dipped their lambs for various reasons in relation to the number of sheep on the holding.

	Number of sheep on the holding				All holdings
	under 200	200-499	500-999	>999	
<u>Ticks</u>					
Nil	92	86	80	80	87
Once	8	14	17	17	12
Twice	0	0	3	2	1
>Twice	0	0	0	+	+
<u>Flies, scab</u>					
Nil	4	5	2	1	2
Once	90	78	74	85	86
Twice	0	12	24	13	8
>Twice	6	5	0	2	4
<u>Lice, keds</u>					
Nil	92	97	91	90	92
Once	8	3	9	10	8
Twice	0	0	0	0	0
>Twice	0	0	0	0	0
<u>Clean up, waterproofing, insurance</u>					
Nil	77	78	64	64	73
Once	23	22	36	35	27
Twice	0	0	0	1	+
>Twice	0	0	0	0	0

+ = fewer than 0.5%

TABLE 7 Compulsory dipping periods in Scotland

<u>Year</u>	<u>Dates</u>	<u>No. of Outbreaks</u>	<u>No. of Outbreaks</u>
		<u>of scab in</u> <u>Scotland</u>	<u>of scab in</u> <u>UK</u>
1978	1 September - 26 October	3	43
1979	3 September - 11 November	0	65
1980	Nil	0	33
1981	Nil	10	66
1982	14 June - 5 September	2	94
1983	3 July - 27 August *	3	157
1984	15 July - 11 August *	6	131
	23 September - 3 November		
1985	29 June - 9 August *	10	74
	21 September - 1 November		
1986	29 June - 9 August*	-	-
	21 September - 1 November		

\* Orkney and Shetland and the Western Isles were exempted.

TABLE 8 Compounds licensed for use against scab

1978-1982 HCH.

1983-1984 HCH, Diazinon.

1985-1986 Diazinon, Propetamphos, Flumethrin.

Table 9 Estimated quantities of active ingredient (tonnes) classified by chemical type and region.

	Organo- chlorine	Organo- phosphate	No. of holdings	No. of sheep
Highlands	3.748	11.107	5,571	2,662,547
Caithness	0.296	0.601	1,107	337,309
Moray Coast	0.477	1.040	883	317,043
Aberdeen	0.501	1.230	1,548	527,210
East Central	0.428	1.504	935	438,839
Central Lowlands	0.948	3.093	2,143	1,168,410
Tweed Valley	0.590	1.737	664	657,028
Southern Uplands	1.271	4.183	1,261	1,502,481
Solway	0.659	2.420	1,317	777,223
Scotland	8.918	26.915	15,429	8,388,091

Table 10 Estimated quantities of active ingredient (tonnes) classified by chemical type and season of use.

	Organo- chlorine	Organo- phosphate
Spring (March to May)	1.513	6.795
Summer (June to August)	4.379	14.422
Autumn/Winter (Sept to Feb)	3.026	5.698
All Year	8.918	26.915

**Table 11 Estimated quantities of active ingredient (tonnes) classified by chemical type and size of holding.**

	<b>Organo- chlorine</b>	<b>Organo- phosphate</b>	<b>No. of holdings</b>	<b>No. of sheep</b>
<b>Number of sheep</b>				
<b>under 200</b>	1.257	3.337	7245	933,367
<b>200 to 499</b>	1.270	4.004	3721	1,224,872
<b>500 to 999</b>	1.736	5.214	2109	1,590,196
<b>Over 999</b>	4.655	14.361	2354	4,639,656
<b>Total</b>	<b>8.918</b>	<b>26.915</b>	<b>15429</b>	<b>8,388,091</b>

Table 12 Estimates of volumes of dip made up (millions of litres) and estimated quantities of active ingredients (tonnes), and the reasons for their use.

	Ticks	Flies	Headflies	Scab	Lice	Keds	Waterproof Insurance	Clean-up	Total		
									Volume 10 <sup>6</sup> litres	Active ingredient Tonnes	
Bromophos	.	0.547	0.056	0.402	.	.	.	0.122	0.730	0.39	0.21
Carbophenothion	0.884	5.117	0.768	5.391	0.871	0.071	2.457	1.035	12.478	4.13	9.34
Chlorfenvinphos	0.733	8.559	0.692	8.396	0.125	.	0.455	0.081	11.619	6.18	9.99
Chlorpyrifos	2.284	0.302	.	0.515	0.287	.	0.115	0.019	2.720	1.66	3.22
Coumaphos	2.772	3.379	1.150	3.446	1.038	.	.	0.064	7.164	3.44	5.52
Diazinon	0.982	3.161	0.701	2.862	1.247	0.225	2.375	0.851	9.100	3.12	0.69
Dichlofenthion	1.365	2.996	.	3.269	1.159	0.037	4.696	0.965	11.588	3.21	5.53
Dioxathion	2.866	0.748	.	0.103	.	.	.	.	3.041	3.66	6.22
Fenchlorphos	0.077	0.230	.	0.374	.	.	.	.	0.451	0.42	1.43
Iodofenphos	.	.	.	.	0.092	.	0.174	0.062	0.235	0.27	0.01
Propetamphos	0.092	1.357	0.451	1.462	0.031	.	.	.	1.742	0.67	.
HCH	8.117	17.423	1.454	17.635	2.554	0.108	7.897	2.279	41.531	8.92	17.43

Table 13 Estimated volume of dip made up and the volume of surplus dip discharged into the environment (millions of litres).

	Volume made up $10^6$ litres	Volume discarded $10^6$ litres	% discarded	% discarded (1978)
Spring (March - May)	10.09	3.00	30	36
Summer (June - August)	31.57	10.97	35	38
Autumn/Winter (Sept - Feb)	20.07	6.57	33	34
All year	61.73	20.54	33	36

Table 14 Proximity of dipper (or dip disposal sites) to the nearest downhill water  
(percentage of holdings)

Nearest water (metres)	Soakaway or on soil around dipper	Ditch or drain	Sprayed on fields	Dumped on waste ground	Total
less than 10	+	.	.	.	+
10-50	16	+	+	1	17
51-100	7	.	1	.	8
101-500	47	1	1	1	50
over 500	24	.	1	+	25
Total	94	1	3	3	

+ = less than 0.5%

Table 15 Capacities of dipping tanks in relation to age (percent).

Capacity (litres)	Age of tank (years)			Total
	Under 5	5-10	Over 10	
Up to 500	1	2	1	4
501-1000	2	1	29	32
1001-2000	8	7	37	52
2001-3000	2	4	5	11
3001-4000	+	+	1	1
Over 4000	.	.	+	+
	13	14	73	

+ = less than 0.5%