

PESTICIDE USAGE IN SCOTLAND

SURVEY REPORT 94

FARM GRAIN STORES 1990 - 91

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J P SNOWDEN
Scottish Agricultural Science Agency
East Craigs, Edinburgh

J M DICKSON
Scottish Agricultural Statistics Service
The King's Buildings
Mayfield Road, Edinburgh

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SUMMARY

This was the 5th survey of pesticides used in farm grain stores.

Results showed that 36% of all grain harvested was stored on farms. 7% of all stores in Scotland received insecticides and acaricides. Only 0.4% of stored grain was treated directly with these pesticides. Pirimiphos-methyl remained by far the most popular chemical.

Rodenticides were used on 93% of farms visited. Bromadiolone was the most commonly used and was recorded on more than 50% of the farms.

INTRODUCTION

This was the 5th survey of pesticides used in farm grain stores. The previous 4 were in 1966-67, 1971-72, 1976-77 and 1982-83 (references 1, 2 and 3).

METHOD

Using the 1990 Agricultural Census (reference 4), a sample was drawn representing the whole of Scotland. The sample was selected from holdings growing any of the combine crops (cereals, oilseed rape and peas). The country was divided into 11 land-use regions (Fig 1, reference 5) and the sample was drawn from Census returns of holdings growing at least 1 ha of the crops. Sampling fractions within farm size groups were based on area of crops grown rather than number of holdings, so that smaller size groups would not dominate the sample.

A brief questionnaire was sent to each of the 2,000 farms in the sample asking a) whether grain was stored on the farm during the 12 month period 1 June 1990 to 31 May 1991, even if only for a short time after harvest, b) whether any grain preservatives were used on stored grain, and c) whether any other chemicals were used on stored grain or on the fabric of the store to control insect or mite pests. Question b) was necessary to identify those farmers who did not distinguish organic acid preservatives from pesticides and to eliminate them from the survey. Only those farmers who replied 'yes' to question c) formed the basis of the visits, when detailed information was collected by personal interview. Data sought included the quantities of appropriate crops both harvested and stored on the farm, together with pesticide usage. In some instances, it was also necessary to approach contractors to provide information.

Sample data were raised to give national estimates of pesticide usage using 2 raising factors. For insecticides and acaricides the first raising factor was, for each region and size group, the ratio of the number of holdings from the postal sample that used pesticides to the number of holdings visited (Tables 1, 2 and 7). For rodenticides, the factor was the ratio of the number of farms storing grain to the number of farms visited (Tables 1, 2, 3 and 8). The second factor (Table 9), was, for both insecticides/acaricides and rodenticides, the ratio of the total numbers of farms growing combine crops in Scotland to the total number of farms replying to the postal questionnaire (Tables 5 and 6). For insecticides/acaricides, an adjustment was derived for each crop which compared estimated areas with those from the Census (Table 10). Land-use regions 1, 2, 3 and 4 were amalgamated (Northern Scotland), as

were regions 5, 6, 8, 10 and 11 (Central and South-West Scotland) and regions 7 and 9 (South-East Scotland). The number of size groups was also reduced, to those growing less than 100 ha and those growing 100 ha or more.

RESULTS

Postal Survey (Tables 1-5)

From the total number of 1,614 questionnaires returned from the initial 2,000 holdings in the postal survey, 1,332 (83%) replied that they had stored grain, and of these, 192 used insecticides and acaricides. It was estimated that pesticides were used in 7% of all farm grain stores in Scotland. Usage was more widespread on farms in the larger size group (25%) than in the smaller group (5%).

Pesticide Usage

All pesticide usage was based on data collected from a sub-sample of 97 farms out of the original 192 in the initial questionnaire replying that they had used pesticides. Table 11 shows estimated quantities of grain harvested, stored and treated. 36% by weight of all crops harvested was stored on farms. A table of comparisons of pesticide usage with previous surveys has not been included in this report because data in those surveys were not raised to national level.

Insecticides and acaricides (Tables 11, 12 and 13)

Most of the pesticides recorded were applied to the fabric of the stores. Pirimiphos-methyl was again by far the most popular insecticide/acaricide used. A total of 280 kg was applied, accounting for 74% of total usage of all pesticides. Chlorpyrifos-methyl, which had been used in only small quantities in the previous survey was the second most popular in 1990-91 (69 kg). As in 1982-83, only 6 active ingredients were recorded; these being the same as found previously with the exception of permethrin which displaced malathion. Slightly more than half of the treatments applied to the fabric of the stores were as sprays whilst the remainder were smoke generators.

Only 4,000 tonnes (0.4% of all grain stored) were treated directly with insecticides/acaricides. Of these treatments, two-thirds involved the application of chemical to the total bulks of grain, whilst for the remainder, the chemicals were applied to the surface layers only. The principal chemical used was pirimiphos-methyl; only very small quantities of chlorpyrifos-methyl were applied. As in the previous survey, no fumigants were recorded.

The predominant reason for usage of insecticides/acaricides was for insurance purposes, whilst a few treatments were for control of saw-toothed grain beetle (*Oryzaephilus surinamensis*), mites (var.spp.) and fungus beetle (*Typhaea stercorea*) (Table 13).

Rodenticides (Table 14)

The raised data refers to the use of rodenticides anywhere on farms storing grain.

93% of all farms visited used rodenticides, compared with 80% in the previous survey. As then, only 6 chemicals were recorded; 5 remained the same, aluminium phosphide having replaced calciferol. In the present survey, bromadiolone was the most popular, being used on more than half the farms, followed by difenacoum. In 1982-83, warfarin and chlorophacinone were the most commonly used.

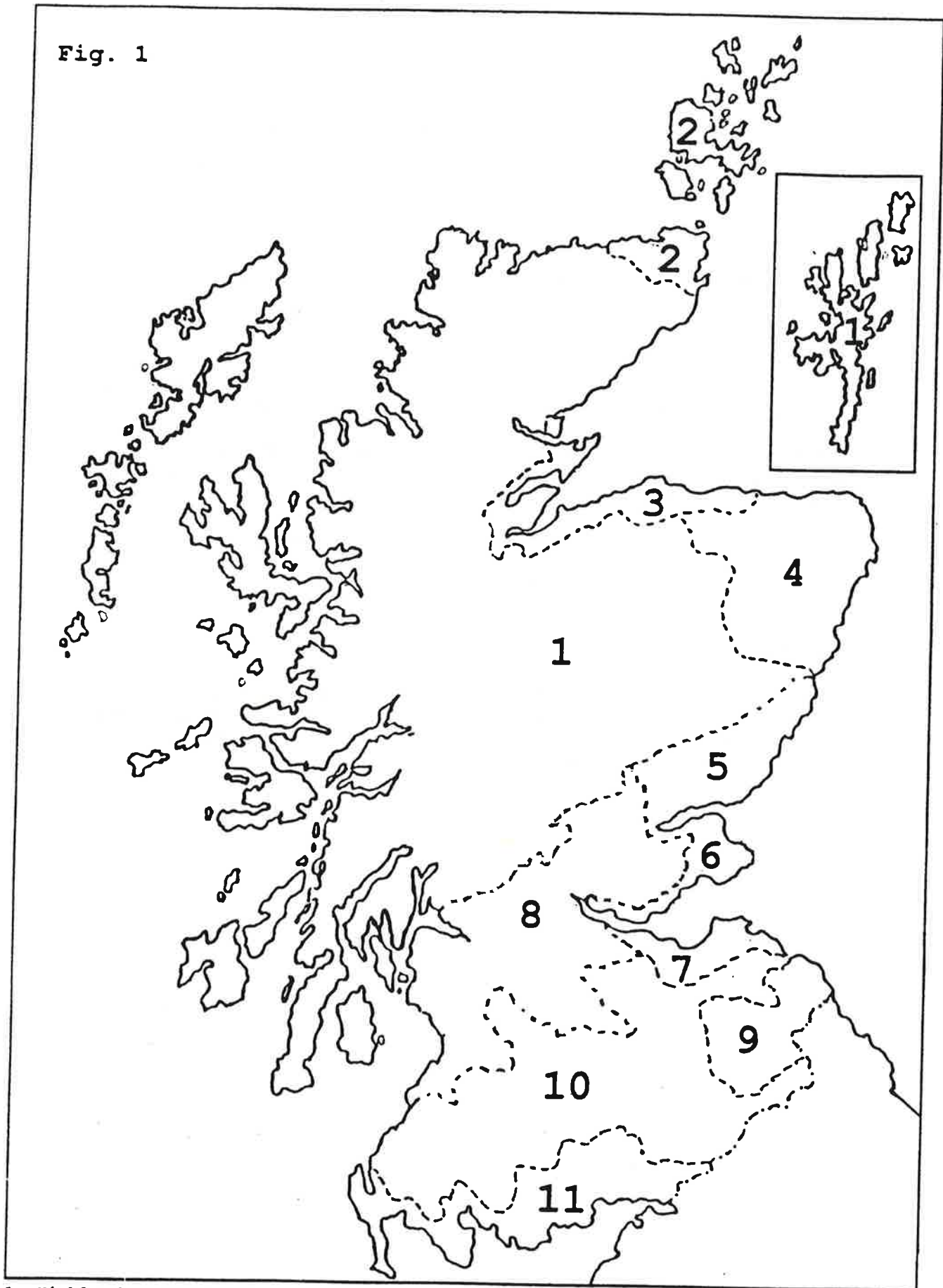
REFERENCES

1. The quantities of pesticides used for the protection of stored grain and the control of harmful mammals on British farms. D.S. Papworth and A.J.B. Rudge. International Pest Control, November/December 1971.
2. Protection of stored grain and the control of harmful mammals on British farms. D.S. Papworth, A.F. Millward, J.K. Taylor and A.W. Mayhew. International Pest Control, March/April 1975.
3. Jeffrey, I.G., Woof, T.M., Brodie, J., Bowen, H.M. and Hosie, G. Pesticide Usage Survey Report 55, Farm Grain Stores 1982-83 (1976-77) DAFS, Edinburgh 1988.
4. Agricultural Statistics, Scotland 1990; HMSO, Edinburgh 1991.
5. Wood, H.J. An Agricultural Atlas of Scotland. George Gill and Sons, London 1931.

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Fig. 1



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

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

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

Regions were amalgamated for this survey as follows

North 1+2+3+4 Central and South-west 5+6+8+10+11 South-east 7+9

Table 1: Number of holdings in postal survey storing grain, using pesticides, but not visited

Size group (ha)	Northern Scotland	Central and South-west Scotland		South-east Scotland	Scotland
		Central and South-west Scotland	South-east Scotland		
1-99.9	4	9	5	18	
100+	13	21	43	77	
Total	17	30	48	95	

Table 2: Number of holdings in postal survey storing grain, using pesticides and visited

Size group (ha)	Northern Scotland	Central and South-west Scotland		South-east Scotland	Scotland
		Central and South-west Scotland	South-east Scotland		
1-99.9	5	13	1	19	
100+	13	25	40	78	
Total	18	38	41	97	

Table 3: Number of holdings in postal survey storing grain but not using pesticides

Size group (ha)	Northern Scotland	Central and South-west Scotland		South-east Scotland	Scotland
		Central and South-west Scotland	South-east Scotland		
1-99.9	283	314	72	669	
100+	133	203	135	471	
Total	416	517	207	1140	

Table 4: Number of holdings in postal survey not storing grain

Size group (ha)	Northern Scotland	Central and South-west Scotland		South-east Scotland	Scotland
		Central and South-west Scotland	South-east Scotland		
1-99.9	93	94	15	202	
100+	20	42	18	80	
Total	113	136	33	282	

Table 5: Number of holdings returning postal questionnaires from the sample of 2,000

Size group (ha)	Northern Scotland	Central and South-west Scotland		South-east Scotland	Scotland
		Central and South-west Scotland	South-east Scotland		
1-99.9	385	430	93	908	
100+	179	291	236	706	
Total	564	721	329	1614	

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Table 6: Number of holdings growing combine crops in Scotland in 1990

Size group (ha)	Northern Scotland	Central and South-west Scotland		South-east Scotland	Scotland
		Central and South-west Scotland	South-east Scotland		
1-99.9	6237	4897	804	11938	
100+	355	554	425	1334	
Total	6592	5451	1229	13272	

Table 7: 1st raising factors for insecticides and acaricides

Size group (ha)	Northern Scotland	Central and South-west Scotland	South-east Scotland
1-99.9	1.80	1.69	6.00
100+	2.00	1.84	2.08

Table 8: 1st raising factors for rodenticides

Size group (ha)	Northern Scotland	Central and South-west Scotland	South-east Scotland
1-99.9	58.40	25.85	78.00
100+	12.23	9.96	5.45

Table 9: 2nd raising factors for all pesticides

Size group (ha)	Northern Scotland	Central and South-west Scotland	South-east Scotland
1-99.9	16.20	11.39	8.65
100+	1.98	1.90	1.80

Table 10: Adjustment factors for individual crops

Barley	Wheat	Oats	Triticale	Oilseed rape	Peas
1.11	0.93	0.95	0.80	1.00	5.90

Table 11: Estimated quantities (tonnes) of grain harvested, stored on farms, and treated with pesticides

Crop	Census area (ha)	Tonnes harvested	Tonnes stored on farms and % of tonnes harvested in parentheses	Tonnes treated and % of tonnes stored in parentheses
Barley	338,298	1,989,915	617,861 (31)	1,445 (0.2)
Wheat	110,986	899,013	447,359 (50)	2,268 (0.5)
Oats	29,177	150,248	30,933 (21)	455 (1.5)
Triticale	1,380	5,996	4,457 (74)	.
Oilseed rape	45,194	146,030	32,437 (22)	.
Peas	4,395	21,220	9,970 (47)	.
All crops	529,430	3,212,422	1,143,017 (36)	4,168 (0.4)

Table 12: Estimated quantities (kg) of insecticides and acaricides used in farm grain stores

	Direct application to grain	Application to building fabric	All treatments
Chlorpyrifos-methyl	0.7	68.7	69.4
Fenitrothion	.	6.5	6.5
Gamma-HCH	.	18.0	18.0
Iodofenphos	.	2.6	2.6
Permethrin	.	0.1	0.1
Pirimiphos-methyl	29.3	251.3	280.6
Total	30.0	347.2	377.2

Table 13: Estimated quantities (kg) of insecticides and acaricides and reasons for their use

	Insurence	saw-toothed grain beetle	mites	fungus beetle
Chlorpyrifos-methyl	65.5	.	4.0	.
Fenitrothion	6.5	.	.	.
Gamma-HCH	14.4	.	3.6	.
Iodofenphos	2.6	.	.	.
Permethrin	0.1	.	.	.
Pirimiphos-methyl	228.2	43.5	3.8	5.1
Total	317.3	43.5	11.4	5.1

Table 14: Estimated quantities (kg) of rodenticides used on farms storing grain and % of farms treated

	kg	% of farms treated
Aluminium phosphide	0.18	1
Bromadiolone	15.24	51
Chlorophacinone	0.54	11
Coumatetralyl	12.33	7
Difenacoum	1.45	29
Warfarin	0.74	2
Unknown rodenticide treatment	.	12
Total rodenticide	30.48	93