HGCA

PROJECT REPORT No. 29

COMMERCIAL GRAIN STORES 1988/89, ENGLAND AND WALES PEST INCIDENCE AND STORAGE PRACTICES - PART 2

MARCH 1991

PRICE £25.00
(PARTS 1 & 2)

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COMMERCIAL GRAIN STORES 1988/1989
ENGLAND AND WALES
PEST INCIDENCE AND STORAGE PRACTICE - PART 2

edited by
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March 1991

Final report of a one year project at the ADAS Central Science Laboratory, London Road, Slough, SL3 7HJ. The work commenced in September 1988 and was jointly funded by the Ministry of Agriculture, Fisheries and Food (Crop Protection Commission Programme B3, Project CP38) and by a grant of £101,869 from the Home-Grown Cereals Authority (Project No 0004/1/88).

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Table 1. Number and general description of sites visited.

Type of Site	Region						Total	Percent
	N	M+W	E	SE	SW	Wales	Sites	of Total
Commercial trading	30	14	64	13	10	-	131	76.6
Co-operative	1	2	2	6	3	-	14	8.2
Comm. + Co-op	2	-	1	-	3	2	8	4.7
Comm. + other type	-	-	1	-	-	-	1	0.6
Other type	1	1	-	-	-	-	2	1.2
Government owned	2	2	1	1	-	-	6	3.5
Gov. + Comm.	-	-	1	-	-	-	1	0.6
Port	-	-	1	-	2	-	3	1.8
Port + Comm.	1	-	-	-	1	1	3	1.8
Port + Co-op	1	-	-	-	-	-	1	0.6
Port + Comm. + Co-op	1	-	-	-	-	-	1	0.6
Total Sites	39	19	71	20	19	3	171	
Percent of total	22.8	11.1	41.5	11.7	11.1	1.8		

Note: The 5 MAFF Regions are Northern; Midlands and Western; Eastern; South Eastern; and South Western. The boundares are shown in Figure 1.

Sites were classified as one or more of the following:- commercial trading; co-operative; Government owned; associated with a port; or 'other type'.

Table 2. Date of first visit to each site

Month and year	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of total
September 88	1	-	-	-	-	-	1	0.6
October 88	9	7	22	4	2	-	44	25.7
November 88	13	6	30	8	10	-	67	39.2
December 88	16	6	12	3	2	3	42	24.6
January 89	-	-	3	5	4	-	12	7.0
February 89	-	-	2	-	1	-	3	1.8
March 89	-	-	2	-	-	-	2	1.2
Total Sites	39	19	71	20	19	3	171	

Table 3. Use of sites visited

Use of Site	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of total
Solely grain storage	24	15	50	13	15	1	118	69.0
Storage plus other uses*	15	4	21	7	4	2	53	31.0
*Other uses:								
Milling	6	-	3	3	3	2	17	9.9
Malting	2	1	-	-	-	-	3	1.8
Seed cleaning	7	1	12	4	1	-	25	14.6
Other than above	4	2	7	1	1	1	16	9.4

(Note: More than one use may occur at each site)

Table 4. Potentially infestable commodities other than cereal grain that had been stored on site in the last 12 months.

Commodity	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of sites
None (cereal only)	13	8	30	5	7	1	64	37.6
Other infestable commodities*	26	11	41	15	11	2	106	62.4
*Other commodities:								
Rape	24	9	25	13	7	1	79	46.5
Peas or beans	14	7	30	12	9	1	73	42.9
Carobs	-	-	1	-	1	1	3	1.8
Other than above	7	6	13	9	4	2	41	24.1

(Note: More than one commodity may occur at each site.
No answer from one site in SW).

Table 5. Intended fate of grain present on site, including whether it was in Intervention storage.

Intended fate	Region						Total Sites	Percent of sites
	N	M+W	E	SE	SW	Wales		
Export	31	11	36	15	13	1	107	66.5
Sell into Intervention	12	-	9	4	5	-	30	18.6
Already in Intervention	9	6	26	4	3	-	48	29.8
Food manufacture	9	-	8	9	3	-	29	18.0
Flour mill	18	5	24	11	8	-	66	41.0
Feed mill	32	9	39	13	10	2	105	65.2
Seed	4	-	7	4	2	-	17	10.6
Malting	13	2	26	13	6	-	60	37.3
Back to farm	8	-	8	4	7	-	27	16.8
To other grain stores	6	-	15	6	7	-	34	21.1
Other fate	-	2	2	2	1	-	7	4.3
Number of sites	38	18	67	19	16	3	161	

Note: More than one fate was specified at most sites.
No cereal grain was present at four sites.
No answer for six sites.

Table 6. Source of grain present on site.

Source of grain	Region						Total Sites	Percent of sites
	N	M+W	E	SE	SW	Wales		
Home-grown from:-								
a) farms	37	18	66	20	18	3	162	98.2
b) other stores	14	5	22	7	4	2	54	32.7
Imports	3	-	4	-	2	-	9	5.5
Number of sites	38	18	67	20	19	3	165	

Note: Sites may receive grain from more than one source
No cereal grain was present at four sites
No answer for two sites

Table 7. Number of sites with floor-stores, internal bins or external bins for grain storage.

Type of storage at each site	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of sites
Floor-stores only	19	11	37	6	9	1	83	48.5
Internal bins only	1	-	2	4	1	1	9	5.3
External bins only	2	-	2	1	4	-	9	5.3
Floor + int. bins	5	2	9	3	1	-	20	11.7
Floor + ext. bins	5	4	11	2	3	1	26	15.2
Int. + ext. bins	1	-	1	1	-	-	3	1.8
Floor + int. + ext. bins	6	2	9	3	1	-	21	12.3
Total sites	39	19	71	20	19	3	171	
Total with floor-stores	35	19	66	14	14	2	150	87.7
Total with int. bins	13	4	21	11	3	1	53	31.0
Total with ext. bins	14	6	23	7	8	1	59	34.5

Table 8. Total storage capacity in floor-stores, internal bins and external bins at sites visited

Region	Floor-stores No. floors	Floor-stores capacity tonnes	Internal bins No. bins	Internal bins capacity tonnes	External bins No. bins	External bins capacity tonnes	Total capacity tonnes
N	87	735,515	335	40,545	164	146,795	922,855
M+W	37	578,900	76	8,500	73	47,760	635,160
E	176	1,705,750	472	37,480	224	172,400	1,915,630
SE	28	275,000	349	30,500	202	81,285	386,785
SW	36	293,400	165	38,000	131	102,220	433,620
Wales	3	13,530	14	300	122	24,000	37,830
Total	367	3,602,095	1,411	155,325	916	574,460	4,331,880
Percent of total capacity		83.2		3.6		13.3	

Table 9. Quantity of grain in floor-stores, internal bins and external bins at time of visits.

Region	Floor-stores No. sites	Floor-stores content tonnes	Internal bins No. sites	Internal bins content tonnes	External bins No. sites	External bins content tonnes	Total No. Sites	Total content tonnes
WHEAT								
N	25	140,379	6	13,455	10	45,540	32	199,374
M+W	14	116,920	3	2,340	3	19,580	16	138,840
E	46	580,261	10	6,264	16	46,995	55	633,520
SE	11	62,113	9	6,293	6	30,248	17	98,654
SW	11	80,146	3	20,081	7	35,278	17	135,505
Wales	-	-	-	-	-	-	-	-
Total	107	979,819	31	48,433	42	177,641	137	1,205,893
Percent of wheat		81.3		4.0		14.7		
BARLEY								
N	27	200,125	6	11,439	9	41,064	35	252,628
M+W	15	185,310	4	2,245	4	26,515	17	214,070
E	35	347,948	14	11,039	16	53,325	48	412,312
SE	6	65,542	9	8,599	6	22,586	19	96,727
SW	9	56,737	3	4,058	7	32,350	14	93,145
Wales	2	11,250	-	-	1	16,300	2	27,550
Total	94	866,912	36	37,380	43	192,140	135	1,096,432
Percent of barley		79.1		3.4		17.5		

(continued)

Table 9. (continued) - Quantity of grain in floor-stores, internal bins and external bins at time of visits.

Region	Floor-stores No. sites	Floor-stores content tonnes	Internal bins No. sites	Internal bins content tonnes	External bins No. sites	External bins content tonnes	Total No. Sites	Total content tonnes
OTHER GRAIN								
N	5	4,955	-	-	-	-	5	4,955
M+W	-	-	1	180	-	-	1	180
E	2	340	3	688	2	720	6	1,748
SE	1	90	5	474	2	569	7	1,133
SW	2	317	1	200	1	1,200	2	1,717
Wales	1	30	1	300	-	-	2	330
Total	11	5,732	11	1,842	5	2,489	23	10,063*
Percent of 'other grain'		57.0		18.3		24.7		

*8,235 tonnes oats, 1,360 maize, 468 rye

TOTAL GRAIN								
N	33	345,459	8	24,894	12	86,604	38	456,957
M+W	18	302,230	4	4,765	4	46,095	19	353,090
E	59	928,549	18	17,991	20	101,040	68	1,047,580
SE	13	127,745	10	15,366	7	53,403	20	196,514
SW	14	137,200	3	24,339	7	68,828	19	230,367
Wales	2	11,280	1	300	1	16,300	3	27,880
Total	139	1,852,463	44	87,655	51	372,270	167	2,312,388
Percent of total grain		80.1		3.8		16.1		

Note: Four sites had no grain at the time of visit

Table 10. Grain throughput at sites visited - either in last 12 months or in last trading year.

Region	Wheat No. sites	Wheat Throughput tonnes	Barley No. sites	Barley Throughput tonnes	Other specified grain No. sites	Other specified grain Throughput tonnes
N	31	587,226	34	716,456	2	4,560
M+W	11	125,750	13	226,040	1	500
E	57	884,576	44	623,074	7	6,760
SE	18	187,650	19	152,136	9	2,702
SW	16	285,139	12	209,969	5	8,630
Wales	2	11,000	3	250,000	1	500
Total	135	2,081,341	125	2,177,675	25	23,652*

*All oats except for 360 tonnes maize and 300 rye.

Region	Total specif. grain No. sites	Total specif. grain Throughput tonnes	Total unspecif. grain No. sites	Total unspecif. grain Throughput tonnes	Total grain No. sites	Total grain Throughput tonnes
N	37	1,308,242	-	-	37	1,308,242
M+W	15	352,290	2	74,000	17	426,290
E	64	1,514,410	3	82,045	67	1,596,455
SE	19	342,488	1	42,000	20	384,488
SW	16	503,738	-	-	16	503,738
Wales	3	261,500	-	-	3	261,500
Total	154	4,282,668	6	198,045	160	4,480,713

Note: Five sites holding intervention grain had nil throughput
Six sites did not disclose their throughput

Table 11. Transport used to deliver grain to the site.

Transport	Region N	M+W	E	SE	SW	Wales	Total sites	Percent of sites
Own lorry only	-	1	1	-	-	-	2	1.2
Contractor's lorry only	13	8	13	7	3	1	45	27.1
Tractor/trailer only	-	-	-	3	-	-	3	1.8
Own lorry + contractor's	4	-	10	-	2	-	16	9.6
Own lorry + trailer	-	2	3	-	1	-	6	3.6
Own lorry + other	-	-	1	-	-	-	1	0.6
Contractors's lorry + trailer	15	2	15	5	7	1	45	27.1
Own + contractor + trailer	6	6	19	5	6	1	43	25.9
Own + trailer + other	-	-	3	-	-	-	3	1.8
Own + contractor + trailer + other	-	-	2	-	-	-	2	1.2
Total sites	38	19	67	20	19	3	166	
Total own lorry	10	9	39	5	9	1	73	44.0
Total contractor's lorry	38	16	59	17	18	3	151	91.0
Total tractor/ trailer	21	10	42	13	14	2	102	61.4
Total other transport	-	-	6	-	-	-	6	3.6

Note: 'Other transport' was farmer's lorry.
Transport not specified for the four sites with no grain at the time of visit.
No answer for one site in E.

Table 12. Number of sites where the grain was examined for infestation upon intake.

	Region						Total	Percent
	N	M+W	E	SE	SW	Wales	Sites	of sites
Grain examined on intake:-								
before unloading	36	17	61	17	9	2*	142	85.5
before and during	-	1	1	-	5	-	7	4.2
during unloading	1	-	-	-	2	-	3	1.8
Total sites examining	37	18	62	17	16	2	152	91.6
Sites not examining	1	1	5	3	3	1	14	8.4
Total sites	38	19	67	20	19	3	166	

*At one of these sites grain was examined on farm before transporting.

Note: Four sites with no grain and one site no answer.

Table 13. Methods used to examine grain for infestation upon intake at each site.

Sampling methods	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of examining sites
Spear/sieve only	5	5	11	4	3	-	28	18.4
Spear + visual	7	3	13	4	1	1	29	19.1
Spear + visual + other	1	-	-	-	-	-	1	0.7
Spear + sieve	-	-	1	-	-	-	1	0.7
Spear + sieve + visual	1	-	1	-	-	-	2	1.3
Spear + other	-	-	1	-	-	-	1	0.7
Vacuum/sieve only	5	8	12	3	4	1	33	21.7
Vacuum + visual	8	1	15	2	5	-	31	20.4
Vacuum + Visual + other	2	-	-	-	-	-	2	1.3
Vacuum + sieve + visual	1	-	-	-	2	-	3	2.0
Spear + vacuum	-	-	3	1	-	-	4	2.6
Spear + vacuum + visual	6	-	3	1	-	-	10	6.6
Spear + vacuum + sieve + visual	-	-	1	-	-	-	1	0.7
Visual only	1	1	1	2	-	-	5	3.3
Other method	-	-	-	-	1	-	1	0.7
Total sites	37	18	62	17	16	2	152	
Total spear sampling	20	8	34	10	4	1	77	50.7
Total vacuum sampling	22	9	34	7	11	1	84	55.3

Note: At one spear only and one vacuum only site the samples were examined visually, not by sieving.

Table 14. Number of samples of grain per lorry or trailer load taken for examination for infestation upon intake at each site.

Intake unit	No. of Samples	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of sites
Own lorry	1 or 2	2	1	10	1	1	-	15	22.7
	3 or 4	2	1	11	1	1	-	16	24.2
	5 or 6	2	3	6	-	4	-	15	22.7
	7 or 8	2	3	8	3	-	-	16	24.2
	>8	1	-	2	-	1	-	4	6.1
	Total Sites	9	8	37	5	7	-	66	
Contractor's lorry	1 or 2	4	2	14	3	1	-	24	17.6
	3 or 4	6	-	6	2	3	1	18	13.2
	5 or 6	8	2	10	3	6	-	29	21.3
	7 or 8	13	8	18	5	3	-	47	34.6
	>8	6	2	6	3	1	-	18	13.2
	Total Sites	37	14	54	16	14	1	136	
Tractor/Trailer	1 or 2	4	4	9	4	5	-	26	30.6
	3 or 4	7	1	13	2	3	-	26	30.6
	5 or 6	7	3	10	3	2	-	25	29.4
	7 or 8	1	-	3	1	-	-	5	5.9
	>8	-	-	2	-	1	-	3	3.5
	Total Sites	19	8	37	10	11	-	85	

Table 15. Level of pest numbers acceptable in grain upon intake.

Region	Insects			Mites			Total Sites
	Nil	Small nos.	Large nos.	Nil	Small nos.	Large nos.	
N	36	2	1	1	37	1	39
M+W	17	2	-	5	13	1	19
E	65	1	4	7	58	5	70
SE	15	2	2	5	12	2	19
SW	13	3	-	4	12	-	16
Wales	3	-	-	3	-	-	3
Total	149	10	7	25	132	9	166
Percent of sites	89.8	6.0	4.2	15.1	79.5	5.4	

Note: No answer for five sites.

Table 16. Grain rejected on intake because of infestation in last 12 months.

Region	Grain rejected?		Total quantity rejected		Source of rejected grain		
	Yes	No	No. sites	tonnes	Farms	Stores	Unknown
N	27	11	25	5,967	22	8	1
M+W	9	10	9	810	8	1	-
E	41	28	32	5,655	31	10	2
SE	11	9	11	3,650	9	3	-
SW	9	9	9	2,170	8	1	-
Wales	2	1	2	600	2	-	-
Total sites	99	68	88	18,852	80	23	3
Percent	59.3	40.7			80.1	23.2	3.0

Note: No answer for rejection at four sites; quantity rejected not known for 11 sites; more than one source for some sites - percentage of 99 sites.

Table 17. Sites where grain cleaners were used in last 12 months.

Region	Cleaner used? Yes	No	Type of cleaner used: Aspirated	Sieve	Aspirated Sieve	Other Type
N	23	16	5	6	20	2
M+W	8	11	5	4	4	-
E	40	30	3	5	33	3
SE	16	4	5	4	13	1
SW	11	7	3	1	7	-
Wales	2	1	-	-	2	-
Total sites	100	69	21	20	79	6
Percent of total	59.2	40.8				
Percent of those sites that used cleaner			21.0	20.0	79.0	6.0

Note: No answer whether cleaner used at two sites
Some sites used more than one type of cleaner

Table 18. Sites where grain dryers were used in last 12 months.

	Dryer used?		Type of dryer used				
			Heated		(near)-ambient		Dehumidifier
Region	Yes	No	continuous	batch	bulk	bin	bulk
N	26	13	24	4	2	2	-
M+W	14	5	12	2	3	-	-
E	44	26	35	13	3	-	1
SE	14	6	12	2	2	1	-
SW	11	7	9	3	-	-	-
Wales	2	1	1	-	-	1	-
Total Sites	111	58	93	24	10	4	1
Percent of total	65.7	34.3					
Percent of those sites that used dryer			83.8	21.6	9.0	3.6	0.9

Note: No answer whether dryer used at two sites
Some sites used more than one type of dryer

Table 19. Sites where grain coolers were used in last 12 months.

Region	Cooler used? Yes	No	Type of cooler used: Refrigerated	Non-refrigerated: Spearator	Ducted system	Ventilated floor	Total ducted or ventilated
N	35	4	1	5	28	10	35
M+W	18	1	-	3	17	1	18
E	68	3	2	3	64	22	68
SE	19	1	1	-	11	10	19
SW	12	6	-	1	8	4	11
Wales	2	1	-	-	2	-	2
Total sites	154	16	4	12	130	47	153
Percent of total	90.6	9.4					
Percent of those sites that used cooler			2.6	0.8	84.4	30.5	99.4

Note: No answer whether cooler used at one site
Some sites used more than one type of cooler

Table 20. Total capacity for grain cooling.

	No sites	Capacity tonnes	Percent of capacity
Total storage capacity of all sites visited	171	4,331,880	
Capacity where unknown if cooler used	1	12,900	
Capacity where known if cooler used	170	4,318,980	
Capacity where cooler used	154	4,185,820	96.9
Capacity where cooler not used	16	133,160	3.1
Capacity where quantity of grain that can be cooled at one time was not specified	26	821,610	
Capacity of sites where quantity that can be cooled was specified	128	3,364,210	
Total that can be cooled at one time	128	2,857,460	84.9
Storage capacity greater than cooling capacity		506,750	15.1

Table 21. Method of fan control at sites where grain cooler used.

Region	No. Sites	Method of fan control: Manual	Automatic: Normal thermostat	Automatic: Differential thermostat	Automatic: Combination of thermostat and humidistat	Automatic: Timer	Other method	Total Automatic sites
N	35	32	1	1	1	-	-	3
M+W	18	15	3	-	3	-	-	6
E	68	59	1	1	14	4	3	19
SE	19	17	-	-	7	1	-	7
SW	11	4	6	1	1	-	-	8
Wales	2	2	1	-	-	-	-	1
Total Sites	153	129	12	3	26	5	3	44
Percent of total		84.3	7.8	2.0	17.0	3.3	2.0	28.8

Note: At one site method of control not stated.
At the three 'other automatic method' sites, two used humidistats and one not known.
Some sites used more than one type of control.

Table 22. Sites which said they had had insect or mite infestation at some time within the last 12 months.

	Insect infestation?		Mite infestation?		Insects or mites	
Region	Yes	No	Yes	No	Yes	No
N	7	32	19	18	22	17
M+W	2	17	7	9	8	11
E	17	54	31	38	40	31
SE	7	13	5	15	9	11
SW	7	11	3	15	7	11
Wales	-	3	-	3	-	3
Total	40	130	65	98	86	84
Percent	23.5	76.5	39.9	60.1	50.6	49.4

Note: No answer for insects at one site and for mites at eight sites.

Table 23. Insects said to have been present in infestations within the last 12 months.

Insects	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of occurrences
Oryzaephilus only	1	1	7	3	1	-	13	32.5
Cryptolestes only	-	-	1	2	-	-	3	7.5
Sitophilus only	1	-	6	-	4	-	11	27.5
Oryzaephilus + *Cryptolestes*	-	1	-	-	-	-	1	2.5
Oryzaephilus + *Sitophilus*	-	-	1	-	2	-	3	7.5
Cryptolestes + *Sitophilus*	-	-	-	1	-	-	1	2.5
Oryzaephilus + *Cryptolestes* + *Sitophilus*	1	-	-	-	-	-	1	2.5
Tribolium	1	-	-	1	-	-	2	5.0
Ptinidae	-	-	1	-	-	-	1	2.5
Psocoptera	1	-	-	-	-	-	1	2.5
Endrosis	1	-	-	-	-	-	1	2.5
Unknown	1	-	1	-	-	-	2	5.0
Total sites	7	2	17	7	7	-	40	
Total *Oryzaephilus*	2	2	8	3	3	-	18	45.0
Total *Cryptolestes*	1	1	1	3	-	-	6	15.0
Total *Sitophilus*	2	-	7	1	6	-	16	40.0
Total *Oryzaephilus* or *Cryptolestes* or *Sitophilus*	3	2	15	6	7	-	33	82.5

Note: See glossary for insect common names.

Table 24. Site managers' views as to the seriousness of infestation by insects and mites if it were to occur.

Perception	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of sites
Insect infestation								
Very serious	34	12	61	19	9	3	138	81.2
Serious	4	2	8	-	8	-	22	12.9
Of some concern	1	3	-	-	1	-	5	2.9
Of little concern	-	2	2	1	-	-	5	2.9
Total Sites	39	19	71	20	18	3	170	
Mite infestation								
Very serious	10	2	10	12	3	2	39	22.9
Serious	22	2	25	5	5	1	60	35.3
Of some concern	5	10	30	3	10	-	58	34.1
Of little concern	2	5	6	-	-	-	13	7.6
Total Sites	39	19	71	20	18	3	170	

Note: No view was expressed at one site.

Table 25. **Insects which site managers considered to be the most significant potential pest.**

Insects	Region						Total Sites	Percent of sites
	N	M+W	E	SE	SW	Wales		
Oryzaephilus	21	13	54	5	5	-	98	64.9
Sitophilus	10	6	15	3	8	-	42	27.8
Cryptolestes	3	1	6	2	-	-	12	7.9
Ahasverus	2	-	3	-	-	-	5	3.3
Tribolium	1	-	-	-	-	-	1	0.7
Mites	-	-	-	4	-	-	4	2.6
'Weevils'	-	-	-	-	1	-	1	0.7
'Any grain pest'	-	-	5	2	4	-	11	7.3
Total sites	35	16	70	15	15	-	151	

Note: No answer for 20 sites.
Some sites specified more than one pest.
Although the question referred to insects, 'mites' were specified at four sites.

Table 26. **Insect detection methods used at sites in last 12 months - individual methods.**

Methods used	N	M+W	Region E	SE	SW	Wales	Total Sites	Percent of sites
Spear/sieve	33	16	61	14	9	1	134	78.8
Vacuum/sieve	9	3	10	6	5	1	34	20.0
Sieve	10	2	6	3	-	1	22	12.9
Probe trap	10	9	23	2	3	-	47	27.6
Pitfall trap	4	5	19	2	3	-	33	19.4
Bait bag	8	3	11	2	2	-	26	15.3
Visual	26	5	45	15	14	-	105	61.8
Other methods	1	1	4	2	2	-	10	5.9
NONE	1	1	6	-	1	1	10	5.9
Total Sites	39	19	71	20	18	3	170	

Note: No answer at one site.
One 'vacuum/sieve' was examined visually rather than by sieving.
Other methods were:- temperature - 7 sites
smell - 3 sites
sticky trap - 1 site
(total 10 sites)

Table 27. Insect detection methods used at sites in last 12 months - grain sampling and insect trapping.

Methods used	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of total sites
Grain sampling								
Spear only	25	14	51	9	8	1	108	63.5
Vacuum only	1	1	-	1	4	1	8	4.7
Spear + vacuum	8	2	10	5	1	-	26	15.3
Total sampling	34	17	61	15	13	2	142	83.5
Insect trapping								
Probe trap only	6	4	7	2	-	-	19	11.2
Pitfall trap only	2	1	4	-	-	-	7	4.1
Baitbag only	5	-	2	-	-	-	7	4.1
Probe + pitfall	1	2	8	-	2	-	13	7.6
Probe + baitbag	2	1	2	-	1	-	6	3.5
Pitfall + baitbag	-	-	1	2	1	-	4	2.4
Probe + pitfall + baitbag	1	2	6	-	-	-	9	5.3
Total trapping	17	10	30	4	4	-	65	38.2
Total sampling or trapping	38	17	61	15	14	2	147	86.5
Sieving only	-	-	-	1	-	-	1	0.6
Visual only	-	1	4	4	3	-	12	7.1
NONE	1	1	6	-	1	1	10	5.9
Total sites	39	19	71	20	18	3	170	

Note: No answer at one site.

Table 28. Number of sites where the fabric of the store or machinery in them had been treated with insecticide in last 12 months, and the reason for these treatments.

Region	Fabric treated? Yes	No	Reason for treatment Prophylaxis	Prophylaxis and infestation	Known infestation
N	34	5	33	1	-
M+W	17	2	15	2	-
E	59	11	55	1	3
SE	18	2	17	1	-
SW	16	2	13	-	3
Wales	1	2	1	-	-
Total sites	145	24	134	5	6
Percent of total sites	85.8	14.2			
Percent of treated sites			92.4	3.4	4.1

Note: No answer at two sites

Table 29. Insecticides used at sites to treat the fabric of the store or machinery.

Insecticide and formulation	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of treated sites
Pirimiphos-methyl								
EC	22	9	29	12	8	-	80	55.2
WP	2	3	2	-	2	-	9	6.2
Unknown spray	-	-	-	-	2	-	2	1.4
dust	8	2	13	4	5	-	32	22.1
smoke	7	5	14	11	5	-	42	29.0
fog	-	1	1	-	-	-	2	1.4
Total PM sites	28	14	39	15	13	-	109	75.2
Chlorpyrifos-methyl								
EC	3	4	8	2	-	-	17	11.7
unknown spray	-	-	1	-	-	-	1	0.7
dust	1	-	-	-	-	-	1	0.7
smoke	-	-	1	-	-	-	1	0.7
Total CPM sites	3	4	10	2	-	-	19	13.1
Etrimfos								
EC	5	2	6	2	2	-	17	11.7
WP	-	-	2	-	-	-	2	1.4
dust	2	-	1	-	2	-	5	3.4
smoke	-	-	1	-	-	-	1	0.7
Total Etrimfos sites	5	2	8	2	2	-	19	13.1

(continued)

Table 29. (continued) - Insecticides used on fabric.

Insecticide and formulation	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of treated sites
Methacrifos								
EC	-	-	4	1	1	-	6	4.1
Fenitrothion								
EC	1	-	-	-	-	-	1	0.7
WP	2	-	-	-	-	-	2	1.4
total Fen. sites*	3	-	-	-	-	-	3	2.1
Pyrethroids (including mixtures with OPs.)								
Turbair GSI (Fen + pyr.)	2	2	10	-	-	-	14	9.7
Multispray (pyr. + OP)	1	-	1	-	1	-	3	2.1
ULV500 (pyr.)	-	-	-	1	-	-	1	0.7
Pybuthrin fog	-	-	1	-	1	-	2	1.4
Pyrethroid WP	-	-	-	-	-	1	1	0.7
total pyrethroid sites	3	2	12	1	1	1	20	13.8
Phosphine	-	-	1	-	-	-	1	0.7
Unknown insecticide	1	1	4	-	1	-	7	4.8
Total treated sites	34	17	59	18	16	1	145	
Average number of formulations used per treated site	1.7	1.7	1.7	1.8	1.9	1.0	1.7	

Note: EC = emulsifiable concentrate; WP = wettable powder; OP = organophosphorous insecticide; GSI = grain store insecticide
*the 'total Fenitrothion sites' does not include the sites where this compound was used in a mixture with pyrethroids - see Turbair GSI.

Table 30. Number of sites where some or all of the grain had been treated with insecticide in the last 12 months.

Region	Contact insecticide Amount of grain treated All	Part	None	Fumigant Amount treated Part	None	Insecticide or fumigant used Yes	No
N	10	18	11	3	36	30	9
M+W	5	6	8	1	18	12	7
E	18	26	26	7	63	48	22
SE	9	7	4	1	19	16	4
SW	9	6	3	1	17	15	3
Wales	-	-	3	-	3	-	3
Total Sites	51	63	55	13	156	121	48
Percent of total sites (n = 169)	30.2	37.3	32.5	7.7	92.3	71.6	28.4

Note: no answer at 2 sites

Table 31. Reason given by site managers for grain treatments.

Region	Contact insecticide Reason for treatment Prophylaxis	Prophylaxis and infestation	Known infestation	Fumigant Reason for treatment Prophylaxis	Known infestation	Total sites treated for infestation
N	17	-	10	1	2	12
M+W	5	2	3	-	1	6
E	31	2	11	-	7	20
SE	11	2	3	-	1	6
SW	9	2	4	-	1	6
Wales	-	-	-	-	-	-
Total Sites	73	8	31	1	12	50
Percent of treated sites (n = 112)	65.2	7.1	27.7	-	-	42.0 (n=119)

Note: no reason given for treatment with contact insecticide at two sites

Table 32. Estimated quantity of grain treated with insecticide in last 12 months at sites visited.

	Wheat		Barley		Oats		Total grain	
Region	No. sites	tonnes	No. sites	tonnes	No. sites	tonnes	No. sites	tonnes
N	17	145,235	22	295,926	1	4,500	28	445,661
M+W	4	48,300	9	146,543	-	-	10	194,843
E	36	246,609	22	196,091	1	700	46	443,400
SE	9	120,565	12	118,352	3	1,050	14	239,967
SW	13	78,700	10	121,700	4	6,050	15	206,450
Wales	-	-	-	-	-	-	-	-
Total Sites	79	639,409	75	878,612	9	12,300	113	1,530,321

Note: Quantity treated not specified at eight sites
Average quantity of grain treated per site = 13,543 tonnes

Table 33. Insecticides used on grain in last 12 months at sites visited.

Insecticide and formulation	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of treated sites
Pirimiphos-methyl								
spray	13	3	11	6	6	-	39	32.2
dust	11	5	22	7	13	-	58	47.9
smoke	2	-	-	-	1	-	3	2.5
total PM sites	24	8	29	13	14	-	88	72.7
Chlorpyrifos-methyl								
spray	7	6	8	3	1	-	25	20.7
Etrimfos								
spray	1	1	5	-	2	-	9	7.4
dust	1	1	3	2	1	-	8	6.6
smoke	-	-	-	-	1	-	1	0.8
total Etrimfos sites	2	1	8	2	2	-	15	12.4
Methacrifos								
spray	1	-	5	-	-	-	6	5.0
dust	-	-	-	-	1	-	1	0.8
unknown	-	-	1	-	-	-	1	0.8
total Methacrifos sites	1	-	6	-	1	-	8	6.6
Fumigants								
Methyl bromide	1	-	3	-	1	-	5	4.1
Phosphine	1	-	3	1	-	-	5	4.1
Liquid fumigant	-	1	-	-	-	-	1	0.8
Unknown fumigant	1	-	1	-	-	-	2	1.7
total fumig. sites	3	1	7	1	1	-	13	10.7
Total treated sites	30	12	48	16	15	-	121	
Average number of formulations used per treated site	1.3	1.4	1.3	1.2	1.8	-	1.4	

Table 34. Method by which the grain was admixed at sites treating the grain with contact insecticide.

Region	Method: Bulk by machine	Method: Surface treatment	Method: Other method	Method: Unknown	Total sites where grain treated
N	19	7	3	-	28
M+W	6	2	3	-	11
E	27	15	3	1	44
SE	11	4	3	-	16
SW	7	5	8	-	15
Wales	-	-	-	-	-
Total sites	70	33	20	1	114
Percent of sites	61.4	28.9	17.5	0.9	

Table 35. Who carried out the insecticide treatments at each site.

Treatment and operator	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of sites
Fabric treatment								
own staff only	23	12	28	16	13	1	93	84.5
other operator only	4	-	9	1	1	-	15	13.6
own + other	-	-	2	-	-	-	2	1.8
total sites	27	12	39	17	14	1	110	
Grain admixture								
own staff only	21	9	29	14	12	-	85	98.8
own + other	1	-	-	-	-	-	1	1.2
total sites	22	9	29	14	12	-	86	
Grain surface								
own staff only	7	2	14	4	4	-	31	93.9
other operator only	-	-	1	-	-	-	1	3.0
own + other	-	-	-	-	1	-	1	3.0
total sites	7	2	15	4	5	-	33	
Fumigation								
own staff only	-	-	-	1	-	-	1	
other operator only	2	1	7	-	1	-	11	
total sites	2	1	7	1	1	-	12	

Note: No answer for fabric treatment (35 sites); admixture (4 sites); fumigation (1 site)

Table 36. Summary of number of sites where fabric and/or some or all grain was treated with insecticide in last 12 months.

Treatment	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of total sites
Fabric only	8	5	18	3	3	1	38	22.4
Fabric and grain	26	12	40	15	13	-	106	62.4
Grain only	4	-	7	1	2	-	14	8.2
Fabric, but grain unknown	-	-	1	-	-	-	1	0.6
Grain, but fabric unknown	-	-	1	-	-	-	1	0.6
Total treated sites	38	17	67	19	18	1	160	94.1
Untreated sites	1	2	4	1	-	2	10	5.9
Total sites	39	19	71	20	18	3	170	
Total fabric	34	17	59	18	16	1	145	85.3
Total grain	30	12	48	16	15	-	121	71.2

Note: No answer for fabric and grain treatment at one site

Table 37. Insecticides used on fabric or grain at each site in last 12 months.

Insecticide and formulation	Region N	M+W	E	SE	SW	Wales	Total Sites	Percent of treated sites
Pirimiphos-methyl								
spray	26	12	31	14	13	-	96	60.0
dust	17	5	30	10	13	-	75	46.9
smoke	7	5	14	11	6	-	43	26.9
fog	-	1	1	-	-	-	2	1.3
total PM sites	35	15	50	18	17	-	135	84.4
Chlorpyrifos-methyl								
spray	8	7	10	3	1	-	29	18.1
dust	1	-	-	-	-	-	1	0.6
smoke	-	-	1	-	-	-	1	0.6
total CPM sites	8	7	11	3	1	-	30	18.8
Etrimfos								
spray	6	2	12	2	2	-	24	15.0
dust	2	1	3	2	2	-	10	6.3
smoke	-	-	1	-	1		2	1.3
total Etrimfos sites	6	2	12	3	2	-	25	15.6
Methacrifos								
spray	1	-	6	1	1	-	9	5.6
dust	-	-	-	-	1	-	1	0.6
unknown	-	-	1	-	-	-	1	0.6
total Methacrifos sites	1	-	7	1	2	-	11	6.9
Fenitrothion								
spray	3	-	-	-	-	-	3	1.9
mixture with pyrethroids	2	2	10	-	-	-	14	8.8
total Fen. sites	5	2	10	-	-	-	17	10.6
Pyrethroids	3	2	12	1	1	1	20	12.5
Fumigants	3	1	7	1	1	-	13	8.1
Unknown insectide	1	1	4	-	1	-	7	4.4
Total treated sites	38	17	67	19	18	1	160	

Table 38. Number of sites said to have had a rodent infestation in last 12 months.

Region	Infestation? Yes	No	Total sites	Rodent Rats	Mice
N	30	9	39	24	28
M+W	17	2	19	14	17
E	42	29	71	33	40
SE	17	3	20	16	16
SW	14	5	19	13	10
Wales	3	-	3	3	2
Total sites	123	48	171	103	113
Percent of sites	71.9	28.1		60.2	66.1

Table 39. Number of sites where rodenticide treatment had been undertaken in last 12 months.

Region	Treatment? Yes	No	Total sites	Target rodent Rats	Mice
N	38	1	39	32	35
M+W	18	1	19	16	17
E	70	1	71	64	68
SE	20	-	20	18	19
SW	18	1	19	18	12
Wales	3	-	3	3	2
Total sites	167	4	171	151	153
Percent of sites	97.7	2.3		88.3	89.5

Table 40. Rodenticides used at sites in last 12 months.

Rodenticide and formulation	Region N	M+W	E	SE	SW	Wales	Total sites	Percent of treated sites
Bromadiolone								
grain	17	3	10	9	2	-	41	
gel	19	2	-	-	-	-	21	
pellet	1	-	-	-	1	-	2	
wax	-	-	3	-	-	-	3	
liquid	-	-	3	-	-	-	3	
paste	1	-	-	-	-	-	1	
lard	-	-	1	1	-	-	2	
sachet	-	-	1	-	-	-	1	
bait	-	-	1	-	-	-	1	
unknown	-	-	1	-	1	-	2	
Total Bromad. sites	25	5	17	10	4	-	61	36.5
Calciferol								
grain	3	4	8	4	-	-	19	
wax	1	-	3	-	-	-	4	
block	-	-	-	1	-	-	1	
canary seed	1	-	-	1	-	-	2	
meal	-	-	2	-	-	-	2	
unknown	-	-	1	1	-	-	2	
Total Calcif. sites	5	4	12	7	-	-	28	16.8
Chlorophacinone								
grain	5	2	9	2	-	-	18	
pellet	1	-	1	-	-	-	2	
liquid	-	-	2	-	-	-	2	
Total Chlor. sites	6	2	11	2	-	-	21	12.6
Coumatetralyl								
grain	1	1	4	-	-	-	6	
pellet	1	-	-	-	-	-	1	
dust	-	1	1	-	-	-	2	
sachet	-	-	3	-	-	-	3	
Total Coum. sites	2	2	8	-	-	-	12	7.2
Difenacoum								
grain	4	6	9	6	-	1	26	
pellet	1	5	1	-	1	1	9	
dust	-	-	1	-	-	-	1	
wax	-	-	2	1	-	1	4	
liquid	-	-	1	-	-	-	1	
unknown	-	-	1	-	-	-	1	
Total Difen. sites	5	11	14	7	1	1	39	23.4

(continued)

Table 40. (continued) - Rodenticides used at sites in last 12 months.

Rodenticide and formulation	Region N	M+W	E	SE	SW	Wales	Total sites	Percent of treated sites
Warfarin								
grain	4	-	4	-	3	-	11	
dust	3	1	-	-	2	-	6	
liquid	5	-	2	2	1	-	10	
Total Warf. sites	11	1	6	2	5	-	25	15.0
Brodifacoum								
grain	-	-	2	1	-	-	3	
wax	2	-	2	-	-	-	4	
Total Brodif. sites	2	-	4	1	-	-	7	4.2
Alphachloralose								
grain	-	-	4	-	-	-	4	2.4
Flocoumafen								
grain	-	-	1	-	-	-	1	0.6
Lindane								
gel	-	-	1	-	-	-	1	
dust	-	-	1	-	-	-	1	
Total Lind. sites	-	-	1	-	-	-	1	0.6
Sodium cyanide	-	1	1	2	-	-	4	2.4
Aluminium phosphide	-	-	-	1	-	-	1	0.6
Zinc phosphide	-	-	1	-	-	-	1	0.6
Unknown rodenticide								
grain	1	-	15	1	9	-	26	
dust	-	-	1	-	-	-	1	
pellet	-	-	1	1	-	-	2	
wax	-	-	2	1	2	-	5	
liquid	-	-	1	-	-	-	1	
paste	-	-	2	-	-	-	2	
lard	-	-	2	-	-	-	2	
sachet	-	-	1	-	-	-	1	
tubes	-	-	1	-	-	-	1	
unknown	-	2	12	-	2	2	18	
Total 'unknown' sites	1	2	31	2	11	2	49	29.3
Total treated sites	38	18	70	20	18	3	167	
Average number of formulations per site	1.9	1.6	1.8	1.8	1.3	1.7	1.7	

Note: No distinction has been made between the use of a mixture of compounds and the use of more than one compound.

Table 41. Who carried out rodenticide treatment at each site.

Region	Own Staff	Contractor	Operator Local authority	Own and Contractor	Own and Local	Contractor and Local	Total sites
N	12	20	1	3	2	-	38
M+W	10	7	1	-	-	-	18
E	20	42	-	5	1	2	70
SE	5	11	3	1	-	-	20
SW	4	9	2	2	-	-	17
Wales	-	2	-	-	1	-	3
Total Sites	51	91	7	11	4	2	166
Percent of sites	30.7	54.8	4.2	6.6	2.4	1.2	

Note: no answer at one site

Table 42. Cost of rodenticide treatments at each site in last 12 months.

Region	Operator: Own Staff	Contractor	Local authority	Own and Contractor	Own and Local	Contractor and local	Total
N							
No. sites	8	19	1	2	1	-	31
total cost £	1,810	8,209	250	480	230	-	10,979
M+W							
no. sites	9	6	-	-	-	-	15
total cost £	2,646	3,082	-	-	-	-	5,728
E							
no. sites	15	27	-	5	-	2	49
total cost £	6,475	13,334	-	2,560	-	772	23,141
SE							
no. sites	4	7	3	1	-	-	15
total cost £	270	5,272	537	900	-	-	6,979
SW							
no. sites	4	7	2	-	-	-	13
total cost £	1,110	1,230	227	-	-	-	2,567
Wales							
no. sites	-	1	-	-	1	-	2
total cost £	-	1,200	-	-	400	-	1,600
Total							
no. sites	40	67	6	8	2	2	125
total cost £	12,311	32,327	1,014	3,940	630	772	50,994
average cost per site £	308	482	169	493	315	386	408

Note: No estimate of cost was given for 42 sites

Table 43. Site managers' views of the effectiveness of rodenticide treatments carried out in last 12 months.

Region	Effectiveness	Own Staff	Contractor	Operator Local authority	Own and Contractor	Own and Local	Contractor and Local	Total
N	very	8	17	1	1	1	-	28
	partially	4	3	-	2	1	-	10
M+W	very	6	5	-	-	-	-	11
	partially	3	2	1	-	-	-	6
E	very	11	21	-	2	1	2	37
	partially	9	21	-	3	-	-	33
SE	very	4	6	2	1	-	-	13
	partially	1	5	1	-	-	-	7
SW	very	3	6	1	2	-	-	12
	partially	1	3	1	-	-	-	5
Wales	very	-	2	-	-	-	-	2
	partially	-	-	-	-	1	-	1
Total	very	32	57	4	6	2	2	103
	partially	18	34	3	5	2	-	62
Total sites		50	91	7	11	4	2	165
Percent of sites	very	64.0	62.6	57.1	54.5	50.0	100	62.4
	partially	36.0	37.4	42.9	45.5	50.0	-	37.6

Note: No answer for two sites
None of the sites judged the treatment to be 'ineffective'

Table 44. Combinations of rodenticides used at each site, and the managers' views of the effectiveness of treatments.

Rodenticide	Effectiveness very	Effectiveness partially	Total sites
Bromadiolone sites			
Bromad only	17	7	24
Bromad + Calcif	3	2	5
Bromad + Chlor	2	-	2
Bromad + Coum	1	-	1
Bromad + Difen	3	1	4
Bromad + Warf	6	2	8
Bromad + Brodif	-	1	1
Bromad + Calcif + Difen	1	2	3
Bromad + Chlor + Coum	1	1	2
Bromad + Chlor + Difen	2	-	2
Bromad + Chlor + Warf	1	2	3
Bromad + Coum + Difen	1	-	1
Bromad + Difen + Lindane	1	-	1
Bromad + Unknown	3	1	4
Total Bromad sites	42	19	61
Calciferol sites			
Calcif only	6	2	8
Calcif + Bromad	3	2	5
Calcif + Coum	-	1	1
Calcif + Difen	3	1	4
Calcif + Warf	1	1	2
Calcif + Floc	-	1	1
Calcif + NaCN	1	-	1
Calcif + Bromad + Difen	1	2	3
Calcif + Chlor + Alpha	1	-	1
Calcif + Difen + Wharf	2	-	2
Total Calcif sites	18	10	28

(continued)

Table 44. (continued) - Combinations of rodenticides used at each site, and the managers' views of the effectiveness of treatments.

Rodenticide	Effectiveness very	Effectiveness partially	Total sites
Chlorophacinone sites			
Chlor only	-	2	2
Chlor + Bromad	2	-	2
Chlor + Coum	1	-	1
Chlor + Difen	2	-	2
Chlor + Brodif	1	-	1
Chlor + Alpha	-	1	1
Chlor + Bromad + Coum	1	1	2
Chlor + Bromad + Difen	2	-	2
Chlor + Bromad + Warf	1	2	3
Chlor + Calcif + Alpha	1	-	1
Chlor + Difen + NaCN	1	-	1
Chlor + Brodif + Alpha	2	-	2
Chlor + Difen + Warf + NaCN + AlPH	1	-	1
Total Chlor Sites	15	6	21
Coumatetralyl sites			
Coum only	2	1	3
Coum + Bromad	1	-	1
Coum + Calcif	-	1	1
Coum + Chlor	1	-	1
Coum + Difen	2	-	2
Coum + Bromad + Chlor	1	1	2
Coum + Bromad + Difen	1	-	1
Coum + Unknown	-	1	1
Total Coum Sites	8	4	12

(continued)

Table 44. (continued) - Combinations of rodenticides used at each site, and the managers' views of the effectiveness of treatments.

Rodenticide	Effectiveness very	Effectiveness partially	Total sites
Difenacoum sites			
Difen only	8	8	16
Difen + Bromad	3	1	4
Difen + Calcif	3	1	4
Difen + Chlor	2	-	2
Difen + Coum	2	-	2
Difen + Bromad + Calcif	1	2	3
Difen + Bromad + Chlor	2	-	2
Difen + Bromad + Coum	1	-	1
Difen + Bromad + Lindane	1	-	1
Difen + Calcif + Warf	2	-	2
Difen + Chlor + NaCN	1	-	1
Difen + Chlor + Warf + NaCN + AlPH	1	-	1
Total Difen Sites	27	12	39
Warfarin sites			
Warf only	2	4	6
Warf + Bromad	6	2	8
Warf + Calcif	1	1	2
Warf + Brodif	1	1	2
Warf + Bromad + Chlor	1	2	3
Warf + Calcif + Difen	2	-	2
Warf + Difen + Chlor + NaCN + AlPH	1	-	1
Warf + Unknown	1	-	1
Total Warf Sites	15	10	25

(continued)

Table 44. (continued) - Combinations of rodenticides used at each site, and the managers' views of the effectiveness of treatments.

Rodenticide	Effectiveness very	Effectiveness partially	Total sites
Brodifacoum sites			
Brodif only	1	-	1
Brodif + Bromad	-	1	1
Brodif + Chlor	1	-	1
Brodif + Warf	1	1	2
Brodif + Chlor + Alpha	2	-	2
Total Brodif Sites	5	2	7
Alphachloralose sites			
Alpha + Chlor	-	1	1
Alpha + Calcif + Chlor	1	-	1
Alpha + Chlor + Brodif	2	-	2
Total Alpha Sites	3	1	4
Flocoumafen sites			
Floc + Calcif	-	1	1

Note: No distinction has been made between formulated mixtures and the use of more than one compound.
Sites using more than one active ingredient occur in each of the relevant site categories.
A total of 124 sites are represented in this table; of the other 43 treated sites, one used zinc phosphide plus an 'unknown' rodenticide, and 42 were totally 'unknown'.

Abbreviations:

Alpha	= Alphachloralose	Coum	= Coumatetralyl
AlPH	= Aluminium phosphide	Difen	= Difenacoum
Brodif	= Brodifacoum	Floc	= Flocoumafen
Bromad	= Bromadiolone	Lindane	= Lindane
Calcif	= Calciferol	NaCN	= Sodium cyanide
Chlor	= Chlorophacinone	Warf	= Warfarin

Table 45. Additional methods used to control rodents in last 12 months.

Region	Method						Total sites using additional method
	Ultrasonics	Trap	Shoot	Cat	Dog	Other Method	
N	-	3	1	2	3	2	12
M+W	-	1	-	-	2	-	3
E	2	6	4	7	1	2	18
SE	1	4	2	3	2	-	9
SW	-	-	2	4	-	-	6
Wales	-	-	1	2	-	-	2
Total sites	3	14	10	18	8	4	50

Note: Method not specified at one N site
Some sites used more than one additional method
All sites used rodenticide

Table 46. Number of sites said to have had a bird infestation in last 12 months.

Region	Infestation? Yes	No	Total Sites	Bird Pigeon	Sparrow	Starling	Other
N	23	16	39	19	12	1	4
M+W	18	1	19	14	6	-	-
E	30	41	71	22	18	1	1
SE	5	15	20	4	2	-	-
SW	13	6	19	12	1	2	-
Wales	2	1	3	1	-	-	1
Total sites	91	80	171	72	39	4	6
Percent of sites	53.2	46.8		42.1	22.8	2.3	3.5

Note: 'Pigeon' includes collared dove

Table 47. Number of sites where bird control had been undertaken in last 12 months.

	Bird control undertaken?						
	At sites where infestation reported*		At sites where no infestation reported		Total	Total	Total
Region	Yes	No	Yes	No	'yes'	'no'	sites
N	11	12	1	15	12	27	39
M+W	9	9	-	1	9	10	19
E	16	14	9	32	25	46	71
SE	2	3	-	15	2	18	20
SW	6	6	-	6	6	12	18
Wales	2	-	-	1	2	1	3
Total sites	46	44	10	70	56	114	170
Percent of sites					32.9	67.1	

Note: No answer at one site (at which infestation reported)

* ie said to have had a bird infestation in last 12 months

Table 48. Bird control methods used at each site and the managers' views of their effectiveness.

Method of bird control	Bird infestation in last 12 months	Effectiveness and operator: very own	very cont.	partially own	partially cont.	ineffective own	ineffective cont.	Total Sites
Proofing only	Pigeon	2	1	1	1	-	-	5
	Sparrow	-	-	1	3*	-	-	4
	Pigeon + Sparrow	2	-	1	-	-	-	3
	Sparrow + Starling	-	-	1	-	-	-	1
	Other bird	-	-	-	-	-	-	1**
	None	7	-	1	1	-	-	9
		11	1	5	5	-	-	23
Shooting only	Pigeon	7	1	6	-	3	-	17
	Pigeon + Starling	1	-	-	-	-	-	1
	Pigeon + Sparrow + Other	-	-	1	-	-	-	1
	None	1	-	-	-	1	-	2
		9	1	7	-	4	-	21
Baiting only	Pigeon	-	1	-	1	-	-	2
	Pigeon + Sparrow	-	-	-	-	-	1	1
Bait + Shoot	Pigeon	-	-	-	1	-	1	2
Proof + Shoot	Pigeon + Sparrow	-	-	1	-	-	-	1
	Sparrow	1	-	1	-	-	-	2
Proof + Nest Removal	Pigeon + Sparrow	1	-	-	-	-	-	1
Shoot + Trap	Pigeon	1	-	-	-	-	-	1
Nest Removal only	Pigeon + Sparrow + Other	1	-	-	-	-	-	1
'Good Hygiene'	Pigeon + Sparrow	1	-	-	-	-	-	1
Total Sites		25	3	14	7*	4	2	56

* One of these was both 'own' and 'cont.' (own staff and contractor)
** Effectiveness and operator not specified

Table 49. Sources from which advice was sought and/or gained on grain storage in last 12 months.

Source	N	Region M+W	E	SE	SW	Wales	Total Sites	Percent of all Sites (n = 171)
Advice on pest control								
Chemical Company	8	2	24	3	2	-	39	22.8
Agricultural Company	1	1	1	-	1	-	4	2.3
ADAS Staff	6	1	16	2	5	1	31	18.1
ADAS Leaflets	5	-	5	-	2	-	12	7.0
Total ADAS	9	1	17	2	5	1	35	20.5
Consultants	1	-	7	1	2	-	11	6.4
Other source	7	4	11	5	4	-	31	18.1
Total Sites Advised	21	7	48	10	10	1	97	56.7
Other advice								
Chemical Company	1	-	3	-	5	-	9	5.3
Agricultural Company	3	-	1	-	3	-	7	4.1
ADAS Staff	2	1	9	2	5	-	19	11.1
ADAS Leaflets	3	-	2	2	6	-	13	7.6
Total ADAS	4	1	10	3	8	-	26	15.2
Consultants	3	-	1	-	4	-	8	4.7
Other source	6	2	13	2	4	-	27	15.8
Total Sites Advised	15	3	23	5	12	-	58	33.9
All advice								
Chemical Company	8	2	26	3	5	-	44	25.7
Agricultural Company	4	1	2	-	3	-	10	5.9
ADAS Staff	6	2	20	4	7	1	40	23.4
ADAS Leaflets	6	-	5	2	6	-	19	11.1
Total ADAS	10	2	21	5	9	1	48	28.1
Consultants	3	-	7	1	4	-	15	8.8
Other source	9	5	14	6	4	-	38	22.2
Total Sites Advised	25	9	52	12	14	1	113	66.1
TOTAL SITES	39	19	71	20	19	3	171	

Table 50. Number of storage structures inspected by WSB Advisers at each site visited.

Region	No. of stores inspected per site 0	1	2	3	4	Total sites visited	Total sites inspected	Total stores inspected
N	2	18	7	11	1	39	37	69
M+W	-	11	3	4	1	19	19	33
E	7	31	18	13	2	71	64	114
SE	1	11	4	2	2	20	19	33
SW	4	7	4	1	3	19	15	30
Wales	-	2	1	-	-	3	3	4
Total Sites	14	80	37	31	9	171	157	
Total Stores	-	80	74	93	36			283

Note: WSB = Wildlife and Storage Biology Discipline of ADAS.

Table 51. Sites visited but not inspected.

Type of site	No. of sites	Reason not inspected: External bins only	Reason not inspected: Other reasons
Commercial trading	6	2	4
Co-operative	5	5	-
Comm. + Co-op.	2	1	1
Comm. + Co-op. + Port	1	1	-
Total	14	9	5

Note: Use of site - 12 sites solely grain storage
1 site storage and seed cleaning
1 site storage and milling

Table 52. Number and capacity of stores inspected.

Region	Total no. of Sites	Total no. of Stores	Floor-stores No. Sites	Floor-stores No. Floors	Floor-stores Capacity Tonnes	Internal bins No. Sites	Internal bins No. Bins	Internal bins Capacity Tonnes	Total Capacity Tonnes
N	37	69	34	62	614,515	11	287	30,950	645,465
M+W	19	33	19	30	536,900	2	40	6,260	543,160
E	64	114	62	108	1,264,450	8	103	14,735	1,279,185
SE	19	33	13	17	220,000	11	349	30,500	250,500
SW	15	30	14	26	256,550	3	165	38,000	294,550
Wales	3	4	2	3	13,530	1	14	300	13,830
Total	157	283	144	246	2,905,945	36	958	120,745	3,026,690
Percent*	91.8	-	96.0	67.0	80.7	67.9	67.9	77.7	69.9

Note: * The percentages are of totals for all 171 sites visited. (See Table 8).
External bins were not inspected.

Table 53. Fabric of internal bins in stores inspected.

Fabric of bin	No. of sites	No. of bins	Percent of bins	Capacity tonnes	Percent of bin capacity
Metal	19	426	44.5	29,185	24.2
Metal + Wood	1	52	5.4	1,000	0.8
Concrete	10	360	37.6	75,040	62.1
Brick + Wood	1	3	0.3	3,800	3.1
Wood + asbestos	1	16	1.7	1,200	1.0
Mesh + lining	1	42	4.4	4,200	3.5
Unknown	3	59	6.2	6,320	5.2
Total	36	958		120,745	

Table 54. Type of floor-stores inspected.

Region	Purpose-Built			Hangar			Other Type		
	No. of Sites	No. of Stores	Capacity Tonnes	No. of Sites	No. of Stores	Capacity Tonnes	No. of Sites	No. of Stores	Capacity Tonnes
N	23	38	262,800	3	7	98,000	12	17	253,715
M+W	10	15	153,400	7	13	312,000	2	2	71,500
E	35	60	583,450	19	28	293,600	15	20	387,400
SE	10	12	125,000	3	3	30,000	1	2	65,000
SW	7	14	57,650	3	6	170,000	5	6	28,900
Wales	2	2	13,500	-	-	-	1	1	30
Total	87	141	1,195,800	35	57	903,600	36	48	806,545
Percent	60.4	57.3	41.2	24.3	23.2	31.1	25.0	19.5	27.8

Note: Some sites had more than one type of floor-store.

Table 55. Presence and fabric of grain walling in floor-stores inspected.

	Region						Total	Percent
	N	M+W	E	SE	SW	Wales	Stores	of stores
Grain walling present?								
Yes	41	26	97	15	22	2	203	82.5
No	21	4	11	2	4	1	43	17.5
Total	62	30	108	17	26	3	246	
Fabric of walling								
Metal	15	15	60	7	2	-	99	48.8
Metal + Wood	2	1	7	1	-	-	11	5.4
Metal + Wood + Straw	-	1	-	-	-	-	1	0.5
Concrete	6	-	4	1	6	-	17	8.4
Concrete + Metal	-	-	-	3	-	1	4	2.0
Concrete + Wood	2	1	2	-	3	1	9	4.4
Brick	-	-	1	-	-	-	1	0.5
Brick + Metal	1	-	1	-	-	-	2	1.0
Brick + Metal + Wood + Asbestos	-	1	-	-	-	-	1	0.5
Wood	11	7	21	3	11	-	53	26.1
Wood + Asbestos	-	-	1	-	-	-	1	0.5
Mesh + Lining	1	-	-	-	-	-	1	0.5
Total	38	26	97	15	22	2	200	

Note: Fabric of walling not specified for three floor-stores.

Table 56. Number of inspected floor-stores with grain surcharged above grain walling.

Region	Stores with walling	Walling but no grain	Walling and grain present	Grain surcharged? Yes	No
N	41	3	38	30	7
M+W	26	2	24	15	6
E	97	6	91	83	8
SE	15	-	15	12	3
SW	22	1	21	17	4
Wales	2	-	2	2	-
Total	203	12	191	159	28
Percent				85.0	15.0

Note: Not known whether grain surcharged in four floor-stores

Table 57. Quantity of grain present in floor-stores and internal bins at time of inspection.

Region	Floor-stores No. Stores	Floor-stores Content Tonnes	Internal bins No. Stores	Internal bins Content Tonnes	Total Content No. Stores	Total Content Tonnes
WHEAT						
N	31	137,560	6	11,930	36	149,490
M+W	14	79,820	2	2,025	16	81,845
E	54	474,323	4	3,214	56	477,537
SE	13	57,005	15	6,293	28	63,298
SW	12	61,846	4	20,081	16	81,927
Wales	-	-	-	-	-	-
Total	124	810,554	31	43,543	152	854,097
Percent*		82.7		89.9		70.8
BARLEY						
N	34	180,575	7	10,739	40	191,314
M+W	21	188,880	3	1,773	24	190,653
E	55	293,468	8	6,284	62	299,752
SE	7	65,542	12	8,599	19	74,141
SW	16	47,837	4	4,058	20	51,895
Wales	2	11,250	-	-	2	11,250
Total	135	787,552	34	31,453	167	819,005
Percent*		90.8		84.1		74.7

(continued)

Table 57. (continued) - Quantity of grain present in floor-stores and internal bins at time of inspection.

Region	Floor-stores No. Stores	Floor-stores Content Tonnes	Internal bins No. Stores	Internal bins Content Tonnes	Total Content No. Stores	Total Content Tonnes
OTHER GRAIN						
N	5	5,385	-	-	5	5,385
M+W	-	-	-	-	-	-
E	1	240	3	648	4	888
SE	1	90	5	474	6	564
SW	2	317	1	200	3	517
Wales	1	30	1	300	2	330
Total	10	6,062	10	1,622	20	7,684**
Percent*		100***		88.1		76.4
TOTAL GRAIN						
N	56	323,520	9	22,669	62	346,189
M+W	28	268,700	3	3,798	31	272,498
E	100	768,031	9	10,146	106	778,177
SE	17	122,637	16	15,366	33	138,003
SW	24	110,000	4	24,339	28	134,339
Wales	3	11,280	1	300	4	11,580
Total	228	1,604,168	42	76,618	264	1,680,786
Percent*		86.6		87.4		72.7

NOTE: * The percentages are of totals for all 171 sites visited (see Table 9)

** Total 'other grain'=5,796 tonnes oats, 1,360 maize, 528 rye.

***Unresolved discrepancy of 430 more tonnes of 'other grain' in N region than shown in Table 9

19 stores contained no grain at time of inspection

Table 58. Potentially infestable commodities other than cereal grain present in stores inspected.

Commodities	Region N	M+W	E	SE	SW	Wales	Total Stores	Percent of Stores
Stores with grain								
None	43	22	91	21	23	2	202	72.1
Rape only	4	2	7	-	-	-	13	4.6
Peas/beans only	8	4	3	3	2	-	20	7.1
Rape + peas/beans	2	2	-	5	-	-	9	3.2
Rape + other	1	-	-	-	-	-	1	0.4
Peas/beans + other	3	-	-	1	-	-	4	1.4
Rape + peas/beans + other	-	-	-	1	-	-	1	0.4
Rape + peas/beans + carobs + other	-	-	-	-	-	1	1	0.4
Other commodities only	1	1	3	2	2	1	10	3.6
	62	31	104	33	27	4	261	93.2
Stores with no grain								
None	2	1	5	-	2	-	10	3.6
Rape only	4	-	1	-	-	-	5	1.8
Peas/beans only	-	-	1	-	-	-	1	0.4
Rape + peas/beans + other	-	1	-	-	-	-	1	0.4
Other commodities only	1	-	1	-	-	-	2	0.7
	7	2	8	-	2	-	19	6.8
Total Stores								
None	45	23	96	21	25	2	212	75.7
Rape only	8	2	8	-	-	-	18	6.4
Peas/beans only	8	4	4	3	2	-	21	7.5
Rape + peas/beans	2	2	-	5	-	-	9	3.2
Rape + other	1	-	-	-	-	-	1	0.4
Peas/beans + other	3	-	-	1	-	-	4	1.4
Rape + peas/beans + other	-	1	-	1	-	-	2	0.7
Rape + peas/beans + carobs + other	-	-	-	-	-	1	1	0.4
Other commodities only	2	1	4	2	2	1	12	4.3
	69	33	112	33	29	4	280	100
Total rape	11	5	8	6	-	1	31	11.1
Total peas/beans	13	7	4	10	2	1	37	13.2
Total other commodities	6	2	4	4	2	2	20	7.1

Note: No answer for three stores

Table 59. Number of stores inspected in which the grain had been cooled.

	Region						Total	Percent
	N	M+W	E	SE	SW	Wales	Stores	of Stores
Grain Present?								
Yes	62	31	106	33	28	4	264	93.3
No	7	2	8	-	2	-	19	6.7
Total	69	33	114	33	30	4	283	
Cooling System Present?								
Yes	55	26	99	30	11	1	222	84.7
No	7	5	7	3	15	3	40	15.3
Total	62	31	106	33	26	4	262	
Grain Cooled?								
Yes	53	26	89	29	9	1	207	93.7
No	2	-	9	1	2	-	14	6.3
Total	55	26	98	30	11	1	221	

Note: Each question refers only to the stores answering 'Yes' to the questions above.
No answer to 'cooling system present' at two stores.
No answer to 'grain cooled' at one store.

Table 60. Number of stores inspected that monitored the temperature of the grain present.

	Region						Total	Percent
	N	M+W	E	SE	SW	Wales	Stores	of Stores
Is temperature measured?								
Yes	54	28	93	16	16	3	210	80.5
No	8	3	13	17	9	1	51	19.5
Total	62	31	106	33	25	4	261	
How is it measured?								
Fixed sensors	19	8	33	6	6	-	72	34.8
Fixed + spot	5	3	13	4	2	-	27	13.0
Spot measuring	29	17	46	6	8	2	108	52.2
Total	53	28	92	16	16	2	207	
Was it measured on intake?								
Yes	32	21	78	12	11	3	157	76.6
No	20	7	14	4	3	-	48	23.4
Total	52	28	92	16	14	3	205	
How often measured after intake?								
Daily	18	11	28	7	3	-	67	32.1
Weekly	16	4	44	5	9	1	79	37.8
Monthly	14	10	9	4	2	1	40	19.1
Less than monthly	5	3	11	-	1	-	20	9.6
Never	1	-	1	-	-	1	3	1.4
Total	54	28	93	16	15	3	209	

Note: No answer to 'is temperature measured?' for three stores.
No answer to 'how measured?' for three stores.
No answer to 'measured on intake?' for five stores.
No answer to 'how often measured?' for one store.

Only those stores which answered 'Yes' to 'Is temperature measured?' are included in the subsequent questions.

Table 61. Number of stores inspected that monitored the moisture content of the grain present.

	Region						Total	Percent
	N	M+W	E	SE	SW	Wales	Stores	of Stores
Is moisture content measured?								
Yes	61	31	104	32	24	3	255	97.3
No	1	-	2	1	2	1	7	2.7
Total	62	31	106	33	26	4	262	
How is it measured?								
Oven	-	4	-	-	-	-	4	1.6
Oven + meter	24	4	18	8	2	-	56	23.0
Meter	36	22	83	20	19	3	183	75.0
Other method	-	-	-	-	1	-	1	0.4
Total	60	30	101	28	22	3	244	
Was it measured on intake?								
Yes	60	30	101	31	22	3	247	99.6
No	-	-	1	-	-	-	1	0.4
Total	60	30	102	31	22	3	248	
How often measured after intake?								
Daily	-	-	2	2	-	-	4	1.6
Weekly	21	12	42	6	8	-	89	35.0
Monthly	23	9	38	15	4	1	90	35.4
Less than monthly	12	5	17	4	5	-	43	16.9
Never	5	5	5	5	6	2	28	11.0
Total	61	31	104	32	23	3	254	

Note: No answer to 'is moisture content measured?' for two stores.
No answer to 'how measured?' for eleven stores.
No answer to 'measured on intake?' for seven stores.
No answer to 'how often measured?' for one store.

Only those stores which answered 'Yes' to 'Is moisture content measured?' are included in the subsequent questions.

Table 62. Number of stores inspected that monitored the grain present for invertebrate pests.

	Region						Total	Percent
	N	M+W	E	SE	SW	Wales	Stores	of Stores
Is grain checked for pests?								
Yes	59	30	97	32	20	3	241	92.0
No	3	1	9	1	6	1	21	8.0
Total	62	31	106	33	26	4	262	
How is it checked?								
Spear/sieve	52	25	90	18	7	1	193	82.8
Vacuum/sieve	8	1	9	5	6	1	30	12.9
Sieve	8	1	9	4	-	-	22	9.4
Probe trap	12	10	26	3	5	-	56	24.0
Pitfall trap	1	4	16	2	2	-	25	10.7
Bait bag	7	2	2	2	3	-	16	6.9
Visual	26	3	55	24	13	1	122	52.4
Other	-	1	1	1	3	-	6	2.6
Total Stores	58	29	95	32	17	2	233	
Was it checked on intake?								
Yes	59	30	89	25	19	3	225	94.1
No	-	-	7	6	1	-	14	5.9
Total	59	30	96	31	20	3	239	
How often checked after intake?								
Daily	1	-	4	5	-	-	10	4.2
Weekly	20	12	48	14	5	-	99	41.9
Monthly	28	11	28	12	4	-	83	35.2
Less than monthly	8	3	15	1	3	1	31	13.1
Never	2	4	2	-	3	2	13	5.5
Total	59	30	97	32	15	3	236	

Note: No answer for two, eight, two and five stores respectively.

Only those stores which answered 'Yes' to 'Is grain checked for pests?' are included in the subsequent questions.

Table 63. Insect detection methods used in stores inspected - grain sampling and insect trapping.

Methods used	Region N	M+W	E	SE	SW	Wales	Total Stores	Percent of Stores
Grain sampling								
Spear only	46	24	81	13	7	1	172	67.7
Vacuum only	2	1	-	-	6	1	10	3.9
Spear + Vacuum	6	1	9	5	-	-	21	8.3
Total Sampling	54	26	90	18	13	2	203	79.9
Insect trapping								
Probe trap only	11	6	12	3	-	-	32	12.6
Pitfall trap only	-	-	3	-	-	-	3	1.2
Bait bag only	6	-	-	-	-	-	6	2.4
Probe + pitfall	-	2	12	-	2	-	16	6.3
Probe + bait bag	-	-	1	-	3	-	4	1.6
Pitfall + bait bag	-	-	-	2	-	-	2	0.8
Probe + pitfall + bait bag	1	2	1	-	-	-	4	1.6
Total Trapping	18	10	29	5	5	-	67	26.4
Total Sampling or Trapping	56	26	90	18	13	2	205	80.7
Sieving only	-	-	-	1	-	-	1	0.4
Visual only	2	3	5	13	1	-	24	9.4
Other method only	-	-	-	-	3	-	3	1.2
None	3	1	9	1	6	1	21	8.3
Total Stores	61	30	104	33	23	3	254	

Note: No grain present in 19 stores.
No answer for a further 10 stores.

Table 64. Number of stores where the manager was aware of the presence of pests.

	Region						Total	Percent
	N	M+W	E	SE	SW	Wales	Stores	of Stores
Insects present?								
Yes	4	1	5	1	3	-	14	5.0
No	65	31	107	32	26	4	265	95.0
Total Stores	69	32	112	33	29	4	279	
Mites present?								
Yes	11	14	26	11	-	1	63	22.5
No	58	19	87	22	28	3	217	77.5
Total Stores	69	33	113	33	28	4	280	
Rodents present?								
Yes	45	25	46	18	19	1	154	55.2
No	23	8	67	15	10	2	125	44.8
Total Stores	68	33	113	33	29	3	279	
Birds present?								
Yes	19	18	18	5	18	3	81	28.9
No	49	15	95	28	11	1	199	71.1
Total Stores	68	33	113	33	29	4	280	
Any of the above pests present?								
Yes	54	27	65	22	23	4	195	69.4
No	15	6	48	11	6	-	86	30.6
Total Stores	69	33	113	33	29	4	281	

Note: No answer for four, three, four, three, two stores respectively.

Table 65. Number of stores where the fabric of the store or machinery in it had been treated with insecticide in last 12 months, and the reason for these treatments.

Region	Fabric Treated? Yes	No	Reason for Treatment: Prophylaxis	Prophylaxis and infestation	Known infestation
N	58	11	55	1	-
M+W	24	9	21	2	1
E	86	27	84	-	2
SE	30	3	29	1	-
SW	21	7	17	-	4
Wales	1	3	1	-	-
Total Stores	220	60	207	4	7
Percent of Total Stores	78.6	21.4			
Percent of Treated Stores			95.0	1.8	3.2

Note: No answer to whether fabric treated for three stores.
No answer to reason for treatment for two stores.

Table 66. Insecticides used to treat the fabric of the store or machinery in stores inspected.

Insecticide and formulation	Region N	M+W	E	SE	SW	Wales	Total Stores	Percent of treated Stores
Pirimiphos-methyl								
EC	38	13	45	23	8	-	127	57.7
WP	1	5	2	-	5	-	13	5.9
Unknown spray	-	-	-	-	3	-	3	1.4
Dust	12	1	17	8	4	-	42	19.1
Smoke	9	4	14	18	1	-	46	20.9
Fog	-	1	-	-	-	-	1	0.5
Total PM Stores	45	20	56	26	17	-	164	74.5
Chlorpyrifos-methyl								
EC	1	3	12	3	-	-	19	8.6
WP	1	-	-	-	-	-	1	0.5
Unknown spray	-	-	3	-	-	-	3	1.4
Smoke	-	-	1	-	-	-	1	0.5
Total CPM Stores	2	3	16	3	-	-	24	10.9
Etrimfos								
EC	8	2	8	2	-	-	20	9.1
WP	-	-	2	-	-	-	2	0.9
Dust	3	-	1	-	-	-	4	1.8
Smoke	-	-	1	-	-	-	1	0.5
Total Etrimfos Stores	9	2	10	2	-	-	23	10.5

(continued)

Table 66. (continued) - Insecticides used to treat the fabric of the store or machinery in stores inspected.

Insecticide and formulation	Region N	M+W	E	SE	SW	Wales	Total Stores	Percent of treated Stores
Methacrifos								
EC	-	-	5	1	1	-	7	3.2
Fenitrothion								
EC	1	-	-	-	-	-	1	0.5
WP	2	-	-	-	-	-	2	0.9
Total Fen. Stores*	3	-	-	-	-	-	3	1.4
Pyrethroids (including mixtures with OPs)								
Turbair GSI (Fen + Pyr)	4	2	12	-	-	-	18	8.2
Multispray (Pyr + OP)	-	-	1	-	1	-	2	0.9
Pybuthrin fog	-	-	-	-	1	-	1	0.5
Pyrethroid WP	-	-	-	-	-	1	1	0.5
Total Pyrethroid Stores	4	2	13	-	1	1	21	9.5
Fumigants	-	-	-	-	-	-	-	0
Unknown insecticide	4	1	3	-	2	-	10	4.5
Total Treated Stores	58	24	86	30	21	1	220	
Average number of formulations per treated store	1.4	1.3	1.5	1.8	1.2	2.0	1.5	

Note: EC = emulsifiable concentrate; WP = wettable powder; OP = organophosphorus insecticide; GSI = grain store insecticide.

* the 'total Fenitrothion stores' does not include the use of this compound in a mixture with pyrethroids - see Turbair GSI.

Table 67. Number of stores where some or all of the grain present had been treated with insecticide in last 12 months.

Region	Contact insecticide Amount of grain treated			Fumigant Amount treated		Insecticide or fumigant used?	
	All	Part	None	Part	None	Yes	No
N	19	15	28	-	62	34	28
M+W	7	4	20	1	30	12	19
E	31	23	52	1	105	54	52
SE	12	2	19	-	33	14	19
SW	12	5	9	-	26	17	9
Wales	-	-	4	-	4	-	4
Total Stores	81	49	132	2	260	131	131
Percent of Stores	30.9	18.7	50.4	0.8	99.2	50.0	50.0

Note: No answer for 2 stores.
No grain present in 19 stores.

Table 68. Reason given by store managers for grain treatments.

Region	Contact insecticide: Prophylaxis	Contact insecticide: Prophylaxis and infestation	Contact insecticide: Known infestation	Fumigant: Known infestation	Total stores treated for infestation	Total stores with grain
N	25	-	9	-	9	62
M+W	10	-	1	1	2	31
E	49	-	5	1	6	106
SE	11	1	2	-	3	33
SW	11	1	5	-	6	26
Wales	-	-	-	-	-	4
Total Stores	106	2	22	2	26	262
Percent of treated stores	81.5	1.5	16.9		19.8	
Percent of stores with grain	40.5	0.8	8.4	0.8	9.9	

Note: Not known whether insecticide used at two stores with grain.

Table 69. Insecticides used within the last 12 months on grain in stores inspected.

Insecticide and formulation	Region N	M+W	E	SE	SW	Wales	Total Stores	Percent of treated Stores
Pirimiphos-methyl								
Spray	13	1	13	6	3	-	36	27.5
Dust	13	2	23	7	15	-	60	45.8
Smoke	2	-	-	1	-	-	3	2.3
Total PM Stores	28	3	32	13	17	-	93	71.0
Chlorpyrifos-methyl								
Spray	8	7	11	2	2	-	30	22.9
Etrimfos								
Spray	-	1	7	-	-	-	8	6.1
Dust	-	-	1	1	-	-	2	1.5
Total Etrimfos Stores	-	1	8	1	-	-	10	7.6
Methacrifos								
Spray	-	-	4	-	-	-	4	3.1
'Liquid'	-	-	1	-	-	-	1	0.8
Total Methac. Stores	-	-	5	-	-	-	5	3.8
Fumigants								
Methyl bromide	-	-	1	-	-	-	1	0.8
Liquid fumigant	-	1	-	-	-	-	1	0.8
Total Fumigant Stores	-	1	1	-	-	-	2	1.5
Total Treated Stores	34	12	54	14	17	-	131	
Average number of formulations per treated Store	1.1	1.0	1.1	1.2	1.2	-	1.1	

Table 70. Method by which the grain in store was admixed.

Method of admixture	Region N	M+W	E	SE	SW	Wales	Total Stores	Percent of admixing Stores
Bulk by machine								
Spray	18	8	25	7	2	-	60	48.4
Dust	1	-	6	2	1	-	10	8.1
Spray + dust	-	-	4	-	-	-	4	3.2
Bulk by machine and by hand								
Spray + dust	-	-	-	-	1	-	1	0.8
Bulk by hand and other method								
Dust	6	1	2	2	9	-	20	16.1
Bulk by machine and surface treatment								
Spray + dust	2	-	1	-	2	-	5	4.0
Bulk by other method and surface treatment								
Spray + dust	-	-	-	1	-	-	1	0.8
Surface only								
Spray	-	-	3	-	-	-	3	2.4
Dust	4	1	11	2	2	-	20	16.1
Total Stores	31	10	52	14	17	-	124	100
Other stores treating grain								
Spray - method unknown	1	1	2	-	-	-	4	
Smoke through floor	2	-	-	-	-	-	2	
Fumigation only	-	1	-	-	-	-	1	
Total stores treating grain	34	12	54	14	17	-	131	

Table 71. Number of stores that treated the fabric and/or some or all of the grain with insecticide

Treatment	Region N	M+W	E	SE	SW	Wales	Total Stores	Percent of Stores
Stores with grain								
Fabric only	23	11	37	17	4	1	93	33.1
Fabric and grain	29	12	42	13	15	-	111	39.5
Grain only	5	-	11	1	2	-	19	6.8
Grain (fabric unknown)	-	-	1	-	-	-	1	0.4
Total treated	57	23	91	31	21	1	224	79.7
untreated	5	8	15	2	5	3	38	13.5
Total with grain	62	31	106	33	26	4	262	93.2
Stores without grain								
Fabric treated	6	1	7	-	2	-	16	5.7
untreated	1	1	1	-	-	-	3	1.1
Total without grain	7	2	8	-	2	-	19	6.8
All stores								
Fabric only	29	12	44	17	6	1	109	38.8
Fabric and grain	29	12	42	13	15	-	111	39.5
Grain only	5	-	11	1	2	-	19	6.8
Grain (fabric unknown)	-	-	1	-	-	-	1	0.4
Total treated	63	24	98	31	23	1	240	85.4
untreated	6	9	16	2	5	3	41	14.6
Total stores	69	33	114	33	28	4	281	100

Note: Not known whether two stores with grain were treated.

Table 72. Insecticides used in stores treating fabric and/or grain.

Insecticide and formulation	Region N	M+W	E	SE	SW	Wales	Total Stores	Percent of treated Stores
Pirimiphos-methyl								
Spray	41	18	48	25	16	-	148	61.7
Dust	25	3	37	14	16	-	95	39.6
Smoke	9	4	14	19	1	-	47	19.6
Fog	-	1	-	-	-	-	1	0.4
Total PM Stores	55	20	69	29	22	-	195	81.3
Chlorpyrifos-methyl								
Spray	8	8	16	3	2	-	37	15.4
Smoke	-	-	1	-	-	-	1	0.4
Total CPM Stores	8	8	17	3	2	-	38	15.8
Etrimfos								
Spray	8	2	14	2	-	-	26	10.8
Dust	3	-	2	1	-	-	6	2.5
Smoke	-	-	1	-	-	-	1	0.4
Total Etrimfos Stores	9	2	14	3	-	-	28	11.7
Methacrifos								
Spray	-	-	7	1	1	-	9	3.8
Fenitrothion								
Spray	3	-	-	-	-	-	3	1.3
Pyrethroids (including mixtures with OPs)	4	2	13	-	1	1	21	8.8
Fumigants	-	1	1	-	-	-	2	0.8
Unknown insecticide	2	1	1	-	-	-	4	1.7
Total treated stores	63	24	98	31	23	1	240	100
untreated stores	6	9	16	2	5	3	41	

Note: Not known whether two stores were treated.
See note to Table 66 for pyrethroid mixture containing Fenitrothion.
More than one formulation may be used in each store.

Table 73. Number of sites and stores in which *Oryzaephilus surinamensis* (saw-toothed grain beetle) was detected.

O. surinamensis	Region							Percent of
	N	M+W	E	SE	SW	Wales	Total	inspections
No. of sites (157 inspected)	3	7	9	4	7	1	31	19.7
No. of stores (283 inspected)	4	9	10	6	11	1	41	14.5
Method by which detected								
Baitbag on grain	4	4	5	2	6	1	22	
Pitfall trap	1	5	4	3	3	-	16	
Probe trap	2	8	5	5	9	-	29	
Baitbag on structure	-	3	1	4	7	-	15	
Visual on structure	-	3	1	1	2	-	7	
Sieve	-	1	-	1	3	-	5	
Unknown method	-	-	1	-	-	-	1	
No. of stores where detected:-								
In grain	4	8	8	5	9	1	35	12.4
On structure, not grain	-	1	1	1	2	-	5	1.8
Unknown where	-	-	1	-	-	-	1	0.4

Note: All stores where *O. surinamensis* was detected contained grain.

Note: Although there was a standard protocol for inspecting the stores, it was not possible to use all detection methods in some stores. *Therefore direct comparisons of the relative effectiveness of different detection methods is not valid.*
The occurrences 'in grain' include the results of baitbags on grain, pitfall traps and probe traps; the sieving of residues is not included.

Table 74. Number of sites and stores in which *Cryptolestes ferrugineus* (rust-red grain beetle) was detected.

C. ferrugineus	Region							Percent of
	N	M+W	E	SE	SW	Wales	Total	inspections
No. of sites (157 inspected)	1	8	9	6	2	1	27	17.2
No. of stores (283 inspected)	1	8	11	7	2	1	30	10.6
Method by which detected								
Baitbag on grain	-	2	3	1	1	-	7	
Pitfall trap	1	4	-	2	-	-	7	
Probe trap	1	5	5	2	1	-	14	
Baitbag on structure	-	2	1	4	-	-	7	
Visual on structure	-	2	-	-	-	-	2	
Sieve	-	-	-	2	-	-	2	
Unknown method	-	1	2	-	1	1	5	
No. of stores where detected:-								
In grain	1	6	8	3	1	-	19	6.7
On structure, not grain	-	1	1	4	-	-	6	2.1
Unknown where	-	1	2	-	1	1	5	1.8

Note: One store in which *C. ferrugineus* was detected contained no grain.

Note: Although there was a standard protocol for inspecting the stores, it was not possible to use all detection methods in some stores. *Therefore direct comparisons of the relative effectiveness of different detection methods is not valid.*
The occurrences 'in grain' include the results of baitbags on grain, pitfall traps and probe traps; the sieving of residues is not included.

Table 75. Number of sites and stores in which *Sitophilus spp.* (grain weevils) were detected.

Sitophilus spp.	Region							Percent of
	N	M+W	E	SE	SW	Wales	Total	inspections
S. granarius								
No. of sites	2	5	9	3	5	3	27	17.2
No. of stores	2	6	10	3	5	3	29	10.2
S. oryzae								
No. of sites	-	1	-	1	1	-	3	1.9
No. of stores	-	1	-	1	1	-	3	1.1
Species not identified								
No. of sites	1	-	5	-	-	-	6	3.8
No. of stores	1	-	5	-	-	-	6	2.1
Total Sitophilus								
No. of sites	3	6	14	4	5	3	35	22.3
No. of stores	3	7	15	4	5	3	37	13.1
Method by which detected								
Baitbag on grain	1	-	3	-	-	-	4	
Pitfall trap	2	3	11	-	2	-	18	
Probe trap	-	-	5	-	1	2	8	
Baitbag on structure	-	2	2	2	2	-	8	
Visual on structure	-	3	-	1	1	-	5	
Sieve	-	-	-	-	-	-	-	
Unknown method	-	1	-	2	-	1	4	
No. of stores where detected:-								
In grain	3	3	15	-	3	2	26	9.2
On structure, not grain	-	3	-	2	2	-	7	2.5
Unknown where	-	1	-	2	-	1	4	1.4

Note: All stores where *Sitophilus* was detected contained grain.
Both *S. granarius* and *S. oryzae* were detected in one store.

Note: Although there was a standard protocol for inspecting the stores, it was not possible to use all detection methods in some stores. *Therefore direct comparisons of the relative effectiveness of different detection methods is not valid.*
The occurrences 'in grain' include the results of baitbags on grain, pitfall traps and probe traps; the sieving of residues is not included.

Table 76. Sites and stores where *O. surinamensis*, *C. ferrugineus* or *Sitophilus spp.* was detected.

	Region							Percent of
	N	M+W	E	SE	SW	Wales	Total	inspections
Sites								
O. surinamensis only	3	1	6	1	3	-	14	8.9
C. ferrugineus only	1	2	4	2	-	-	9	5.7
Sitophilus spp. only	3	1	10	2	1	2	19	12.1
O. sur. + C. fer.	-	1	1	2	-	-	4	2.5
O. sur. + Sitophilus	-	-	-	-	2	-	2	1.3
C. fer. + Sitophilus	-	-	2	1	-	-	3	1.9
O. sur. + C. fer. + Sitoph.	-	5	2	1	2	1	11	7.0
O. sur. or C. fer. or Sitoph.	7	10	25	9	8	3	62	39.5
Stores								
O. surinamensis only	4	2	6	3	6	-	21	7.4
C. ferrugineus only	1	2	5	3	-	-	11	3.9
Sitophilus spp. only	3	1	11	2	1	2	20	7.1
O. sur. + C. fer.	-	1	2	2	1	-	6	2.1
O. sur. + Sitophilus	-	1	-	-	3	-	4	1.4
C. fer. + Sitophilus	-	-	2	1	-	-	3	1.1
O. sur. + C. fer. + Sitophilus	-	5	2	1	1	1	10	3.5
O. sur. or C. fer. or Sitophilus	8	12	28	12	12	3	75	26.5

Note: 283 stores inspected at 157 sites.

Table 77. Number of sites and stores in which *Ahasverus advena* (foreign grain beetle) was detected.

A. advena	Region							Percent of
	N	M+W	E	SE	SW	Wales	Total	inspections
Sites								
Ident. confirmed	-	5	2	3	1	1	12	7.6
unconfirmed	2	-	-	-	-	-	2	1.3
Stores								
Ident. confirmed	-	5	2	3	1	1	12	4.2
unconfirmed	2	-	-	-	-	-	2	0.7
Method by which detected*								
Baitbag on grain	-	2	-	-	1	-	3	
Pitfall trap	-	2	-	-	1	-	3	
Probe trap	-	4	2	2	-	1	9	
Baitbag on structure	-	-	-	1	-	-	1	
Visual on structure	-	1	-	-	-	-	1	
Sieve	-	-	-	-	-	-	-	
Unknown method	-	1	-	1	-	-	2	
No. of stores where detected*:-								
In grain	-	4	2	2	1	1	10	3.5
On structure, not grain	-	-	-	-	-	-	-	-
Unknown where	-	1	-	1	-	-	2	0.7

* confirmed identifications only
Note: 283 stores inspected at 157 sites.

Note: Although there was a standard protocol for inspecting the stores, it was not possible to use all detection methods in some stores. *Therefore direct comparisons of the relative effectiveness of different detection methods is not valid.*
The occurrences 'in grain' include the results of baitbags on grain, pitfall traps and probe traps; the sieving of residues is not included.

Table 78. Number of sites and stores in which *Typhaea stercorea* (hairy fungus beetle) was detected.

T. stercorea .	Region N	M+W	E	SE	SW	Wales	Total	Percent of inspections
Sites								
Ident. confirmed	1	7	5	1	-	-	14	8.9
unconfirmed	2	-	6	1	-	-	9	5.7
Stores								
Ident. confirmed	2	8	5	2	-	-	17	6.0
unconfirmed	3	-	6	1	-	-	10	3.5
Method by which detected*								
Baitbag on grain	-	1	-	-	-	-	1	
Pitfall trap	2	5	4	1	-	-	12	
Probe trap	1	4	-	1	-	-	6	
Baitbag on structure	-	-	2	1	-	-	3	
Visual on structure	-	-	-	-	-	-	-	
Sieve	-	-	-	-	-	-	-	
Unknown method	-	1	-	-	-	-	1	
No. of stores where detected*:-								
In grain	2	7	4	1	-	-	14	4.9
On structure, not grain	-	-	1	1	-	-	2	0.7
Unknown where	-	1	-	-	-	-	1	0.4

* confirmed identifications only

Note: Although there was a standard protocol for inspecting the stores, it was not possible to use all detection methods in some stores. *Therefore direct comparisons of the relative effectiveness of different detection methods is not valid.*

The occurrences 'in grain' include the results of baitbags on grain, pitfall traps and probe traps; the sieving of residues is not included.

Table 79. Number of sites and stores from which *Cryptophagus spp.* (mould beetles) were collected.

Cryptophagus spp.	Region							Percent of
	N	M+W	E	SE	SW	Wales	Total	inspections
No. of sites	5	2	18	1	5	-	31	19.7
No. of stores	5	3	24	1	5	-	38	13.4

Identifications	Species	No. of sites	No of stores
	C. acutangulus	1	1
	C. dentatus	4	4
	C. distinguendus	2	3
	C. laticollis	2	2
	C. pseudodentatus	1	1
	C. pilosus	1	1
	C. saginatus	3	5
	C. scanicus	1	1
	C. scutellatus	1	1
	C. simplex	1	1
Total where identified to species		13*	16*
Identified to genus only		18	22

* At four sites and stores two species were identified.

Note: *Cryptophagus spp* were not included in the check-list in question 60 on the fact sheet, but occurred frequently enough in the samples to warrant inclusion in this report. Consequently, the above data are probably an under-estimate of their actual occurrence.

Table 80. Sites and stores where *A. advena*, *T. stercorea* or *Cryptophagus spp.* occurrence was confirmed.

	Region							Percent of
	N	M+W	E	SE	SW	Wales	Total	inspections
Sites								
A. advena only	-	-	1	1	-	1	3	1.9
T. stercorea only	-	2	1	-	-	-	3	1.9
Cryptophagus spp. only	4	-	13	-	4	-	21	13.4
A. adv. + T. ster.	-	3	-	1	-	-	4	2.5
A. adv. + Crypto. spp.	-	-	1	1	1	-	3	1.9
T. ster. + Crypto. spp.	1	-	4	-	-	-	5	3.2
A. adv. + T. ster. + Crypto. spp.	-	2	-	-	-	-	2	1.3
A. adv. or T. ster. or Crypto. spp.	5	7	20	3	5	1	41	26.1
Stores								
A. advena only	-	-	2	1	-	1	4	1.4
T. stercorea only	1	2	2	1	-	-	6	2.1
Cryptophagus spp. only	4	-	21	-	4	-	29	10.2
A. adv. + T. ster.	-	3	-	1	-	-	4	1.4
A. adv. + Crypto. spp.	-	-	-	1	1	-	2	0.7
T. ster. + Crypto. spp.	1	1	3	-	-	-	5	1.8
A. adv. + T. ster. + Crypto. spp.	-	2	-	-	-	-	2	0.7
A. adv. or T. ster. or Crypto. spp.	6	8	28	4	5	1	52	18.4

Note: 283 stores inspected at 157 sites.

Table 81. Number of sites and stores in which *Ptinidae* (spider beetles) were detected.

Ptinidae	Region							Percent of
	N	M+W	E	SE	SW	Wales	Total	inspections
Sites								
Confirmed identification								
Ptinus fur only	2	4	30	6	3	-	45	28.7
Ptinus tectus only	2	-	2	2	2	1	9	5.7
Ptinus pusillus only	1	-	1	-	-	-	2	1.3
P. fur + P. tectus	-	2	7	-	3	-	12	7.6
P. fur + P. pusillus	-	1	-	-	-	-	1	0.6
Unconfirmed	5	3	-	-	-	-	8	5.1
Total sites	10	10	40	8	8	1	77	49.0
Stores								
Confirmed identification								
Ptinus fur only	2	6	36	9	4	-	57	20.1
Ptinus tectus only	2	-	2	2	2	1	9	3.2
Ptinus pusillus only	1	-	1	-	-	-	2	0.7
P. fur + P. tectus	-	2	7	-	3	-	12	4.2
P. fur + P. pusillus	-	1	-	-	-	-	1	0.4
Unconfirmed	9	4	4	1	2	-	20	7.1
Total stores	14	13	50	12	11	1	101	35.7
Method by which detected								
Baitbag on grain	5	4	14	1	2	-	26	
Pitfall trap	11	10	44	6	5	-	76	
Probe trap	1	1	8	1	-	1	12	
Baitbag on structure	2	3	15	6	3	1	30	
Visual on structure	-	2	1	-	1	1	5	
Sieve	1	-	3	-	1	1	6	
Unknown method	-	1	-	2	1	-	4	
No. of stores where detected:-								
In grain	12	10	46	7	7	1	83	29.3
On structure, not grain	2	2	4	3	3	-	14	4.9
Unknown where	-	1	-	2	1	-	4	1.4

Note: Although there was a standard protocol for inspecting the stores, it was not possible to use all detection methods in some stores. *Therefore direct comparisons of the relative effectiveness of different detection methods is not valid.*

The occurrences 'in grain' include the results of baitbags on grain, pitfall traps and probe traps; the sieving of residues is not included.

Table 82. Number of sites and stores in which Moth pests were detected.

Ephestia elutella **(cacao moth)**
Endrosis sarcitrella **(white-shouldered house moth)**
Hofmannophila pseudospretella **(brown house moth)**

	Region						Percent of
	N	M+W	E	SE	SW	Wales	Total	inspections
Sites								
Confirmed identification								
Ephestia elutella	-	1	1	-	1	-	3	1.9
Endrosis sarcitrella	1	5	4	-	-	-	10	6.4
H. pseudospretella	-	2	8	1	1	-	12	7.6
Any of the above three	1	6*	13	1	2	-	23	14.7
Unconfirmed	10	-	6	-	-	3	19	12.1
Stores								
Confirmed identification								
Ephestia elutella	-	1	1	-	1	-	3	1.1
Endrosis sarcitrella	1	5	4	-	-	-	10	3.5
H. pseudospretella	-	3	9	1	1	-	14	4.9
Any of the above three	1	8*	14	1	2	-	26	9.2
Unconfirmed	12	1	7	-	-	3	23	8.1

* Two sites and one store had two species of moth.

Method by which detected*	*Ephestia*	*Endrosis*	*Hofmannophila*	Total Stores	Percent
Baitbag on grain	1	1	-		
Pitfall trap	2	7	-		
Probe trap	1	1	1		
Baitbag on structure	-	5	8		
Visual on structure	-	1	2		
Sieve	-	1	1		
Unknown method	1	3	5		
No. of stores where detected:-					
In grain	2	8	1	10	3.5
On structure, not grain	-	1	9	10	3.5
Unknown where	1	1	4	6	2.1

* confirmed identifications only

Note: Although there was a standard protocol for inspecting the stores, it was not possible to use all detection methods in some stores. *Therefore direct comparisons of the relative effectiveness of different detection methods is not valid.*

The occurrences 'in grain' include the results of baitbags on grain, pitfall traps and probe traps; the sieving of residues is not included.

Table 83. Number of sites and stores in which *Psocoptera* (psocids or book-lice) were detected.

Psocoptera	Region							Percent of
	N	M+W	E	SE	SW	Wales	Total	inspections
Sites								
Confirmed identification	18	11	43	9	7	1	89	56.7
Unconfirmed	6	1	2	1	2	1	13	8.3
Total sites	24	12	45	10	9	2	102	65.0
Stores								
Confirmed identification	21	18	59	20	11	1	130	45.9
Unconfirmed	11	3	6	1	2	2	25	8.8
Total stores	32	21	65	21	13	3	155	54.8
SPECIES								
Sites								
Lepinotus patruelis	12	9	31	7	3	-	62	39.5
Lachesilla pedicularia	6	9	26	8	3	1	53	33.8
Ectopsocus briggsi	1	1	6	4	-	-	12	7.6
Liposcelis bostrychophila	-	1	1	-	-	-	2	1.3
Liposcelis entomophila	-	-	-	-	1	-	1	0.6
Liposcelis corrodens	1	-	2	-	1	-	4	2.5
Liposcelis decolor	1	1	2	-	1	-	5	3.2
Stores								
Lepinotus patruelis	15	14	38	11	3	-	81	28.6
Lachesilla pedicularia	6	12	32	16	5	1	72	25.4
Ectopsocus briggsi	1	1	7	7	-	-	16	5.7
Liposcelis bostrychophila	-	2	1	-	-	-	3	1.1
Liposcelis entomophila	-	-	-	-	2	-	2	0.7
Liposcelis corrodens	1	-	2	-	1	-	4	1.4
Liposcelis decolor	1	1	3	-	1	-	6	2.1
WHERE DETECTED (confirmed idents.)								
Sites								
In grain	12	11	34	8	6	1	72	45.9
On structure, not grain	4	-	8	1	1	-	14	8.9
Unknown where	2	-	1	-	-	-	3	1.9
Stores								
In grain	13	16	45	18	8	1	101	35.7
On structure, not grain	6	2	12	1	1	-	22	7.8
Unknown where	2	-	2	1	2	-	7	2.5

Note: 283 stores inspected at 157 sites.

Table 84. Number of sites and stores where mites of the genera *Acarus*, *Glycyphagus* or *Tyrophagus* were detected.

Mites	Region							Percent of inspections
	N	M+W	E	SE	SW	Wales	Total	
Sites								
Acarus only	7	1	7	1	1	-	17	10.8
Glycyphagus only	3	4	5	2	-	-	14	8.9
Tyrophagus only	-	-	-	-	1	-	1	0.6
Acarus + Glycyph.	13	4	16	4	5	2	44	28.0
Acarus + Tyroph.	1	-	5	-	1	-	7	4.5
Glycyph + Tyroph.	1	-	-	-	-	1	2	1.3
Acarus + Glycyph. + Tyroph.	7	6	21	5	1	-	40	25.5
Unidentified mites	3	1	3	2	3	-	12	7.6
Total with mites	35	16	57	14	12	3	137	87.3
Total *Acarus*	28	11	49	10	8	2	108	68.8
Total *Glycyphagus*	24	14	42	11	6	3	100	63.7
Total *Tyrophagus*	9	6	26	5	3	1	50	31.8
Stores								
Acarus only	12	4	20	3	5	-	44	15.5
Glycyphagus only	8	5	15	3	-	-	31	11.0
Tyrophagus only	-	1	-	-	1	-	2	0.7
Acarus + Glycyph.	17	7	19	8	8	2	61	21.6
Acarus + Tyroph.	2	2	7	2	1	-	14	4.9
Glycyph. + Tyroph.	2	-	1	2	-	1	6	2.1
Acarus + Glycyph. + Tyroph.	9	5	28	6	1	-	49	17.3
Unidentified mites	8	2	5	2	5	1	23	8.1
Total with mites	58	26	95	26	21	4	230	81.3
Total *Acarus*	40	18	74	19	15	2	168	59.4
Total *Glycyphagus*	36	17	63	19	9	3	147	51.9
Total *Tyrophagus*	13	8	36	10	3	1	71	25.1

Table 85. Species identifications of the mites detected - sites and stores

Mite species	N	M+W	E	SE	SW	Wales	Total	Percent of inspections
			Region					
Sites								
Acarus siro	28	11	49	10	8	2	108	68.8
A. farris	1	1	1	1	1	-	5	3.2
A. immobilis	1	-	2	1	-	-	4	2.5
Total with *Acarus*	28	11	49	10	8	2	108	68.8
Glycyphagus destructor	24	14	41	11	6	3	99	63.1
G. domesticus	-	-	2	-	-	-	2	1.3
Total with *Glycyphagus*	24	14	42	11	6	3	100	63.7
Tyrophagus longior	6	4	18	4	1	1	34	21.7
T. putrescentiae	6	6	11	3	2	-	28	17.8
T. palmarum	-	1	1	2	-	-	4	2.5
Total with *Tyrophagus*	9	6	26	5	3	1	50	31.8
Stores								
Acarus siro	40	18	74	19	14	2	167	59.0
A. farris	1	1	1	1	1	-	5	1.8
A. immobilis	1	-	2	1	-	-	4	1.4
Total with *Acarus*	40	18	74	19	15	2	168	59.4
Glycyphagus destructor	36	17	61	19	9	3	145	51.2
G. domesticus	-	-	2	-	-	-	2	0.7
Total with *Glycyphagus*	36	17	63	19	9	3	147	51.9
Tyrophagus longior	8	5	25	5	1	1	45	15.9
T. putrescentiae	7	6	13	6	2	-	34	12.0
T. palmarum	-	1	1	2	-	-	4	1.4
Total with *Tyrophagus*	13	8	35*	10	3	1	70*	24.7

* One fewer than shown in Table 84 since species not determined.

Table 86. Number of sites and stores where rodents or birds were detected.

		Region							Percent of
		N	M+W	E	SE	SW	Wales	Total	inspections
Rodents									
Rat	sites	13	12	23	7	9	-	64	40.8
	stores	19	16	38	8	13	-	94	33.2
Mouse	sites	34	17	41	15	7	-	114	72.6
	stores	52	27	63	21	10	-	173	61.1
Rat or mouse	sites	34	19	42	17	12	-	124	79.0
	stores	57	31	71	25	18	-	202	71.4
Birds									
Pigeon*	sites	16	12	26	6	8	1	69	43.9
	stores	17	14	41	6	16	1	95	33.6
Sparrow	sites	9	6	25	4	2	-	46	29.3
	stores	11	7	38	6	5	-	67	23.7
Starling	sites	1	-	1	-	-	-	2	1.3
	stores	1	-	1	-	-	-	2	0.7
Any of above three birds	sites	21	13	42	8	8	1	93	59.2
	stores	24	16	64	10	16	1	131	46.3

* Includes collared dove.

Note: 283 stores inspected at 157 sites.

Table 87. Comparison of whether store managers were aware of the presence of rodents, and whether rodents were detected during inspection.

Region	Rodents detected?	Manager aware of presence of rodents? Sites: Yes	Sites: No	Sites: No Answer	Sites: Total Sites	Stores: Yes	Stores: No	Stores: No Answer	Stores: Total Stores
N	Yes	25	8	1	34	40	16	1	57
	No	1	2	-	3	5	7	-	12
	Total	26	10	1	37	45	23	1	69
M+W	Yes	17	2	-	19	25	6	-	31
	No	-	-	-	-	-	2	-	2
	Total	17	2	-	19	25	8	-	33
E	Yes	24	18	-	42	31	40	-	71
	No	8	14	-	22	15	27	1	43
	Total	32	32	-	64	46	67	1	114
SE	Yes	11	6	-	17	16	9	-	25
	No	1	1	-	2	2	6	-	8
	Total	12	7	-	19	18	15	-	33
SW	Yes	9	3	-	12	13	5	-	18
	No	2	1	-	3	6	5	1	12
	Total	11	4	-	15	19	10	1	30
Wales	Yes	-	-	-	-	-	-	-	-
	No	1	1	1	3	1	2	1	4
	Total	1	1	1	3	1	2	1	4
TOTAL	Yes	86	37	1	124	125	76	1	202
	No	13	19	1	33	29	49	3	81
	Total	99	56	2	157	154	125	4	283
PERCENT	Yes	54.8	23.6	0.6	79.0	44.2	26.9	0.4	71.4
	No	8.3	12.1	0.6	21.0	10.2	17.3	1.1	28.6
	Total	63.1	35.7	1.3	100	54.4	44.2	1.4	100

Table 88. **Ranking of the five MAFF regions according to the frequency with which *Oryzaephilus, Cryptolestes and Sitophilus* occurred in commercial grain stores. Results of the 1987 farm grain store exercise are given in brackets.**

Ranking	*Oryzaephilus*		*Cryptolestes*		*Sitophilus*		Any of the three	
	Region	%	Region	%	Region	%	Regions	%
1	N	6 (1.8)	N	1 (2.3)	N	4 (0.5)	N	12 (3.1)
2	E	9 (1.9)	SW	7 (6.6)	SE	12 (0)	E	25 (5.5)
3	SE	18 (7.4)	E	10 (1.7)	E	13 (3.6)	SE	36 (10.7)
4	M+W	27 (7.2)	SE	21 (4.2)	SW	17 (9.1)	M+W	36 (16.0)
5	SW	37 (9.0)	M+W	24 (9.2)	M+W	21 (6.7)	SW	40 (15.9)
Overall		14.5 (4.8)		10.6 (4.6)		13.1 (4.2)		26.5 (9.7)

Note: Number of commercial stores = 283.

Number of farm stores = 742 (stratified sample).

The farm data are given to illustrate the similarity in ranking. Direct comparison of percentages should not be made between the two studies because they differed in some important aspects, as outlined in the text.

Table 89. **Insect detection methods used by storekeepers in commercial stores where a) none of the major grain beetle pests were detected by WSB Advisers and b) one or more of the major pests were detected.**

a) **Stores where no pests were detected (183 stores).**

Method	Number of stores	Percent of stores
Not checked*	30	16
Spear/vacuum only	100	55
Static traps**	53	29
All detection methods	153	84

a) **Stores where pests were detected (71 stores).**

Method	Number of stores	Percent of stores
Not checked*	19	27
Spear/vacuum only	38	54
Static traps***	14	20
All detection methods	52	73

* Includes visual checks only.

** Only one store used only static straps (probe traps).

*** No stores used static traps on their own.

Table 90. Frequency of use of insect detection methods by storekeepers in commercial stores where a) none of the major grain beetle pests were detected by WSB Advisers and b) one or more of the major pests were detected.

a) Stores where no major pests were found (175 stores - 30 of these (17%) were not checked).

Method	Frequency of use			Total stores	Percent stores
	More often than monthly	Monthly	Less often than monthly		
Spear alone	41	29	15	85	49
Vacuum alone	2	1	0	3	2
Spear + Vacuum	3	3	0	6	3
Spear + Static	16	18	2	36	21
Vacuum + Static	3	0	0	3	2
Spear + Vacuum + Static	6	6	0	12	7
Total stores	71	57	17	145	
Percent stores	41	33	10		

b) Stores where major pests were found (64 stores - 16 of these (25%) were not checked).

Method	Frequency of use			Total stores	Percent stores
	More often than monthly	Monthly	Less often than monthly		
Spear alone	15	13	5	33	52
Vacuum alone	0	1	0	1	2
Spear + Vacuum	0	0	0	0	0
Spear + Static	5	5	1	11	17
Vacuum + Static	0	0	0	0	0
Spear + Vacuum + Static	1	2	0	3	5
Total stores	21	21	6	48	
Percent stores	33	33	9		

Table 91. **Methods used by WSB advisers to detect the 3 major grain pest beetle species *O. surinamensis* (Os), *C. ferrugineus* (Cf) and *S. granarius* (Sg) in stores (total = 73 stores).**

a) Each species

Method	No. Stores*			No. Detected**			% Detected		
	Os	Cf	Sg	Os	Cf	Sg	Os	Cf	Sg
Visual	28	17	20	7	2	5	25	12	25
Sieve	21	16	20	5	2	0	24	13	0
Bait bag on structure	34	22	27	15	7	8	44	32	30
Bait bag on grain	38	27	30	22	7	4	58	26	13
Pitfall trap	31	28	34	16	7	18	52	25	53
Probe trap	35	27	30	29	14	8	83	52	27
Pitfall or Probe	35	28	34	29	16	23	83	57	68

b) All species combined.

Method	No. Stores*	No. Detected**	% Detected
Visual	45	9	20
Sieve	39	7	18
Bait bag on structure	57	21	37
Bait bag on grain	65	29	45
Pitfall trap	62	35	56
Probe trap	63	41	65
Pitfall or Probe	68	52	76

* Number of stores where a major pest was detected and the method had been used.

** Number of stores where the major pest was detected by that method.

Table 92. Frequency of use of Pitfall and Probe static traps by storekeepers in 14 stores where the storekeepers used these methods and WSB Advisers detected one or more of the major grain beetle pests.

Trap type	Frequency with which traps were checked		
	More often than monthly	Monthly	Less often than monthly
Pitfall	0	2	0
Probe	5	0	0
Both Pit & Probe	7	0	0

Table 93. Method by which WSB Advisers detected the major beetle pests in 14 stores where static traps had been used by storekeepers.

Species	Visual	Bait Bag on structure	Bait Bag on grain	Pitfall	Probe
O. sur.	0	0	1	0	1
C. ferr.	0	0	1	1	1
S. gran.	1	3	1	6	2
Total	1	3	3	7	4

Table 94. Detection of the three major beetle pest species by WSB Advisers. Number of stores where all trap methods were used, but only one type detected the insects.

Method	*O. surinamensis*	*C. ferrugineus*	*S. granarius*
Bait bag on structure	3	4	6
Bait bag on grain	2	3	2
Pitfall trap	0	1	12
Probe trap	3	7	0
Pitfall and/or probe	5	10	15

Table 95a. Methods by which WSB Advisers detected three minor beetle pests (number of stores).

Method	*A. advena*	*T. stercorea*	*Ptinus spp*
Visual	1	0	5
Sieve	0	0	6
Bait bag on structure	1	3	30
Bait bag on grain	3	1	26
Pitfall trap	3	12	76
Probe trap	9	6	12

Table 95b. Detection of three minor pest beetle species by WSB Advisers. Number of stores where all trap methods were used, but only one type detected the insects.

Method	*A. advena*	*T. stercorea*	*Ptinus spp*
Bait bag on grain	0	0	2
Pitfall	1	9	36
Probe	5	5	0

Table 96. The changes in sex ratio of *Lepinotus patruelis* collected from commercial stores between October 1988 and March 1989.

Date	numbers of		ratio
	males	females	
Mid-October to Mid-November	90	164	1:1.8
Mid-November to Mid-December	96	293	1:3.1
Mid-December to Mid-January	64	378	1:5.9
Mid-January to Mid-February	80	550	1:6.9
Mid-February to Mid-March	184	997	1:5.4

Table 97. For each mite genus the number of stores with the various combinations of each species present.

	Number of stores
Acarus	
siro only	157
farris only	1
immobilis only	0
siro + *farris*	3
siro + *immobilis*	3
farris + *immobilis*	0
siro + *farris* + *immobilis*	1
Glycyphagus	
destructor only	144
domesticus only	2
destructor + *domesticus*	0
Tyrophagus	
longior only	34
palmarum only	1
putrescentiae only	22
longior + *palmarum*	1
longior + *putrescentiae*	10
palmarum + *putrescentiae*	2
longior + *palmarum* + *putrescentiae*	0

Table 98. **A comparison of the percentage of species found at commercial sites and stores, and in farm grain stores in 1987 and 1973. The 1973 data have been calculated from the original data sheets (see Lynch and Muggleton, 1990).**

Species	Commercial		Farm Store	
	site	store	1987	1973
A. siro	68.8	59.0	72.0	48.0
A. farris	3.2	1.8	7.0	37.9
A. immobilis	2.5	1.4	3.2	7.9
G. destructor	63.1	51.2	42.0	89.4
G. domesticus	1.3	0.7	12.1	11.0
G. ornatus	0	0	1.6	0.8
G. michaeli	0	0	0.8	0.4
T. longior	21.7	15.9	18.1	37.0
T. palmarum	2.5	1.4	12.7	8.4
T. putrescentiae	17.8	12.0	3.8	8.4
T. similis	0	0	0	0.8
T. sp. nov.	0	0	1.9	1.6
Number where no mites were found	20	53	238	9
Number where mites not identified	12	23	133	0
Number where mites were identified	125	207	371	227
Total inspected	157	283	742	236

Table 99. **The combinations of mite genera present at commercial sites and stores, and at farm grain stores in 1987 and 1973.**

Genera	Commercial		Farm Store	
	sites	stores	1987	1973
Acarus only	17	44	135	9
Glycyphagus only	14	31	41	36
Tyrophagus only	1	2	19	6
Total single genus occurrences	32	77	195	51
Acarus + Glycyphagus	44	61	76	55
Acarus + Tyrophagus	7	14	28	6
Glycyphagus + Tyrophagus	2	6	19	9
Acarus + Glycyphagus + Tyrophagus	40	49	53	69
Total mixed genus occurrences	93	130	176	139

Table 100. **The presence and absence of each mite genus in commercial stores, related to insecticide usage. The number of occurrences for each genus includes all those mites identified to species level together with unidentified mites that had been assigned to that genus.**

Genus		Number of stores fabric treated	Number of stores fabric not treated	Number of stores grain* treated	Number of stores grain not treated
Acarus	present	153	32	89	87
	absent	67	30	41	46
		chi^2 = 6.893, P<0.01		chi^2 = 0.276, ns	
Glycyphagus	present	130	32	68	88
	absent	92	28	62	47
		chi^2 = 0.528, ns		chi^2 = 4.536, P<0.05	
Tyrophagus	present	69	9	35	39
	absent	151	50	95	98
		chi^2 = 5.994, P<0.025		chi^2 = 0.079, ns	

* All or part of the grain treated; some stores were empty so totals of mite occurrences will be lower than for the fabric comparisons.

Table 101. The discriminating doses used to detect resistance to insecticides. Five hour exposure period unless stated otherwise. (Concentration = % in oil; deposit = mg/m².)

Compound	*O. surinamensis*		*C. ferrugineus*		*S. granarius*		*S. oryzae*	
	Conc.	Deposit	Conc.	Deposit	Conc.	Deposit	Conc.	Deposit
Malathion	0.3	78	1.0	260	0.4+	104	1.5++	390
Fenitrothion	0.5	130	0.2	52	-	-	-	-
Pirimiphos-methyl	0.6	156	0.5	130	-	-	-	-
Chlorpyrifos-methyl	1.0	260	0.5	130	0.05+	13	0.05+	13
Methacrifos	0.4*	104	-	-	-	-	-	-
Etrimfos	0.2	52	0.15	39	-	-	-	-

* in polyethylene glycol
\+ 24 hour exposure period
++ 6 hour exposure period

Table 102. The discriminating doses used to detect resistance to fumigants.

Species	Fumigant (mg/l)	
	Methyl Bromide (5 hour exposure)	Phosphine (20 hour exposure)
O. surinamensis	9	0.05
C. ferrugineus	-	0.06
S. granarius	9	0.07
S. oryzae	6	0.04

Table 103. The results of discriminating dose tests on strains of *O. surinamensis* collected from commercial stores. The figures are percentage knockdown. *Grain or store treated with an insecticide during the previous twelve months. No fumigants had been used in these stores in the twelve months.

Ref	mal	fen	p-m	cp-m	etr	meth	PH_3	MeBr
3002/1*	100	100	100	67.6	59.4	100	100	100
3002/2*	88.7	100	100	80.7	70.9	100	100	100
3015/1*	100	100	92.0	60.6	53.5	100	100	100
4003/1*	100	100	97.9	78.2	73.2	100	100	100
4008/1*	100	100	94.9	65.1	54.5	98.2	100	100
4009/1*	100	100	97.4	91.7	40.0	100	100	100
4009/2*	100	100	96.8	92.3	60.3	100	96.3	100
4009/3*	100	100	98.0	93.7	67.0	100	100	100
4012/1*	100	100	100	63.2	75.7	96.9	100	100
4016/2*	100	100	92.2	41.9	79.0	100	100	100
5009/1*	52.3	67.7	73.6	88.7	21.7	100	100	100
5019/1	100	100	92.3	86.6	74.5	100	98.3	100
5065/2*	100	100	100	67.0	68.0	100	98.4	100
6010/1*	100	100	78.6	73.5	61.8	100	100	100
6010/2*	100	100	98.4	85.2	95.7	100	100	100
6010/3*	100	100	100	92.2	98.5	100	100**	100
6013/3*	100	100	91.1	41.5	79.8	100	98.9	100
6017/1*	100	100	94.9	75.5	53.9	94.4	100	100
6018/1*	22.7	51.1	55.6	83.8	10.4	100	100	100
7002/1*	4.5	14.4	7.2	65.3	1.9	100	100	100
7005/1*	100	100	94.8	93.1	59.0	100	98.2	100
7005/2	100	100	92.1	97.8	62.6	100	100	100
7009/1*	92.4	100	91.0	85.3	38.4	100	97.2	100
7012/1*	11.8	32.6	6.0	22.6	0	8.3	98.9	100**
7014/1*	83.1	98.9	90.1	89.5	67.4	95.7	100	100
7022/1	100	100	97.2	55.1	83.5	92.9	100	100
7022/3*	100	100	92.1	63.7	78.1	93.6	100	100
7022/4*	100	100	91.4	72.4	82.5	98.0	97.7	100

** less than 1% survival, test not repeated.

Table 104. Results of discriminating dose tests on strains of *C. ferrugineus* collected from commercial grain stores. Figures are percentage knockdown. *Grain or store treated with an insecticide during the previous twelve months. + fumigant used on grain during the previous twelve months.

Ref.	mal	fen	p-m	cp-m	etr	PH_3
3021/3	100	100	100	100	100	100
4003/1*	100	100	100	100	100	100
4008/1*	100	100	100	100	100	100
4009/2*	100	100	100	100	100	100
4011/1*	100	83.9	100	100	100	100
4012/1*	100	100	100	100	100	97.8
4016/2*	100	100	100	100	100	100
5006/1*+	100	100	100	100	100	100
5009/1*	100	100	100	100	100	100
5012/2*	100	100	100	100	100	100
5050/2*	100	100	100	100	100	100
5055/1*	100	100	100	100	97.8	100
5072/2*	100	100	100	100	100	100
5075/1	100	100	100	100	100	100
6005/1*	100	100	100	100	100	100
6012/1*	72.0	100	100	100	100	100
6013/3*	100	100	100	100	100	100
6017/1*	74.0	100	100	100	100	100
7005/1*	85.6	100	100	100	100	100
7012/1*	100	100	100	100	100	98.3
8002/1	100	100	100	100	96.5	100

Table 105. Results of discriminating dose tests on strains of *S. granarius* and *S. oryzae* collected from commercial grain stores. Figures are percentage knockdown. *grain or store treated with insecticide during the previous twelve months. + fumigant used on grain during the twelve months.

Ref.	mal	cp-m	PH_3	MeBr	species
3030/1*	100	100			*granarius*
4009/2*	100	100			*granarius*
4009/3*	100	100	100**	100	*granarius*
4011/1*	100	100	100	100	*granarius*
4012/1*	100	100			*granarius*
4016/2*	97.0	100	100**	100	*granarius*
5006/1*+	100	100			*granarius*
5010/1*	100	100	100	100	*granarius*
5012/3*	100	100	100	100	*granarius*
5054/1*	100	100	100	100	*granarius*
6004/1*	100	100	100	100	*granarius*
7001/1*	100	90.4	100	100	*granarius*
7012/1*	100	100	100	100	*granarius*
8001/2	100	100	100	100	*granarius*
8003/1*	100	100	97.0	100	*granarius*
4008/1*	100	100	100	100	*oryzae*
6018/1*	100	91.3	100	100	*oryzae*

** less than 1% survival, test not repeated.

Table 106. The number of (a) sites and (b) stores in each MAFF Region and in Wales with populations of *O. surinamensis* resistant to various pesticides.

Region	no. with *O. sur.*	no. tested	mal	fen	p-m	cp-m	etr	meth	PH_3	MeBr
(a) Sites										
North	3	2	1	0	1	2	2	0	0	0
M & W	7	5	0	0	4	5	5	2	1	0
East	9	3	1	1	2	3	3	0	2	0
SE	4	4	1	1	4	4	4	1	1	0
SW	7	6	4	3	6	6	6	3	4	0
Wales	1	0	-	-	-	-	-	-	-	-
All	31	20	7	5	17	20	20	6	8	0
% Res.			35	25	85	100	100	30	40	0
(b) Stores										
North	4	3	1	0	1	3	3	0	0	0
M & W	9	7	0	0	6	7	7	2	1	0
East	10	3	1	1	2	3	3	0	2	0
SE	6	6	1	1	5	6	6	1	1	0
SW	11	9	4	3	9	9	9	5	4	0
Wales	1	0	-	-	-	-	-	-	-	-
All	41	28	7	5	23	28	28	8	8	0
% Res.			25	18	82	100	100	29	29	0

Table 107. The number of (a) sites and (b) stores in each MAFF Region and in Wales with populations of *C. ferrugineus* resistant to various pesticides.

Region	no. with *C. ferr.*	no. tested	mal	fen	p-m	cp-m	etr	PH_3
(a) Sites								
North	1	1	0	0	0	0	0	0
M & W	8	6	0	1	0	0	0	1
East	9	7	0	0	0	0	1	0
SE	6	4	2	0	0	0	0	0
SW	2	2	1	0	0	0	0	1
Wales	1	1	0	0	0	0	1	0
All	27	21	3	1	0	0	2	2
% Res.			14	5	0	0	10	10
(b) Stores								
North	1	1	0	0	0	0	0	0
M & W	8	6	0	1	0	0	0	1
East	11	7	0	0	0	0	1	0
SE	7	4	2	0	0	0	0	0
SW	2	2	1	0	0	0	0	1
Wales	1	1	0	0	0	0	1	0
All	30	21	3	1	0	0	2	2
% Res.			14	5	0	0	10	10

Table 108. **The number of (a) sites and (b) stores in each MAFF Region and in Wales with populations of *S. granarius* resistant to various pesticides.**

Region	no. with *S. gran.*	no. tested	mal	cp-m
(a) Sites				
North	2	1	0	0
M & W	5	4	1	0
East	9	4	0	0
SE	3	1	0	0
SW	5	2	0	1
Wales	3	2	0	0
All	27	14	1	1
% Res.			7	7
(b) Stores				
North	2	1	0	0
M & W	6	5	1	0
East	10	4	0	0
SE	3	1	0	0
SW	5	2	0	1
Wales	3	2	0	0
All	29	15	1	1
% Res.			7	7

Table 109. The combinations of insecticide resistance found in populations of *O. surinamensis* from commercial grain stores.

Insecticide	Combinations (R = resistant, S = susceptible)												
Chlorpyrifos-methyl	R	R	R	R	R	R	R	R	R	R	R	R	S
Methacrifos	R	R	R	R	S	S	R	S	S	S	S	S	S
Etrimfos	R	R	R	R	R	R	S	S	S	R	R	R	S
Pirimiphos-methyl	R	R	R	S	R	S	S	S	S	R	S	R	S
Malathion	R	R	S	S	S	S	S	R	S	R	R	R	S
Fenitrothion	R	S	S	S	S	S	S	S	S	R	S	S	S
no. of strains with each combination	2	0	5	1	12	3	0	0	0	3	1	1	0

Table 110. The percentage of farm stores, commercial sites and commercial stores where resistance to each insecticide and fumigant was detected in *O. surinamensis*.

Insecticide	Farm stores	Commercial sites	Commercial stores
Malathion	13.0	35.0	25.0
Fenitrothion	3.0	25.0	17.8
Pirimiphos-methyl	27.0	85.0	82.1
Chlorpyrifos-methyl	100.0	100.0	100.0
Etrimfos	60.0	100.0	100.0
Methacrifos	77.0	30.0	28.6
Phosphine	10.0	40.0	28.6
Methyl Bromide	27.0	0	0

Table 111. The five strains of *O. surinamensis* showing multiple organophosphate resistance, listed in order of their percentage knockdown by malathion.

Strain	mal	fen	p-m	etr	cp-m	meth
7002/1	4.5	14.4	7.2	1.9	65.3	100.0
7012/1	11.8	32.6	6.0	0	22.6	8.3
6018/1	22.7	51.1	55.6	10.4	83.8	100.0
5009/1	52.3	67.7	73.6	21.7	88.7	100.0
7014/1	83.1	98.9	90.1	67.4	89.5	95.7

Table 112. The percentage of all commercial stores using various insecticide treatments compared to the percentage of stores with resistant *O. surinamensis* using the same treatments. The number of stores is shown in parenthesis.

% stores that treated	all stores	stores with resistant strains
Fabric only	38.8 (109)	38.4 (10)
Fabric & grain	39.5 (111)	46.2 (12)
Grain only	6.8 (19)	7.8 (2)
Grain*	0.4 (1)	0 (0)
Neither	14.6 (41)	7.8 (2)

* No details of whether or not the fabric was treated in this store.

Table 113. The percentage of pirimiphos-methyl resistant populations of mites at those sites where mites were tested for resistance.

Region	No of sites sent mites	No of sites mites tested	No of sites with resistant mites	% with mites resistant
Northern	35	30	17	56.7
Mid & West	15	14	11	78.6
Eastern	55	52	37	72.5
S. East	13	12	11	91.7
S. West	12	9	7	77.8
Wales	3	3	2	-
Totals	133	119	85	71.4

Table 114. The percentage of pirimiphos-methyl resistant populations of mites at those stores where mites were tested for resistance.

Region	No of stores sent mites	No of stores mites tested	No of stores with resistant mites	% with mites resistant
Northern	53	46	23	50.0
Mid & West	25	21	14	66.7
Eastern	98	83	53	63.9
S. East	26	24	20	83.3
S. West	20	15	10	66.7
Wales	3	3	2	-
Totals	225	192	122	63.5

Table 115. **The results of pirimiphos-methyl discriminating dose tests on strains of *A. siro*, *G. destructor*, *T. putrescentiae* and *T. longior* from commercial grain stores.**

Species	no. tested	no. resistant	% resistant
A. siro	155	110	71.0
G. destructor	92	10	10.9
T. putrescentiae	28*	28	100.0
T. longior	14**	0	0

* Three were mixed strains of *T. putrescentiae* and *T. palmarum*, only the *T. putrescentiae* survived.

** One of these was a mixed strain of *T. longior* and *T. palmarum*.

Table 116. **The number of sites with each of the combinations of pirimiphos-methyl resistant mite species. A = *A. siro*, T = *T. putrescentiae*, G = *G. destructor*.**

Region	A only	T only	G only	A+T	A+G	T+G	A+T+G
Northern	12	0	0	4	1	0	0
Mid & West	6	0	2	2	0	0	1
Eastern	26	0	1	9	0	0	1
S. East	6	1	1	2	1	0	0
S. West	4	1	0	1	1	0	0
Wales	2	0	0	0	0	0	0
Totals	56	2	4	18	3	0	2
		62			21		2