



Scottish Government – Pesticide Practices Survey



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Executive Summary

Introduction and Method

The Pesticide Safety Directorate, now known as the HSE Chemicals Regulation Directorate wished to survey farmers, advisors and contractors across the UK to understand practices with regard to pesticide application, machinery testing and maintenance; use of integrated pest management and pesticide waste disposal practices. In order to gain robust information on practices within Scotland, the Scottish Government commissioned surveys to boost the total number of interviews conducted amongst farmers in Scotland. This report presents the findings of all farmer interviews conducted in Scotland. Interviews were conducted by telephone by a specialist market research interviewing agency the Hill Taylor Partnership.

Quotas were placed on the sample to ensure representativeness in terms of the proportion of farms in each farm type and Standard Labour Requirement¹ (SLR) size band. All farms within the sample had a gross margin greater than zero with the aim of removing inactive farms from the sample. 641 interviews were conducted with a representative sample of farms in Scotland with a gross margin greater than zero, yielding 170 interviews amongst farms to which pesticides were applied. A further 219 interviews were conducted with farms over 1SLR in order to boost the number of farms in the sample that applied pesticides. In total 320 interviews were conducted with farms on which pesticides were applied.

Pesticide Application Practice

Pesticide application

Pesticides were applied to 27% of the farms in Scotland. This equates to approximately 13,500 farms across Scotland. Farms under 1SLR were significantly less likely to apply pesticides (19%) than the larger farms. Pesticide application was greater on arable farms (66-71%) and mixed farms (64%) than other farm types and greatest in the South East of Scotland (37%) and lowest in the North West (18%).

There is a smaller proportion of farms in Scotland applying pesticides compared to the whole of the UK, where 34% of holdings applied pesticides. The estimated 13,500 farms applying pesticides in Scotland equates to 17% of the UK farms that apply pesticides.

Pesticides were applied by the farmer or farm worker on 54% of farms that applied pesticides, equivalent to around 9,000 holdings. Contractors only applied pesticides on 33% of farms, whilst on a further 13% of farms both a contractor and the farmer applied pesticides. Farmers, family members and farm workers applied pesticides on average approximately 8-13 days per year, although 45% sprayed for only 1 or 2 days per year and could be classed as infrequent spray operators. This compares to 36% across the UK.

Farm based spray operators

There are an estimated 10,000 farm based spray operators in Scotland, or an average of 1.1 per holding that applied pesticides (excluding contractors). Of these 87% are sole spray operators on the holding.

¹ The Standard Labour Requirement (SLR) for a farm business represents the labour requirement (in full-time equivalents) for all the agricultural activities on the farm, based on standard coefficients for each commodity on the farm. The SLR is representative of labour requirement under typical conditions for enterprises of average size and performance.

Training

On holdings where pesticides were applied by the farmer or farm worker, 53% applied pesticides under the grandfather rights exemption i.e. were born before 31st December 1964 and did not hold a certificate of competence. This equates to in the region of 5,000 farms across Scotland with an operator working under the grandfather rights exemption.

On a further 23% of farms that applied pesticides themselves the spray operators were born on or before 31st December 1964 (i.e. over 44yrs) and held a certificate of competence, despite there being no legal requirement to do this. On 20% of the farms pesticides were applied by a farm based operator with a certificate of competence, born after 31st December 1964 (aged 44 years and under).

However on 4% of the farms the operator was aged 44 years and under but did not hold a certificate of competence, and was not operating under the supervision of a certified operator and may therefore be operating illegally (UK 6%). The number of farms with an operator working illegally equates to approximately 1% of the total farms in Scotland with a gross margin greater than zero i.e. in the region of 350 farms across Scotland.

19% of the farms that applied pesticides had at least one member of NRoSO, with the farms over 1SLR, arable farms and farms in the North East and South East being the most likely to have at least one member. This compares to the UK figure of 25% of holdings with at least one member of NRoSO.

Pesticide Application Decision Making

Decisions on which pesticides to use

On 33% of farms that apply pesticides the farmer made the decision over **which** pesticides to apply, whilst agronomist made the decision on 45% (independent 15%, supplier based 30%), and a contractor decided on 20% of farms. The smaller the farm the greater was the likelihood that the farmer would make the decision.

The farmer was the key decision maker on cattle and sheep LFA and other farm types, whilst an agronomist was the most common decision maker on arable farms. The farmer was the main decision maker in the North West, however a supplier based agronomist was key in the North East and South East.

On 28% of farms that applied pesticides the decision maker held a BASIS certificate of crop protection, whilst on 25% of farms they held a certificate of competence to spray pesticides and 22% had a member of NRoSO. 30% did not know what qualifications the decision maker had, however it is likely that the farmer was unaware of the qualification held by an agronomist or contractor. 22% of farms stated the decision maker had no qualifications (46% of the decision makers on farms operating under grandfather rights had no qualifications). The decision makers for farms over 1SLR, arable farms, and farms in the North East and South East were the most likely to hold relevant qualifications.

Decisions on when to apply pesticides

The farmer was the main decision maker in terms of **when** pesticide application took place on 52% of farms that applied pesticides. An agronomist decided on 29% of farms (independent 10%, supplier based 19%), whilst a contractor made the decision on 16%. Again the farmer was more likely to be the decision maker on farms under 1SLR than on larger farms. An agronomist was the key decision maker on arable farms and was as important as the farmer in the North East and South East.

31% of those who decided when to apply pesticides did not hold any relevant qualifications (58% of decision makers on farms operating under grandfather rights had no relevant qualifications), whilst 22% of farms were not aware which qualifications were held. As discussed above the farmer may not have been aware of qualifications held by the agronomist or contractor. 24% had a certificate of competence to spray pesticides, 22% had the BASIS certificate of crop protection, whilst 23% were members of NRoSO. The likelihood of the decision maker holding relevant qualifications was greatest on farms of 3-5SLR, arable farms and farms in the North East and South East.

Spray conditions

The factors most commonly taken into account when deciding when to apply pesticides were whether it will rain (66%), wind speed (63%), crop growth stage (39%) and ground conditions (19%). The livestock and other farm types, were often the least likely to take the key factors into account.

The key method of reducing pesticide drift to watercourses and other non-target areas was to spray in low wind (68%). Other frequently mentioned methods included spray when the wind is blowing away from sensitive areas (22%), buffers strips (14%), and low drift nozzles (13%). The use of buffer strips and low drift nozzles appeared greater in the presence of a certified operator, on farms over 1SLR, on arable and mixed farms and farms within the North East and South East of Scotland.

Integrated pest management

19% of the farms that applied pesticides did not make use of any information or programmes to help them plan or manage pesticide application. The most popular information sources were however product manuals (43%), advice from an agronomist (independent 22%, supplier based 41%), articles in the farming press (36%), the UK Pesticide Guide (22%) and the code of practice on the safe use of plant protection products (22%). The arable farms and farms in North East and South East often made greater use of the various information sources than the livestock farms and farms located elsewhere.

The assessment of weeds, pests and diseases in crops and grassland was most often carried out by regular crop inspections undertaken by the farmer (75%) or agronomist (44%). 8% of the farms used in field tests and traps, which were more common on farms over 1SLR, cereal farms and farms in the North East and South East. The key benefits of in field tests and traps over crop inspections were to determine the need for pesticide application and assess the level of infestation.

Farm assurance

20% of the farms that applied pesticides were not a member of any farm assurance scheme, however the most popular schemes were Quality Meat Scotland (36%) and Scottish Quality Cereals (31%). Farms operating under grandfather rights were less likely than other farms to be in a scheme. The likelihood of being in a scheme was lower amongst farms of less than 1SLR than other farms. The arable and dairy farms were the most likely to be in a scheme, whilst the other farm type was the least likely. Farms in the North West were the least likely to be in a scheme.

Pesticide Application Equipment

Equipment type

Knapsacks were the common type of equipment used to apply pesticides (65%), followed by tractor mounted/trailed or self propelled boom sprayers (50%) and quadbikes (12%). Knapsacks were most common on farms of 2-3SLRs, on other farm types and on farms

operating under grandfather rights. Tractor mounted/trailed or self propelled boom sprayers were most common on farms with certified operators, farms over 1SLR and farms in the North East, but less likely to be found on cattle and sheep farms than arable dairy or mixed farms. It is estimated that there are in the region of 9,800 knapsacks and 7,300 tractor mounted/trailed or self propelled boom sprayers in Scotland.

Spray days

On average all spray operators based on the farm applied pesticides for between 8 and 13 days per year. The highest proportion of farmer spray operators sprayed for 1 day, 21%, or 2 days, 23%, however the number of days on which spraying took place ranged from 1 to 150. In total 45% of spray operators that spray for less than 2 days a year could be classified as infrequent spray operators. Cattle and sheep and the other farm type holdings had the highest proportion of farms spraying for 2 days or less each year. The lowest number of days sprayed by the respondent was registered on farms without a certified operator (grandfather rights 5 days, certified operator under 44 yrs 17 days) and on farms under 1SLR (4 days).

Equipment age

The machinery held on farm by the respondents varied in age, however the tractor mounted/trailed standard boom sprayers recorded the highest average age of just over 10 years (UK 9 years), with 23% between 10-20 years old and 11% over 20 years old. This is a higher proportion of older machines compared to the UK where 8% were over 20 years old. Knapsack sprayers had an average age of just over 6 years (UK just over 5 years), air assisted boom sprayers in Scotland had an average age of 7 years (UK 7.5 years) and quadbikes 3 years (UK nearly 4 years).

Equipment maintenance

Most types of equipment was more likely to be maintained regularly rather than faults being fixed as they occurred, although faults with knapsacks were more likely to be fixed as they occurred. Maintenance or servicing was most often conducted annually. In the majority of cases the machinery was maintained by the farmer, although a specialist company maintained a substantial proportion. Only 4% of the knapsacks, but 33% of the tractor mounted/trailed or self propelled boom sprayers had been tested through the NSTS, with the majority of equipment having been tested in the last year or within the last 1-2 years. The nozzles on the boom sprayers were set on average 56-62cm above the crop. The average boom width for the tractor mounted/trailed or self propelled boom sprayer was 15m. The average speed at which the boom sprayers travelled was 5 miles per hour.

Informing adjacent residents

17% of the farmers who had pesticides applied on their farm informed adjacent neighbours, with the farms with a certified spray operator being more likely to inform neighbours than those operating under grandfather rights. General cropping farms were more likely to inform neighbours than the remaining farm types. A face to face visit (50%) followed by a phone call (30%) were the most common ways of informing neighbours.

Disposal of Pesticides and Empty Pesticide Containers

Information sources

An agronomist from a pesticide supplier (16%), followed by leaflets (12%), an independent agronomist (10%) and training courses/seminars (8%) were the most common sources of information obtained by the farmers on how to dispose of pesticides and pesticide containers. 28% had not obtained any information. Farms operating under grandfather rights

were less likely to have obtained information than those with a certified operator. Arable farms were the most likely to have obtained some type of information whilst the other farm types were the least likely. Farms in the North West and South West were less likely than farms elsewhere to have obtained information.

Disposal of empty pesticide containers

The highest proportion of farms, 28% disposed of empty pesticide containers via a waste recycling contractor or had them taken away by the spray contractor 28%. 18% burned them in a drum incinerator. 3% took containers to a household recycling disposal site whilst 5% placed them in a dustbin, with the farms operating under grandfather rights, being the most likely to put the containers in the dustbin.

Livestock farms and farms operating under grandfather rights were less likely to burn the containers in the drum incinerators. Farms in the North East and South East were more likely than farms elsewhere to burn the containers in a drum incinerator. 2% of farms stored the containers with no plans for re-use, with 71% of these storing the containers in a standard store. Only 14% stored them in an adapted or purpose built store.

Cleaning pesticide containers

13% of farms did not clean out the empty pesticide containers before disposal, this response being most common amongst those who used a spray contractor. The most common cleaning process was however a triple rinse by hand (45%), whilst 19% used specialist equipment of the sprayer, the latter being most common on the general cropping farms and farms in the South East. 68% of farms who cleaned the containers sprayed the rinsings out with the sprayer on appropriate crops, whilst 13% disposed of them on waste land. 2% however admitted to disposing of them down the drain.

Disposal of waste dilute pesticide

The largest proportion of farms did not have any waste undiluted pesticide (37%), however the largest proportions that did, either had the pesticide taken away by the spray contractor (26%) or stored it (14%). 1% tipped or buried the pesticide. The farms with spray operators over 44 years and the smaller farms were the most likely to store the pesticide. Of the farms that stored the waste undiluted pesticide 22% did so in a standard store, whilst 67% stored it in an adapted or purpose built store.

Left over diluted pesticide was most commonly applied to another crop (26%) or taken away by the spray contractor (23%). 29% of the farms however did not have any left over diluted pesticide. 1% admitted to pouring the waste diluted pesticide down the drain. 3% of farms stored the waste diluted pesticide, with 60% storing it in an old bottle or drum, 20% permanently stored it in the sprayer, whilst 20% temporarily stored it in the sprayer. Farms operating under grandfather rights and those farms that applied the pesticides themselves were more likely to have no pesticide left over than those with a certified operator or those using a spray contractor.

Discussion and conclusions

General points

The purpose of this research was to understand sprayer practices across the UK, in all farm types and farm sizes by holding. Previous research has tended to focus on farms with arable crops only and any measures were based on area sprayed rather than individual holdings. This survey has the number of farm holdings as a baseline. In other surveys such as the Pesticide Usage Surveys² and the Voluntary Initiative Farm Sprayer Practices Survey³, the focus was on a particular crop type and the area sprayed rather than the number of holdings so direct comparisons are not possible.

Policy considerations

Scotland has a relatively low number of holdings applying pesticides, but in implementing the Sustainable Use Directive there are some particular challenges:

- There is a high proportion of spray operators who only use a knapsack sprayer
- There is a high proportion of infrequent spray operators (45%)
- There is a high proportion of farm based spray operators working under grandfather rights (53%)
- There is a higher proportion of older boom sprayers (11% > 20 years) compared to the UK
- There is low use or availability of agronomy support
- There is low use of IPM techniques
- There is some poor understanding and implementation of good disposal practices

Much of the lack of understanding or poor practice is related to lack of training and reliance on the grandfather rights exemption. Addressing this issue will be key to developing appropriate policies.

Removal of grandfather rights

The removal of grandfather rights under changes in the Sustainable Use Directive could have a significant impact in Scotland, particularly given that 87% of farms rely on a sole spray operator. It will have a particular impact on livestock farms and smaller farms where there is often a sole spray operator and no alternative. The impact will depend on the type of equipment used, the detail of the requirement (e.g. does it cover knapsack usage) and the response to the change. Some farmers will retrain, while others may choose to stop spraying and either use a contractor or other methods of control. The costs of retraining are dependent the type of course available. The foundation course and knapsack sprayer training course is in the region of £530 while the foundation course and boom sprayer training course is £730. There may be issues of willingness to retrain and perhaps access to training venues. Some guidance to farmer attitudes towards changes to grandfather rights

² CSL (now Fera), various years Pesticide Usage Surveys

³ CSL (now Fera)(2004) Farm Sprayer Practices Survey for the Voluntary Initiative

can be obtained from the Scottish Government survey and report on the removal of grandfather rights (publishing date to be confirmed); also carried out by ADAS.

Sprayer Testing

The impacts of sprayer testing may have a disproportionate impact on Scotland due to a higher proportion of older machines. There may also be issues of access to testing and servicing centres indicated by the higher proportion of holdings who currently carry out their own maintenance. Consideration may need to be given to how to improve access, particularly in some of the more remote regions. The cost of maintenance and any repairs may mean that some farmers will stop using their equipment and rely more on contractors.

Integrated pest management

The low use of IPM techniques in Scotland is partially a reflection on the farming structure with only a low proportion of the land in arable/horticulture crops for which there is a wider range of IPM measures such as pest trapping. There are however, some measures that may be appropriate for grassland management that should be promoted more widely such as prevention or reduction of pests in grass reseeds, or non-chemical control of thistles, docks and nettles.

Waste disposal practices

Many of the poor waste disposal practices can be related to infrequent spray operators and lack of training and avenues for increased awareness of the key issues should be considered.

Influencing behaviour

Agronomists are the main decision makers on 45% of holdings and advice is sought from agronomists by 63% of holdings. Their use is lowest on small and livestock farms. The relatively low use or availability of agronomists in Scotland means that they may not be the most appropriate route for encouraging changes in behaviour, and messages direct to farmers will be important in Scotland. The revisions of training requirements will be an important part of this as it is evident that many of the poorer practices and lack of knowledge tend to be in those without formal training.

This may be a reflection on the type of spraying with a significant proportion applied by knapsack where the products and problems are unlikely to change from year to year. This is supported in the use of support material which is heavily reliant on product manuals (labels) rather than the use of agronomist in small farms and livestock farms.

Clearly, in many situations where agronomist input is limited, the farmer is key to influencing product choice and decision about what and when to apply pesticides. Product manuals/labels are important areas for information as they were used by a higher proportion than any other source of information, although even here it was limited to only 43% of holdings although this may be an underestimate as the question asked about product manuals, rather than specifically labels.

Along with agronomists, articles in the farming press were an important source of information particularly in the cereal sector. Use of computer support programmes was limited amongst farmers even in the higher usage arable farms, but used by a majority of agronomists.

Enforcement

Around 30-35% of farms were members of farm assurance schemes that had specific requirements for pesticide usage such as certification, or sprayer testing. These schemes usually have annual audits which increases farmer awareness and compliance with scheme

requirements. Crop assurance schemes usually have requirements to demonstrate correct training and testing of equipment. Given the profile of the farm types it is unlikely that the crop assurance schemes are appropriate for many farms in Scotland. It may be appropriate to work with livestock assurance schemes to include similar requirements.

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1. Introduction

The EU Thematic Strategy on the Sustainable Use of Plant Protection Products contains a number of proposed changes to pesticide legislation including revisions of the approvals legislation (EU Directive 91/414/EEC), a Sustainable Use Directive, and proposals to collect statistical information on the sale and use of pesticides. The proposals under the Sustainable Use Directive focus on correct usage of pesticides and include requirements for training, machinery maintenance, and use of integrated pest management. The UK is quite well placed in meeting these requirements, but there are some key areas where it is necessary to establish the extent to which certain practices have been adopted in order to determine a baseline for assessing the effectiveness of measures adopted under the Directive. The Pesticide Safety Directorate, now known as the HSE Chemicals Regulation Directorate wished to survey farmers, advisors and contractors across the UK to understand:

- Practices with regard to pesticide application, machinery testing and maintenance
- Use of integrated pest management
- Pesticide waste disposal practices

In order to gain robust information on practices within Scotland, the Scottish Government commissioned surveys to boost the total number of interviews conducted amongst farmers in Scotland. This report presents the findings of all farmer interviews conducted in Scotland.

2. Method and Sample

The survey was conducted via telephone interview using CATI (computer assisted telephone interviewing), and administered by experienced telephone interviewers from the Hill Taylor Partnership (a dedicated market research telephone interviewing agency). The survey questionnaires can be found within Appendix 1. Interviews amongst those who apply pesticides lasted approximately 15 minutes. Where no pesticide application took place the interviews lasted 3-4 minutes.

All interviews were conducted in line with the Market Research Society code of conduct. Standards applied under the code include:

- Designing a questionnaire that is fit for purpose
- Clearly communicating reassurances about the MRS code of conduct, the subject and purpose of the interview and the likely length of the interview to the respondent
- Allowing the respondent to opt out of the survey if they do not wish to take part either before or during the interview
- Interviews are not conducted before 9am weekdays or Saturdays or 10am on a Sunday, or after 9pm on any day unless by appointment.
- Respecting respondent anonymity – individual respondents are not identified within the report, only aggregated data is used
- Ensuring that contact databases supplied by the client are used only for the purpose of the survey, are handled securely and are destroyed on completion of the project.
- Respondents will not be re-contacted unless they have provided permission, and unless for quality control purposes. A number of respondents within this survey have provided permission for this re-contact by ADAS within 6 months of the fieldwork

- Reports include sufficient information to enable reasonable interpretation of the validity of the results

An opt-out mailing was conducted by ADAS prior to the survey to give those not wishing to take part in a telephone survey the opportunity to decline.

The sample was drawn by the Scottish Government from the agricultural census data. The sample excluded farms with a gross margin less than zero, in order to exclude the inactive farms and was drawn to be representative of farm type within standard labour requirement⁴ (SLR) size band. The first 641 interviews included all size bands, however given a lower than expected proportion of farms that applied pesticides the decision was taken to conduct a further booster survey only amongst farms of greater than 1SLR to enable more robust analysis of pesticide application practice. This sample was representative of farms in Scotland over 1SLR with a gross margin greater than zero in terms of farm size within SLR size band.

The 641 interviews generated 170 interviews amongst farmers who applied pesticides, i.e. 27% of all farms with a gross margin of greater than zero applied pesticides. A further 219 interviews amongst farms of at least 1SLR generated 150 interviews with farmers who applied pesticides (68%). Thus in total interviews were conducted amongst 860 farmers, 320 of which applied pesticides to their farm.

Data from the first 641 interviews amongst farms of all sizes has been used within the report to identify the proportion and profile of farms that apply pesticides. Data from the booster survey of farms 1SLR and over has been combined with the representative sample to boost the sample base for all questions relating to application decision making and behaviour.

Interlocking quotas were applied to the interview sample to reflect the farming population in terms of farm type within SLR size bands. The achieved sample is detailed in table 1 and compared to the profile of farms within the population with a gross margin of greater than zero.

⁴ The Standard Labour Requirement (SLR) for a farm business represents the labour requirement (in full-time equivalents) for all the agricultural activities on the farm, based on standard coefficients for each commodity on the farm. The SLR is representative of labour requirement under typical conditions for enterprises of average size and performance.

Table 1 Sample Profile

	Target (population profile – all farm sizes, gross margin greater than zero)	Achieved Interviews (excluding booster survey)	Achieved interviews (including booster survey)
Farm type			
Cereals	8%	8%	8%
General cropping	4%	5%	6%
Horticulture	2%	2%	2%
Pigs and Poultry	4%	4%	3%
Dairy	3%	3%	5%
Cattle and sheep (LFA)	28%	28%	33%
Cattle and sheep (lowland)	4%	4%	3%
Mixed	5%	5%	7%
Other	43%	42%	32%
SLR			
Very small under 1 SLR	80%	80%	59%
Small 1 to 2 SLR	7%	7%	15%
Medium 2 to 3 SLR	4%	4%	8%
Large 3-5SLR	5%	5%	10%
Very large 5+SLR	4%	4%	8%
Region (no quotas set)			
North East		19%	19%
North West		37%	32%
South East		20%	21%
South West		24%	28%
Total sample	49,946	641	860

3. Farmer Survey

3.1 Data Analysis

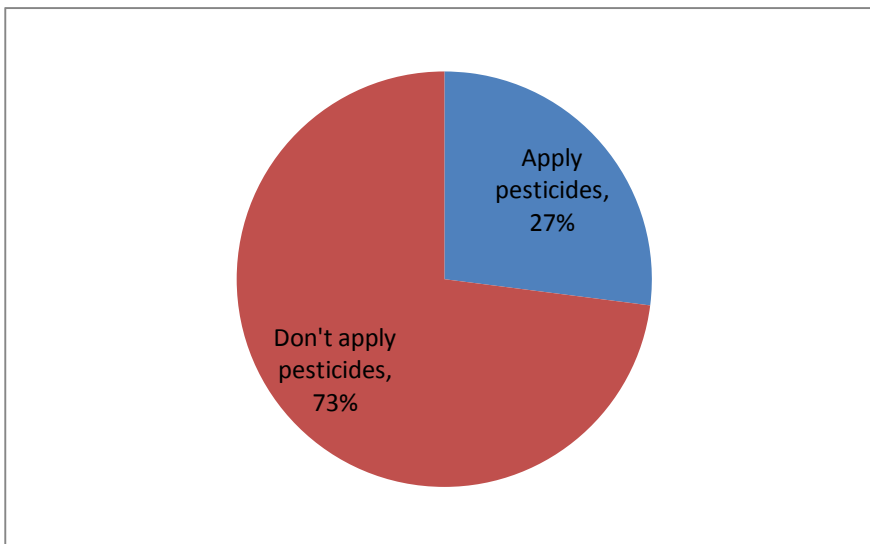
Figure 1 and tables 2-4 within section 3.2 are based on a representative sample of Scottish farms with a gross margin greater than zero and exclude the booster sample. Subsequent figures and tables include the booster sample of farms over 1SLR.

Horticulture, specialist pigs and poultry, and cattle and sheep lowland farm types have been excluded from analysis of farms that apply pesticides due to small base sizes.

Statistical tests have been performed to identify differences between two proportions (z test) and mean scores (t test). Statistical differences are identified by * or **, with * showing a significant difference compared to the remaining sample at the 95% confidence level and ** showing a significant difference when compared to the remaining sample at the 99% confidence level.

3.2 Pesticide Application Practice

Figure 1 Pesticide application



Base: All respondents (excluding booster sample) n= 641

Pesticides are applied to 27% of the farms within the sample (UK 34%, England 37%, and Wales 27%). This equates to an estimated 13,500 farms with a gross margin of greater than zero across Scotland. This represents almost 17% of the estimated 81,000 UK holdings that apply pesticides.

Given the possibility that respondents may have misunderstood what was meant by a pesticide the interviewers were instructed to explain that a pesticide was any chemical used to control weeds, pests or diseases on the farm. It was made clear that the pesticide could be applied by any method including a knapsack and to any part of the farm, by any person.

Table 2 Pesticide application by farm size

	Scotland total	Very small under 1 SLR	Small 1 to 2 SLR	Medium 2 to 3 SLR	Large 3-5 SLR	Very large 5+SLR
<i>Base</i>	641	511	47	26	32	25
Yes	27%	19%**	60%**	58%	50%**	60%
No	73%	81%**	40%**	42%	50%**	40%

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The use of pesticides increased substantially on farms over 1SLR. 81% of farms under 1SLR did not apply pesticides.

Table 3 Pesticide application by farm type

	Scotland total	Cereals	General cropping	Hortic	Specialist Pigs / Poultry	Dairy	Cattle & sheep (LFA)	Cattle & sheep (lowland)	Mixed	Other
<i>Base</i>	641	48	32	11	24	19	179	23	33	272
Yes	27%	71%**	66%**	0%	21%	53%	23%	17%	64%**	12%**
No	73%	29%**	34%**	100%	79%	47%	77%	83%	36%**	88%**

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The arable and mixed farms were significantly more likely than the remaining sample to apply pesticides. Pesticides were applied on 71% and 66% of cereals and general cropping farms respectively, while less than 25% of cattle and sheep farms applied pesticides. Between the two were dairy and mixed farms, where around 50-60% of farms applied pesticides. Pesticide application on horticultural farms (note very low base) and other farm types was very low.

Table 4 Pesticide application by region

	Scotland total	NE	NW	SE	SW
<i>Base</i>	641	124	238	127	152
Yes	27%	30%	18%**	37%**	29%
No	73%	70%	82%**	63%**	71%

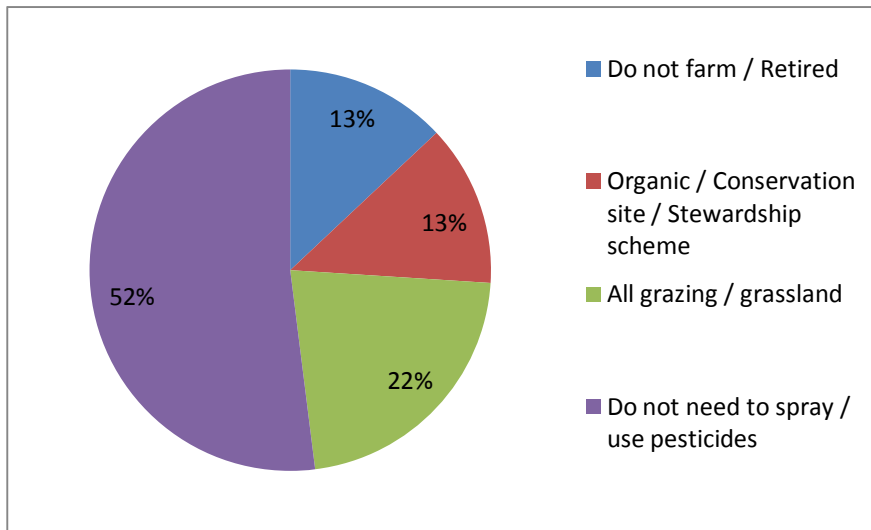
*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

Pesticide application was most likely in the South East of Scotland and least likely in the North West, reflecting the different farm types in the regions.

Reason for not applying pesticides

Figure 2 Reasons for not applying pesticides on the farm



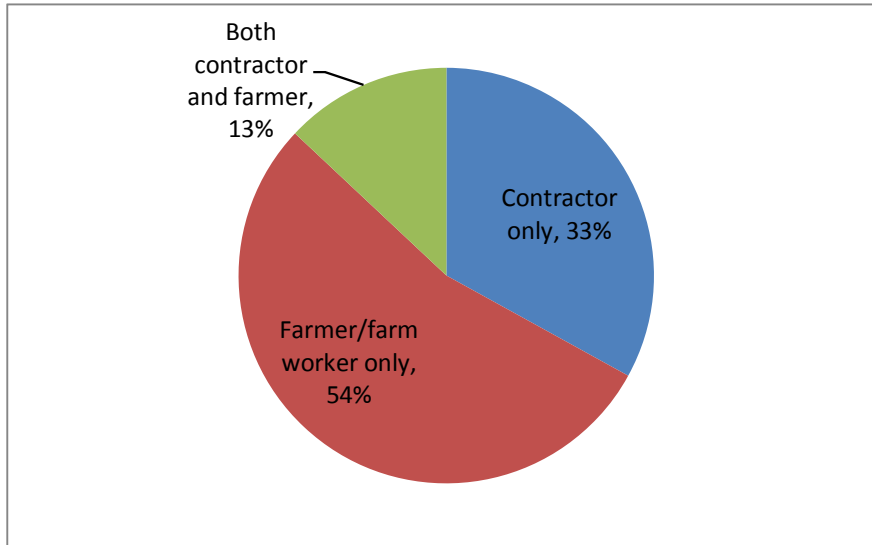
Base: Those that do not apply pesticides n= 540

The largest proportion of farms that did not apply pesticides (52%) simply felt they did not need to use them, while 22% had all grassland or grazing and similarly felt they did not need to use them. On 13% of holdings the respondent felt they were in a scheme which restricted the use of pesticides, whilst 13% did not farm anymore. A high proportion of those who said they did not need to use pesticides were cattle and sheep and other farm types, which may suggest that the reason for not using pesticides was because they were all grassland. Of the 22% who indicated they were all grassland a small proportion were cereal and general cropping farms, according to the agricultural census definitions. This indicates that there may be some changes in farming not fully updated in the census data.

Table 5 Reasons for not applying pesticides by farm type

	Total	Cereals	General cropping	Dairy	Cattle & sheep (LFA)	Cattle & sheep (lowland)	Mixed	Other
<i>Weighted base</i>	540	19	14	14	174	21	21	244
All grazing / grassland	22%	16%	14%	29%	24%	24%	29%	22%
Organic / conservation site / stewardship scheme	13%	37%	50%	14%	16%	0%	24%	7%
Do not farm / retired	13%	32%	21%	0%	6%	5%	10%	17%
Do not need to spray / use pesticides	52%	16%	14%	57%	54%	71%	38%	55%

Spray operators

Figure 3 Who applies the pesticides

Base: All farms that apply pesticides n=320

On holdings where pesticides were applied, they were most likely to be applied by the farmer or another farm worker (54%) rather than a contractor (33%). In addition on 13% of farms pesticides were applied by both a contractor and the farmer.

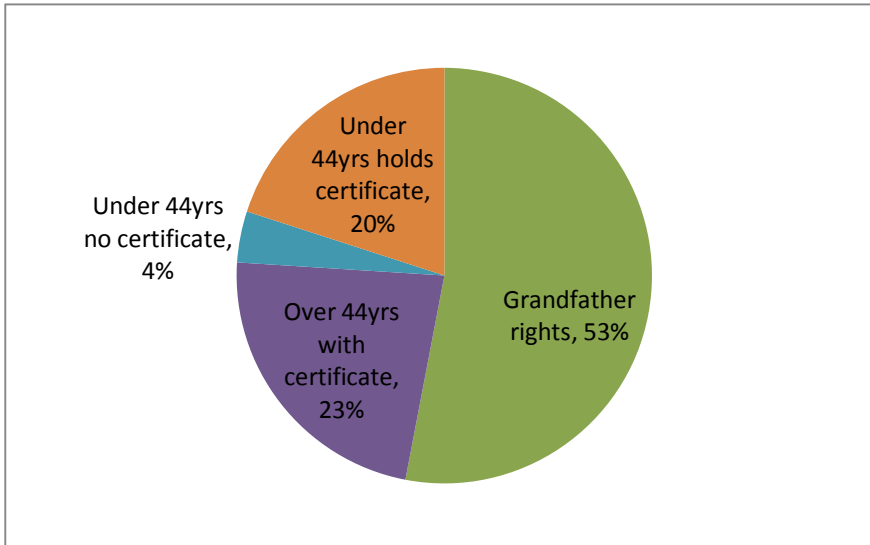
Use of a contractor was only marginally lower on farms of under 2SLR (31%) than on the larger farms (36%). Use of a contractor was lower on cattle and sheep LFA (26%) and other farm types (26%) than the remaining sample. The use of a contractor was marginally lower in the North West (27%) than elsewhere.

Fewer holdings in Scotland had pesticides applied by the farmer only with 54% of holdings compared to 67% for the UK. Use of contractors was greater in Scotland, being used on 46% of holdings, with sole use of contractors on 33% of farms compared to 26% for the UK.

This equates to around 9,000 farm holdings where pesticides are applied by the farmer or farm workers.

Training

Figure 4 Certification



Base: Farms that apply pesticides themselves (includes booster sample)

During the interview respondents were asked who on their farm applied the pesticides. Where this was themselves or another farm worker or family member information was collected to determine if they were born before or after 31st December 1964 (to determine eligibility to operate under the grandfather rights exemption), and whether they held an appropriate certificate (i.e. PA1-PA13), or operated under the supervision of a certified operator.

The majority of farms that applied pesticides themselves (53%) did so under the grandfather rights exemption i.e. were born before 31st December 1964 and did not hold a certificate of competence. This equates to in the region of 5,000 farms across Scotland with a spray operator working under the grandfather rights exemption.

On a further 23% of farms that applied pesticides themselves the spray operators were born on or before 31st December 1964 (i.e. over 44yrs) and held a certificate of competence, despite there being no legal requirement to do this. On 20% of the farms pesticides were applied by a farm based operator with a certificate of competence, born after 31st December 1964 (aged 44 years and under). However on 4% of the farms the operator was aged 44 years and under but did not hold a certificate of competence, and was not operating under the supervision of a certified operator and thus appeared to be operating illegally⁵. The number of farms with an operator working illegally equates to approximately 1% of the total farms in Scotland with a gross margin greater than zero i.e. in the region of 350 farms.

The percentage of farms in Scotland operating under grandfather rights is similar to the UK as a whole, and although there is a similar proportion with a certificate of competence (43% for Scotland and the UK) there are more under 44 years of age with a certificate. The number of farms that may be operating illegally is slightly lower

⁵ Spray operators should be adequately trained. A certificate of competence is one way to demonstrate this but attending recent training courses or events may be sufficient.

in Scotland with 4% of farms that apply pesticides or 1% of the total, compared to 6% of farms that apply pesticides or 1.5% of the total in the UK.

Area sprayed

The average area sprayed⁶ was 74ha, ranging from an average of 30 ha for very small farms to over 160ha for large farms. The average area sprayed was higher on cereal and general cropping farm types (148ha and 170ha respectively) but much lower on dairy farms (27ha) and cattle and sheep farms (23ha).

Farms operating under grandfather rights or with no certified operator under 44yrs on average applied pesticides to significantly fewer hectares than farms with certified operators (certified operator under 44yrs 195ha, certified operator over 44yrs 131ha, grandfather rights 42ha).

Table 6 Hectares pesticides applied to in an average year by farm size

	Total	Very Small under 1 SLR	Small 1 to 2 SLR	Medium 2 to 3 SLR	Large 3-5 SLR	Very large 5+SLR
Base	320	96	81	47	53	43
Average no. hectares	74	30**	55	92	93	163**

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

NB No stats applied to figures for under 10ha

The average number of hectares to which pesticides were applied increased the greater the farm size.

Table 7 Hectares pesticides applied to in an average year by farm type

	Total	Cereals	General cropping	Dairy	Cattle and sheep (LFA)	Mixed	Other
Base	320	50	40	29	108	39	35
Average no. hectares	74	148**	170**	27	23**	107	18*

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The average number of hectares on which pesticides were applied was significantly greater on arable farms than the remaining farm types.

⁶ The area sprayed refers to the area that has pesticides applied, not the number of applications.

Table 8 Hectares pesticides applied to in an average year by region

	Scotland total	NE	NW	SE	SW
Base	320	69	60	83	108
Average no. hectares	74	99	35*	144**	25**

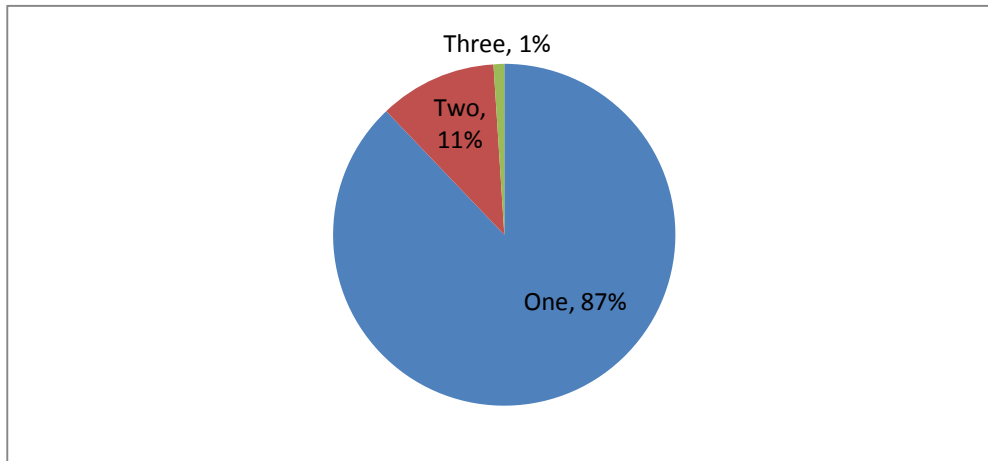
*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

Pesticides were applied to significantly fewer hectares in the North West and South West than elsewhere.

Number applying pesticides

Figure 5 Excluding contractors how many people apply pesticides on the farm?



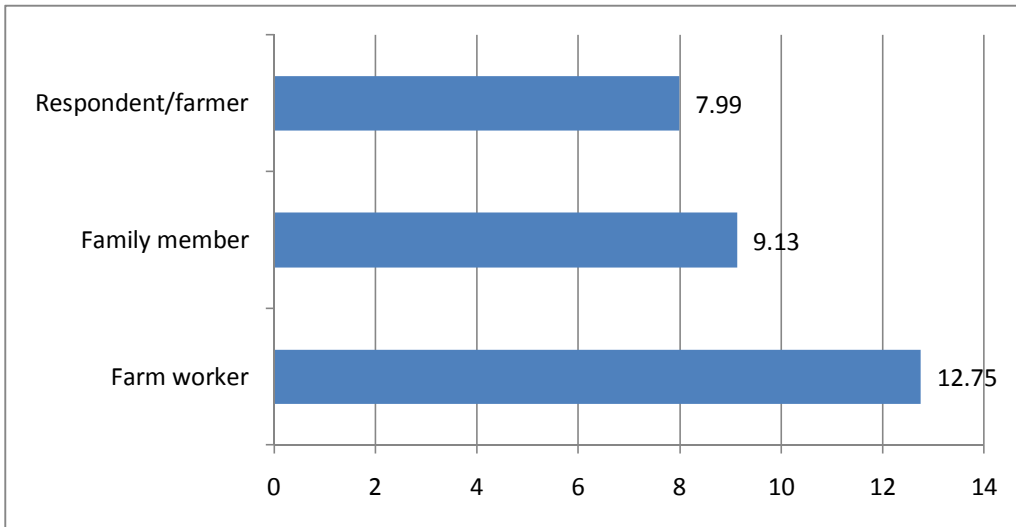
Base: Farms where pesticides are applied by the farmer, family member or farm worker n=214

Where the farmer or farm workers applied the pesticides, they were most likely to be applied by one person (87% of farms). On average pesticides were applied by 1.1 people per farm equivalent to an estimated 10,000 farm based spray operators across Scotland.

The average number of people who applied pesticides on the farm appeared to increase slightly over 2SLRs and was lower on farms operating under grandfather rights than elsewhere (operating under grandfather rights 1.08 people; certified operator under 44yrs 1.46, certified operator over 44yrs 1.24). The number of people applying pesticides on the arable farms appeared greater than on dairy and cattle and sheep LFA, although differences were not significant (cereals 1.17 people, general cropping 1.25 people, dairy 1.07, cattle and sheep LFA 1.08).

The number of people applying pesticides in the South East (1.29) was higher than in the remainder of Scotland (significant difference at the 99% level). (NE 1.04, NW 1.05, SW 1.15).

Figure 6 How many days a year does the respondent/farm worker/family member apply pesticides on the farm?



Base: All those who spray pesticides on farm (all farm based spray operators n=242; respondents/farmers who spray 177; farm workers 41; family members 24)

NB Excludes those who only use a contractor.

On average all spray operators based on the farm applied pesticides for between 8 and 13 days per year. The highest proportion of farmer spray operators sprayed for 1 day, 21%, or 2 days, 23%, however the number of days on which spraying took place ranged from 1 to 150. In total 45% of spray operators that spray for less than 2 days a year could be classified as infrequent spray operators. Cattle and sheep and the other farm type holdings had the highest proportion of farms spraying for 2 days or less each year. The lowest number of days sprayed by the respondent was registered on farms without a certified operator (grandfather rights 5 days, certified operator under 44yrs 17 days) and on farms under 1SLR (4 days).

Table 9 Spray applications of less than 2 days per year by farm type (Respondent sprays on farm)

Respondent sprays on farm	Total	Cereals	General cropping	Dairy	Cattle and sheep (LFA)	Cattle and sheep (lowland)	Mixed	Other
<i>Weighted base</i>	177	27	18	14	69	4	18	21
2 days	23%	4%	11%	21%	30%	25%	17%	38%
1 day	21%	4%	6%	21%	28%	50%	6%	43%
Mean score	7.99	22.67**	15.00	5.79	3.30**	4.00	6.56	2.10

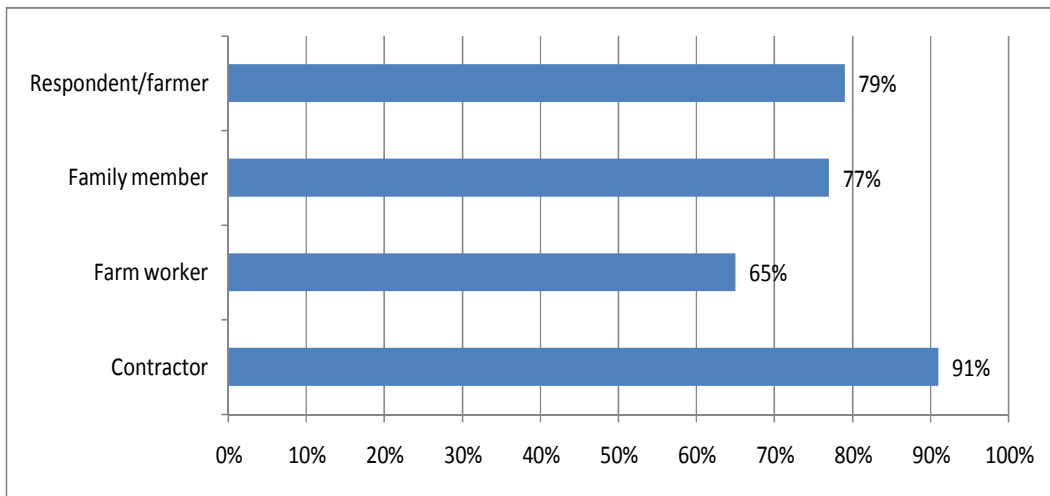
*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The average number of days on which application took place was greater on the arable than livestock farms (cereals 23 days, cattle and sheep LFA 3 days, significantly different to the remaining sample at the 99% level). The respondent sprayed more frequently in the North East and South East of Scotland than elsewhere (NE 15days, SE 12 days, NW 3days, SW 4 days).

The survey results suggest that there are approximately 10,000 farm based spray operators (excluding contractors) in Scotland of which 45% could be classified as infrequent operators (spraying for 2 days or less per year), and 87% are sole spray operators.

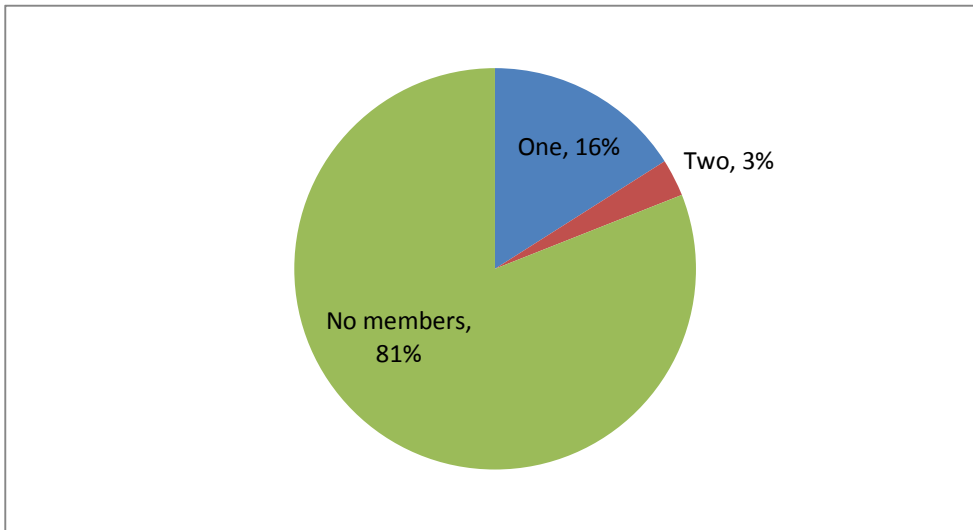
Figure 7 What proportion of all pesticides do respondent/farm worker/family member/contractor apply?



Base All those who spray pesticides on farm n=242 (respondent/farmer, 177, family member 24, farm worker 41) and all farms who use a contractor n=148

Where a contractor is used on farm on average they apply 91% of all pesticides to that farm. Where the respondent or farmer applies pesticides they apply on average 79% of all pesticides. The farmer applied the greatest proportion of pesticides in the North West of Scotland (96%) and the lowest proportion in the South East (68%), (significantly different when compared to the remaining sample at, at least the 95% level). The farmers were also most likely to apply pesticides themselves on farms under 1SLR (88%) and on other farm types (95%), (significant difference compared to the remaining sample at the 95% level).

Figure 8 Excluding contractors how many of the people who apply pesticides on your farm are members of NRoSO?



Base: All farms where pesticides are applied n=320

Of the 320 farms on which pesticides are applied, 19% had at least one spray operator who was a member of NRoSO. This compares to 25% across the UK.

Farms that applied pesticides themselves were more likely to have a member of NRoSO than farms which used a spray contractor (farm only applies pesticides 28%, contractor only 3%, significant difference compared to the remaining sample at the 99% level). Farms operating under grandfather rights were less likely to have a member than farms with a certified operator (grandfather rights 16%, certified operator under 44yrs 54%, certified operator over 44yrs 41%), (significant difference compared to the remaining sample at, at least the 95% level).

Farms under 1SLR (12%) were less likely than the remaining sample to have a member of NRoSO (significant when compared to the remaining sample at the 95% level).

Table 10 NRoSO membership by farm type

	Scotland total	Cereal	General cropping	Dairy	Cattle and sheep LFA	Mixed	Other
<i>Base</i>	320	50	40	29	108	39	35
Two	3%	4%	10%	0%	1%	5%	0%
One	16%	44%**	33%*	0%	4%**	28%	3%**
None	81%	52%**	58%**	100%	95%**	67%*	97%**

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The arable farms were significantly more likely to have an NRoSO member than the livestock and other farm types.

Table 11 NRoSO membership by region

	Scotland total	NE	NW	SE	SW
<i>Base</i>	320	69	60	83	108
<i>Two</i>	3%	0%**	2%	10%**	0%**
<i>One</i>	16%	41%**	5%**	23%	2%**
<i>None</i>	81%	59%**	93%**	67%**	98%**

*Indicates significant difference compared to the remaining sample at the 95% confidence level

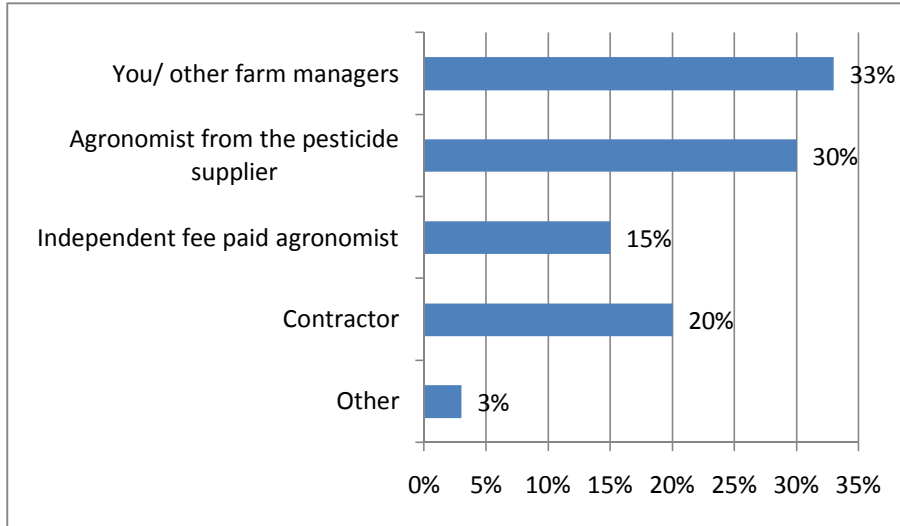
**Indicates significant difference compared to the remaining sample at the 99% confidence level

NRoSO membership was higher in the North East and South East than elsewhere.

3.3 Pesticide Application Decision Making

Decisions on which pesticides to apply

Figure 9 Who is the main person who decides WHICH pesticides to apply on the farm?



Base: Farms that apply pesticides n=320

On 33% of the farms on which pesticides were applied the farmer decided which pesticides to apply. An agronomist decided on a further 45% of farms, whilst a contractor made the decision on 20% of farms. This compares to 42% by farmers, 45% by agronomist and 12% by contractors in the UK.

Where only a contractor applied the pesticides the contractor was the main decision maker on 53% of the farms, whilst an agronomist was key on 41%. The agronomist was more important when contractors sprayed than on farms where the farmer or farm worker applied the pesticides.

Overall the smaller the farm the greater the likelihood of the farmer/farm manager deciding which pesticides should be applied (under 1SLR 49%, 5+SLR 19%).

Table 12 Who decides which pesticides to apply by farm type

	Scotland Total	Cereal	General cropping	Dairy	Cattle and sheep LFA	Mixed	Other
Base	320	50	40	29	108	39	35
You/ other farm managers	33%	18%**	8%**	21%	44%**	21%*	71%**
Contractor	20%	10%*	20%	28%	19%	28%	17%
Independent fee paid agronomist	15%	24%	33%**	14%	10%	13%	6%*
Agronomist from the pesticide supplier	30%	38%	38%	38%	26%	36%	3%**

* Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The farmer was most likely to be the key decision maker on livestock farms and other farm types. Agronomists were generally more important on arable farms than the remaining farm types.

Table 13 Who decides which pesticides to apply by region

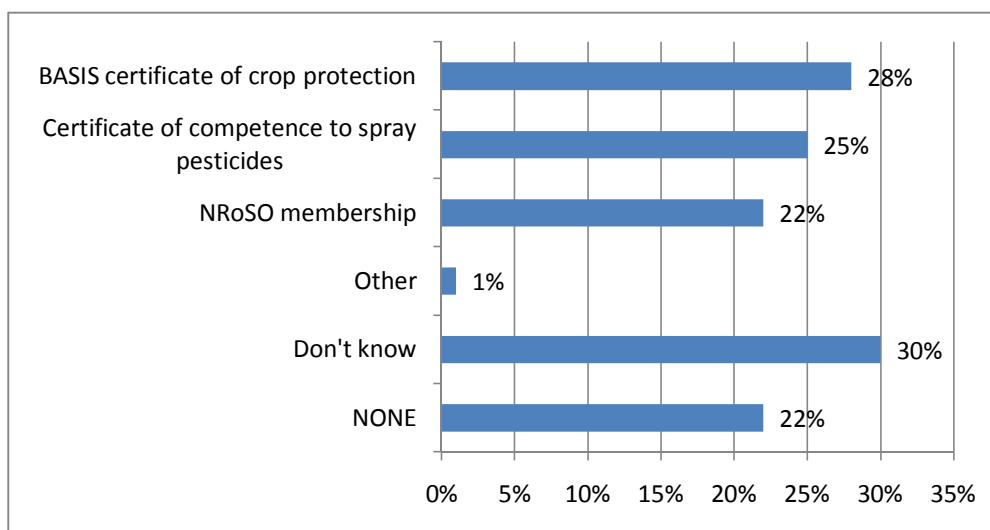
	Scotland Total	NE	NW	SE	SW
Base	320	69	60	83	108
You/ other farm managers	33%	20%**	52%**	22%**	39%
Contractor	20%	16%	22%	20%	20%
Independent fee paid agronomist	15%	23%*	12%	16%	10%
Agronomist from the pesticide suppliers	30%	39%	13%**	36%	29%

significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The farmer was the main decision maker in the North West, however an agronomist from the pesticide supplier was most likely to be the main decision maker in the North East and South East.

Figure 10 Which qualifications relevant to spraying does this person have?



Base: All farms that apply pesticides n=320

On the farms where pesticides are applied, of the person deciding which pesticides to apply 22% did not have any qualifications, whilst a further 30% did not know if the appropriate qualifications were held. This may be a reflection of the number of farms with a spray operator working under grandfather rights (and therefore often has no formal qualification) and an indication that there is some lack of understanding of what is required, rather than a true reflection of qualifications. Advice from agronomist is used by 45% of farms, most of whom have a BASIS certificate in crop protection⁷, yet

⁷ CRD(2009) UK sprayer practices survey – agronomist survey

only 28% mentioned the BASIS certificate of crop protection as the qualification, so it is possible that farmers were not fully aware of the qualification held or required. On over 1/3 of the farms pesticides were applied under the grandfather rights exemption, where the farmer did not hold a certificate of competence.

28% did however hold a BASIS certificate of crop protection, 25% had a certificate of competence to spray pesticides and 22% mentioned the operator was a member of NRoSO.

Table 14 Qualifications of the person who decides WHICH pesticides to apply by farm size

	Scotland Total	Very Small under 1 SLR	Small 1 to 2 SLR	Medium 2 to 3 SLR	Large 3+ SLR	Very large 5+SLR
<i>Base</i>	320	96	81	47	53	43
BASIS certificate of competence	28%	16%**	27%	23%	45%**	37%
Certificate of competence to spray pesticides	25%	20%	30%	19%	34%	21%
NRoSO membership	22%	19%	17%	23%	34%	23%
Don't know	30%	23%	35%	38%	25%	33%
NONE	22%	39%**	16%	23%	11%*	9%**

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The likelihood of the decision maker having a BASIS certificate of crop protection, was generally greater the larger the farm size. Overall the smaller the farm the greater the likelihood that the decision maker held no relevant qualifications.

Table 15 Qualifications of the person who decides WHICH pesticides to apply by farm type

	Scotland total	Cereal	General cropping	Dairy	Cattle and sheep LFA	Mixed	Other
Base	320	50	40	29	108	39	35
BASIS certificate of crop protection	28%	52%**	50%**	17%	15%**	31%	14%*
Certificate of competence to spray pesticides	25%	32%	45%**	10%	20%	23%	20%
NRoSO membership	22%	32%	45%**	28%	14%**	26%	6%**
Don't know	30%	22%	25%	52%	34%	28%	9%**
None	22%	0%**	0%**	17%	32%**	10%*	60%**

* indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The arable farms were significantly more likely than the remaining sample at the 99% level, to have decision makers who held the BASIS certificate of crop protection. The general cropping farms were more likely than the remaining sample to have a decision maker who holds the certificate of competence to spray pesticides and who is a member of NRoSO, (significant at the 99% level). The decision makers for the livestock and other farm types were the most likely not to have any qualifications relevant to spraying.

Table 16 Qualifications of the person who decides WHICH pesticides to apply by region

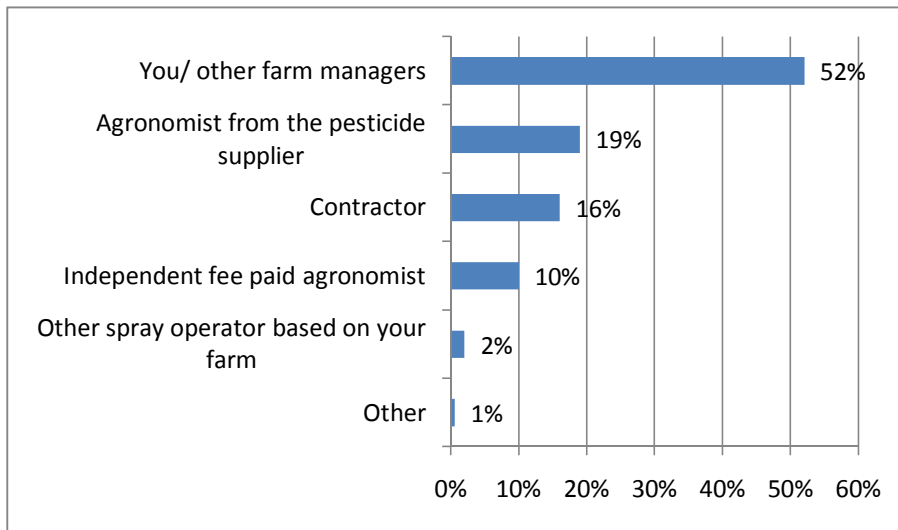
	Scotland total	NE	NW	SE	SW
Base	320	69	60	83	108
BASIS certificate of crop protection	28%	35%	17%*	46%**	15%**
Certificate of competence to spray pesticides	25%	25%	23%	36%**	17%*
NRoSO membership	22%	29%	12%**	33%*	16%*
Don't know	30%	35%	23%	22%	36%
None	22%	9%**	38%**	12%**	30%*

* indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

Decision makers for farms in the North East and South East were more likely to hold relevant qualifications than farms elsewhere.

Decisions on when to apply pesticides

Figure 11 Who is the main person who decides WHEN pesticide spraying will take place?

Base: All farms that apply pesticides n=320

On 52% of the farms where pesticides were applied the farmers/farm manager decided when the pesticides would be applied. An agronomist made the decisions on 29% of farms, whilst a contractor decided on 16%.

On farms where the pesticides were applied by a contractor only, the contractor made the decision on 42% of farms. Agronomists played a greater role where the contractor applied the pesticide.

The farmer was more likely to be the decision maker on farms less than 1SLR (60%) than the remaining sample (significant difference at the 95% level), whereas an agronomist from the pesticide supplier was less likely to be the decision maker on farms under 1SLR (8%) than on larger farms (significant at the 99% level).

Table 17 Who decides WHEN pesticide spraying will take place by farm type

	Total	Cereals	General cropping	Dairy	Cattle and sheep (LFA)	Mixed	Other
<i>Total</i>	320	50	40	29	108	39	35
You/ other farm managers	52%	38%*	23%**	48%	63%**	41%	83%**
Independent fee paid agronomist	10%	12%	20%	10%	8%	10%	3%*
Agronomist from the pesticide supplier	19%	32%*	33%*	21%	14%	18%	0%**
Contractor	16%	8%*	20%	21%	14%	26%	11%

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

Agronomists played a key role in deciding when to apply pesticides on the arable farms but were less commonly the key decision maker on the remaining farm types.

The farmer was most likely to be the decision maker on cattle and sheep farms and other farm types.

Table 18 Who decides WHEN pesticide spraying will take place by region

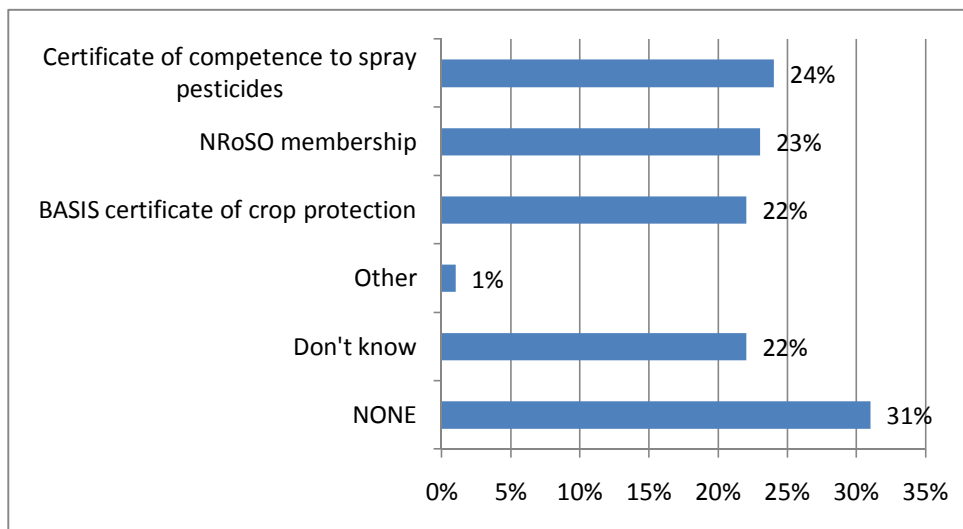
	Scotland total	NE	NW	SE	SW
<i>Base</i>	320	69	60	83	108
You/ other farm managers	52%	38%**	70%**	40%**	60%*
Independent fee paid agronomist	10%	13%	10%	10%	7%
Agronomist from the pesticide supplier	19%	30%*	3%**	28%*	14%
Contractor	16%	16%	15%	17%	16%

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

Although the farmer was a key decision maker in all regions he had the greatest influence on the decision when to apply pesticides in the North West and South West of Scotland. Agronomists from the pesticide supplier were more influential in the North East and South East than elsewhere.

Figure 12 Which qualifications relevant to spraying does this person have?



Base: All farms that apply pesticides n=320

31% of those who decided when to apply the pesticides did not hold any relevant qualifications, linked to the number operating under grandfather rights exemptions, whilst in a further 22% of cases the respondent did not know which qualifications they had, indicating some lack of understanding of the requirements. 24% had a certificate of competence to spray pesticides, 22% had a BASIS certificate of crop protection, whilst 23% were members of NRoSO. This compares to 27%, 27% and 20% respectively for the UK. On 58% of the Scottish farms operating under grandfather rights there was a decision maker with no formal qualifications.

Table 19 Qualifications of the person who decides WHEN pesticide application will take place by farm size

	Scotland Total	Very Small under 1 SLR	Small 1 to 2 SLR	Medium 2 to 3 SLR	Large 3+ SLR	Very large 5+SLR
<i>Base</i>	320	96	81	47	53	43
BASIS certificate of competence	22%	15%*	21%	17%	40%**	23%
Certificate of competence to spray pesticides	24%	18%	27%	17%	36%*	26%
NRoSO membership	23%	20%	19%	19%	40%**	21%
Don't know	22%	21%	27%	26%	17%	19%
NONE	31%	42%*	26%	40%	17%**	26%

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The large farms of 3-5SLR were the most likely to have a decision maker with relevant qualifications.

Table 20 Qualifications of the person who decides WHEN pesticide application will take place by farm type

	Scotland total	Cereals	General cropping	Dairy	Cattle and sheep (LFA)	Mixed	Other
<i>Base</i>	320	50	40	29	108	39	35
BASIS certificate of crop protection	22%	38%**	45%**	10%	13%**	26%	9%**
Certificate of competence to spray pesticides	24%	36%	38%	10%	22%	18%	17%
NRoSO membership	23%	36%*	50%**	21%	14%**	28%	3%**
None	31%	8%**	3%**	41%	38%	23%	66%**
Don't know	22%	16%	23%	34%	28%	18%	9%**

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The likelihood of the decision maker holding relevant qualifications was greater on arable farms than remaining farm types, and lowest on the “other” farm type.

Table 21 Qualifications of the person who decides WHEN pesticide application will take place by region

	Scotland total	NE	NW	SE	SW
<i>Weighted base</i>	320	69	60	53	108
BASIS certificate of crop protection	22%	35%**	10%**	35%**	10%**
Certificate of competence to spray pesticides	24%	20%	27%	37%**	15%**
NRoSO membership	23%	30%	12%**	37%**	13%**
None	31%	17%**	38%	19%**	45%**
Don't know	22%	23%	25%	17%	24%

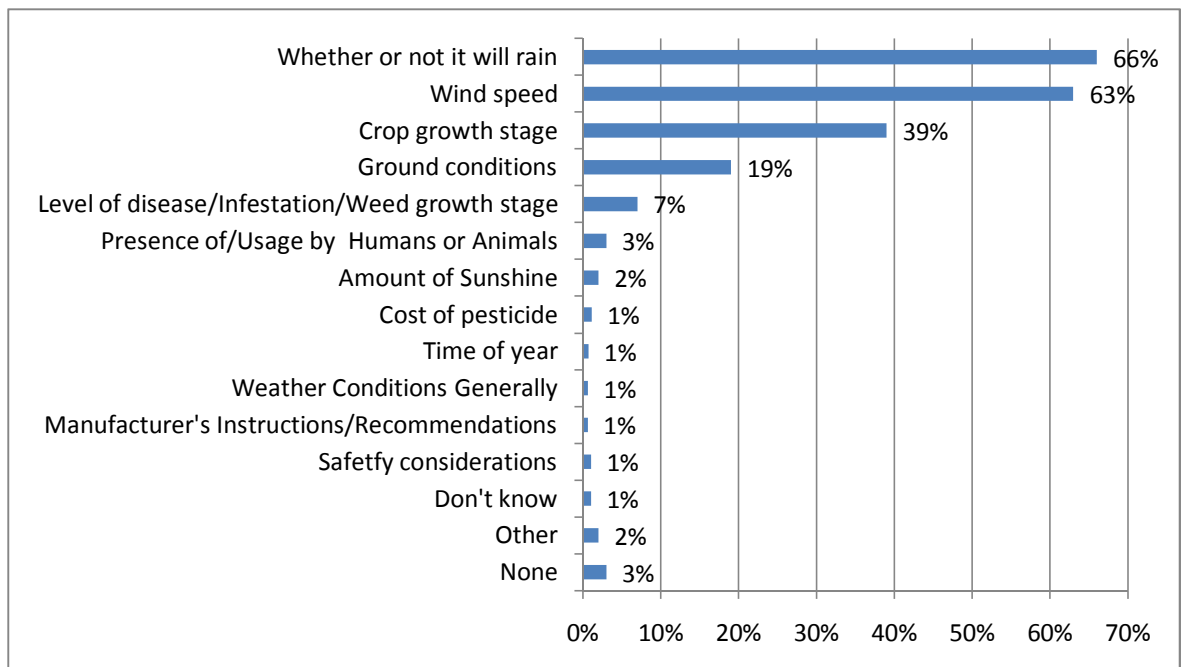
*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

Decision makers in the North East and South East were the most likely to hold relevant qualifications.

3.4 Spray Conditions

Factors taken into account when planning spraying

Figure 13 What factors are taken into account when deciding WHEN to spray pesticides on your farm?

Base: All farms that apply pesticides n= 320

The two factors most frequently taken into consideration when deciding when to apply pesticides were whether or not it will rain (66%) and wind speed (63%). Crop growth stage and ground conditions were also mentioned by substantial proportions of the sample. Only 3% indicated they did not take any factors into account.

Those farms with a spray operator with a certificate of competence to spray pesticides appeared more likely to take each factor into account than those operating under the grandfather rights exemption, although not all differences were significant. For example:

Wind speed: spray operator under 44yrs with certificate of competence 76%, grandfather rights 65%;

Crop growth stage: operator under 44yrs with certificate of competence 48%, grandfather rights 36%.

With regard to farm size the farms under 1SLR were the least likely to take crop growth stage into account (27%), which could be a reflection of the farm type. Other clear patterns by farm size were unclear.

Table 22 Factors taken into account when deciding WHEN to spray pesticides by farm type

	Total	Cereals	General cropping	Dairy	Cattle and sheep (LFA)	Mixed	Other
<i>Base</i>	320	50	40	29	108	39	35
Whether or not it will rain	66%	70%	68%	76%	59%	77%	46%*
Wind speed	63%	82%**	73%	62%	54%*	74%	40%**
Crop growth stage	39%	44%	53%	55%	36%	28%	29%
Ground conditions	19%	20%	38%**	21%	11%**	28%	14%

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The livestock farms and other farm types were often less likely to take the different factors into account than the remaining farm types.

Table 23 Factors taken into account when deciding WHEN to spray pesticides by region

	Scotland total	NE	NW	SE	SW
<i>Base</i>	320	69	60	83	108
Whether or not it will rain	66%	70%	52%*	73%	66%
Wind speed	63%	72%	45%**	73%*	59%
Crop growth stage	39%	45%	28%*	43%	39%
Ground conditions	19%	26%	13%	22%	17%

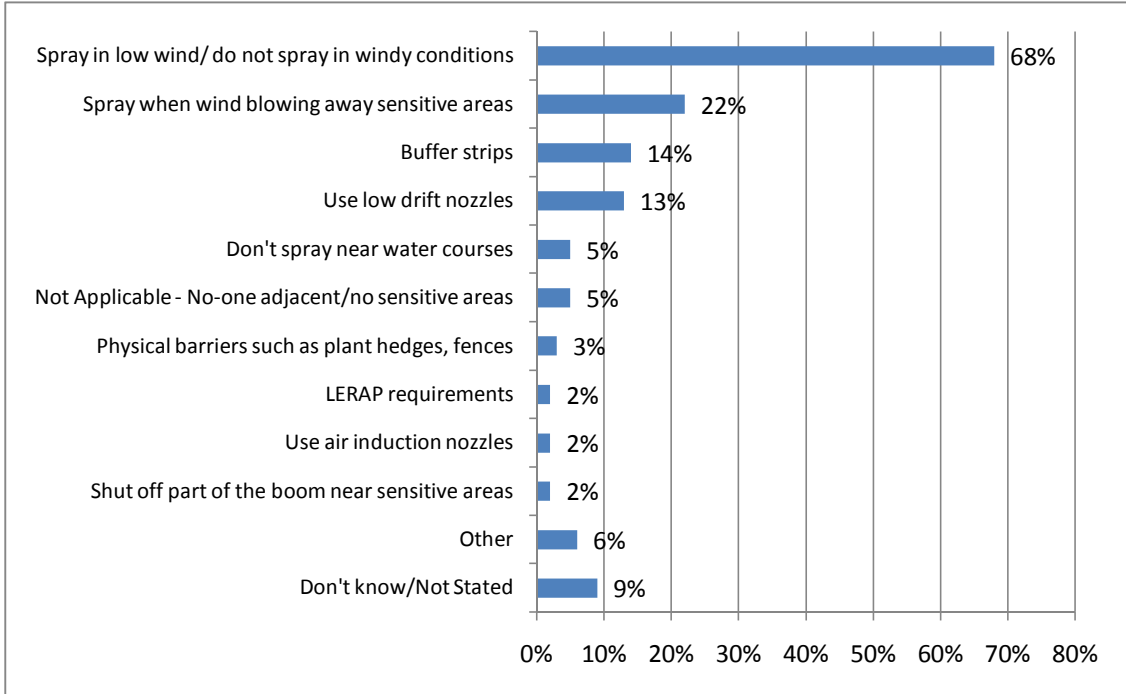
*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

Although differences were not always significant the data suggests that farms in the North East and South East were more likely to take the various factors into account than those located elsewhere.

Reducing spray drift

Figure 14 How is drift into water courses and other non target areas such as neighbours land, reduced when spraying pesticides on your farm?



Base: All farms that apply pesticides n=320

By far the most common method of reducing pesticide drift into water courses and other non-target areas was to avoid spraying in windy conditions (68%). Substantial proportions sprayed when the wind was blowing away from sensitive areas or used buffer strips or low drift nozzles.

Those farms with a spray operator under 44yrs with a certificate of competence were as likely to take spraying in low wind into account (80%) as the farms operating under grandfather rights (76%), however those with a certificate were more likely to consider other factors such as low drift nozzles: under 44yrs with certificate of competence 30%, grandfather rights 14%; buffer strips: under 44yrs with certificate of competence 24%, grandfather rights 7%. Where the pesticides were applied by the farmer there seemed to be a greater consideration of spraying in low wind (74%), than amongst farms who used a contractor (53%).

The use of low drift nozzles (4%) and buffer strips (5%) was lower amongst farms under 1SLR than the remaining sample (significant at the 99% level). Spraying in low wind conditions was similar across all farm sizes, whilst no clear pattern was evident by farm size for spraying when the wind was blowing away from non target areas.

Table 24 How drift into water courses and other non-target areas is reduced by farm type

	Total	Cereals	General cropping	Dairy	Cattle and sheep (LFA)	Mixed	Other
<i>Base</i>	320	50	40	29	108	39	35
Spray in low wind/ do not spray in windy conditions	68%	78%	53%*	86%	67%	67%	54%
Spray when wind blowing away from sensitive areas	22%	18%	23%	41%	19%	31%	20%
Buffer strips	14%	34%**	20%	7%	9%	10%	0%**
Use low drift nozzles	13%	26%*	25%	0%	7%	21%	3%**

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

Spraying in low wind was the most common practice to avoid drift on each farm type. The use of buffer strips was greatest on cereal followed by general cropping farm types, whilst the use of low drift nozzles was most common on arable and mixed farms.

Table 25 How drift into water courses and other non-target areas is reduced by region

	Scotland total	NE	NW	SE	SW
<i>Base</i>	320	69	60	83	108
Spray in low wind/ do not spray in windy conditions	68%	68%	70%	69%	65%
Spray when wind blowing away from watercourses and other sensitive areas	22%	23%	17%	23%	24%
Buffer strips	14%	23%*	5%**	22%**	6%**
Use low drift nozzles	13%	20%	7%*	24%**	4%**

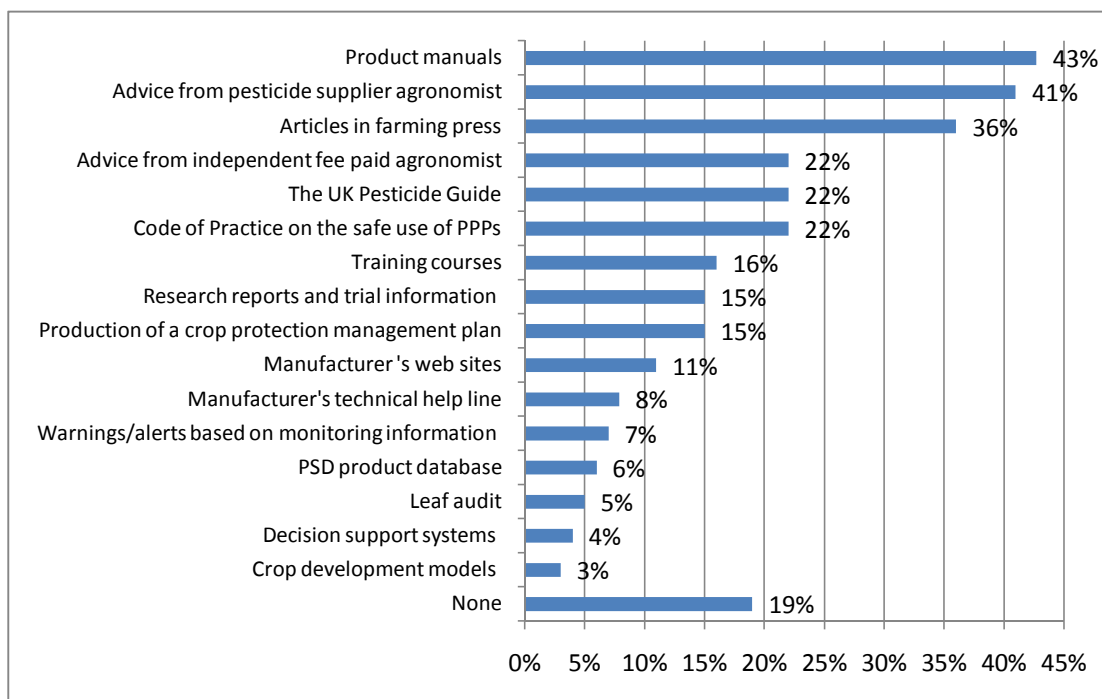
*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

Spraying in low wind conditions as a way of reducing drift was similar across all four regions. The use of buffer strips and low drift nozzles was however more common in the North East and South East than elsewhere.

3.5 Use of information to support decisions

Figure 15 Which of the following types of background information or programmes do you use to help plan and manage your pesticide applications?



Base: All farms that apply pesticides n=320

43% of the farms on which pesticides were applied used product manuals as a source of information to help manage pesticide applications. Further substantial proportions used advice from agronomist (41%) and articles in the farming press (36%). 22% in each case used the UK Pesticide Guide and the code of practice for plant protection products. 19% did not use any information or programmes.

Product manuals appeared very popular across all farms sizes, with the exception of farms over 5SLR (28%). Advice from an agronomist was significantly lower (at the 99% level) amongst farms under 1SLR than the remaining sample.

Farms using only a contractor to apply pesticides were more likely than the remaining sample not to use any information (contractor only 33%, farm only 12%), (significant when compared to the remaining sample at the 99% level). The farms where the farmer applied the pesticides showed a greater use of product manuals than farms where only a contractor applied the pesticides: contractor 18%, farmer only 53% (significant difference when compared to the remaining sample at the 99% level). Those farms applying pesticides under the grandfather rights exemption were as likely to use product manuals and a supplier based agronomist as the certified people over 44years of age but more likely to use these sources than the certified operators under 44yrs.

Table 26 Background information or programmes used by farm type

	Scotland total	Cereals	General cropping	Dairy	Cattle and sheep (LFA)	Mixed	Other
Base	320	50	40	29	108	39	35
Product manuals	43%	52%	43%	17%	49%	26%*	54%
Advice from pesticide supplier agronomist	41%	46%	53%	55%	40%	38%	11%**
Articles in farming press	36%	52%*	40%	28%	40%	28%	20%*
Advice from independent fee paid agronomist	22%	40%**	35%	17%	17%	21%	11%*
The UK Pesticide Guide	22%	36%*	30%	14%	17%	10%*	29%
Code of practice on the safe use of PPPs	22%	38%**	35%	17%	18%	13%	17%
Training courses	16%	44%**	23%	10%	8%**	10%	9%
Research reports and trial information	15%	30%**	25%	10%	14%	3%**	6%*
Production of a crop protection management plan	15%	40%**	30%*	10%	9%*	5%**	0%**
Manufacturer 's web sites	11%	18%	13%	7%	7%	10%	11%
Manufacturer's technical help line	8%	6%	18%	7%	6%	5%	9%
Warnings/alerts based on monitoring information	7%	12%	20%*	14%	3%*	0%**	0%**
PSD product database	6%	10%	20%*	3%	1%**	0%**	9%
Leaf audit	5%	8%	15%*	3%	3%	0%**	3%
Crop development models	3%	8%	8%	0%	0%**	0%**	0%**
Decision support systems	4%	6%	18%*	3%	1%**	0%**	3%
None	19%	10%*	15%	14%	16%	26%	34%*

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

Overall the cereal farms were more likely to have obtained information from many of the sources compared to other farm types, for example articles in the farming press, independent agronomists and training courses. Crop development models and decision support systems were used primarily by the arable farms.

Table 27 Background information or programmes used by region

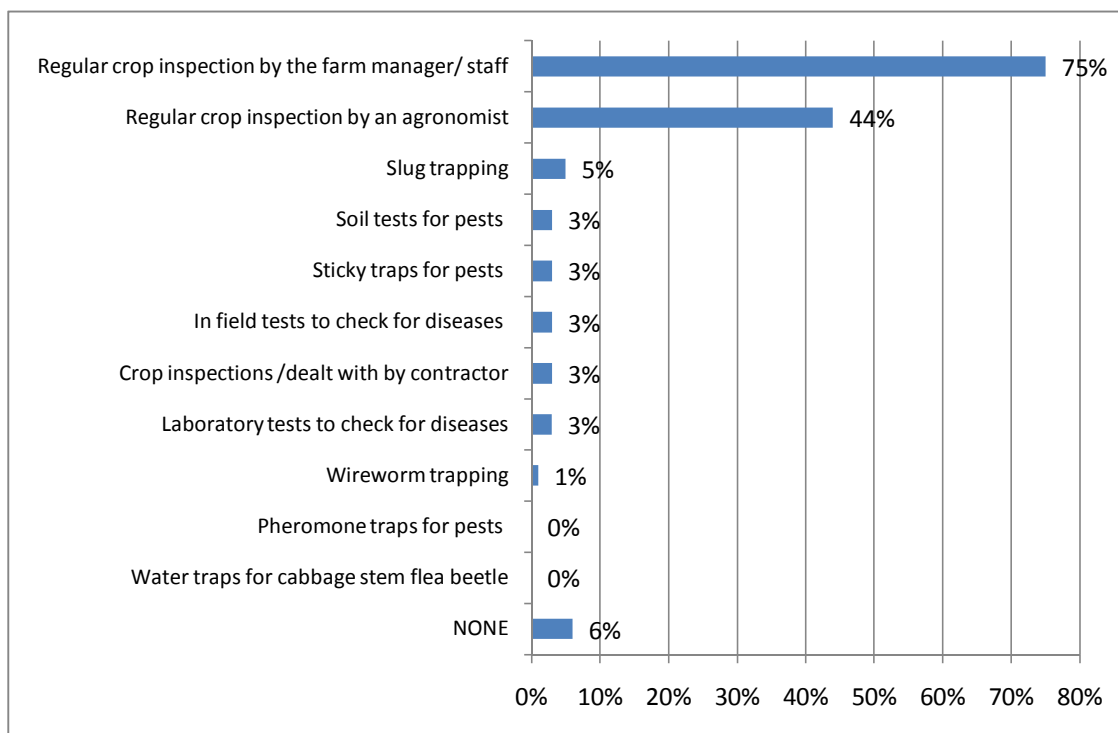
	Scotland total	NE	NW	SE	SW
<i>Base</i>	320	69	60	83	108
Product manuals	43%	43%	50%	40%	41%
Advice from pesticide supplier agronomist	41%	43%	20%**	46%	48%
Articles in farming press	36%	38%	30%	45%	31%
Advice from independent fee paid agronomist	22%	32%*	18%	23%	17%
The UK Pesticide Guide	22%	32%*	20%	23%	17%
Code of practice on the safe use of PPPs	22%	29%	23%	27%	14%**
Training courses	16%	20%	12%	24%*	9%**
Research reports and trial information	15%	20%	10%	18%	11%
Production of a crop protection management plan	15%	26%*	10%	20%	7%**
Manufacturer 's web sites	11%	14%	10%	13%	7%
Manufacturer's technical help line	8%	9%	5%	10%	7%
Warnings/alerts based on monitoring information	7%	4%	3%	13%*	6%
PSD product database	6%	7%	3%	10%	4%
Leaf audit	5%	7%	7%	6%	2%*
Crop development models	3%	6%	0%**	5%	0%**
Decision support systems	4%	6%	0%**	11%*	1%**
None	19%	17%	22%	16%	21%

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

Product manuals were a common source of information in each of the regions. Advice from a pesticide supplier based agronomist was less likely to be sought in the North West than elsewhere. Crop development models and decision support systems appeared more frequently used in the North East and South East than other regions.

Assessing need for pesticides

Figure 16 How do you assess the development of weeds, pests and diseases in your crops and grassland?

Base: All farms that apply pesticides n=320

75% of the farmers assessed the development of weeds, pests and diseases in their crops and grassland through regular crop inspection, whilst on 44% of farms the inspections were carried out by an agronomist. 8% of farms that applied pesticides used in field tests or traps to assess the development of weeds, pests and diseases (some used more than one method)⁸.

Farms where a contractor applied the pesticides were more likely to have regular crop inspections by an agronomist than farms where the pesticides were applied by the farmer, (Crop inspections by the farmer: contractor applies pesticide 60%, farmer applies 83%; crop inspections by agronomist contractor 51%, farmer 37%).

Although the occurrence of inspections by the farmer was similar amongst farms operating under grandfather rights and farms with a certified spray operator under 44years (82% and 85% respectively), farms with a certified spray operator under 44years were more likely to have crop inspections by an agronomist (certified operator 63%, grandfather rights 32%). Overall only 5% of the grandfather rights farms used in field tests and traps, compared to 17% of farms with a certified spray operator under 44years.

The proportion of farms undertaking regular crop inspections themselves was similar across the various farm sizes bands. Inspections carried out by an agronomist were

⁸ It should be noted that not all the tests and trapping methods will apply to all crops, and may be different for weeds, pest and disease so some of the answers may be a reflection of the importance of the particular problem

more common on farms over 1SLR (under 1SLR 29%, significantly different to the remaining sample at the 99% level). Farms under 1SLR were also significantly less likely (at the 99% level) to assess the development of weeds, pests or diseases than the remaining sample, (13% of farms under 1SLR did not use any methods).

Table 28 Methods used to assess the development of weeds, pests or diseases by farm type

	Scotland total	Cereals	General cropping	Dairy	Cattle and sheep (LFA)	Mixed	Other
<i>Base</i>	320	50	40	29	108	39	35
Regular crop inspection by the farm manager/staff	75%	64%	75%	83%	85%**	64%	71%
Regular crop inspection by an agronomist	44%	80%**	80%**	48%	18%**	72%**	6%**
Any form of in field test or trap	8%	22%	10%	14%	2%	8%	0%

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

NB No stats applied to “Any form of in field test or trap”

In field tests or traps were more common on the cereal farms than other farm types. Regular crop inspections by an agronomist were more common on arable farms and mixed farms than livestock farms. Whilst regular crop inspections by the farmer were popular across all farm types, they were more common on livestock farms than arable farms⁹.

Table 29 Methods used to assess the development of weeds, pests or diseases by region

	Scotland total	NE	NW	SE	SW
<i>Base</i>	320	69	60	83	108
Regular crop inspection by the farm manager/staff	75%	65%*	87%**	76%	75%
Regular crop inspection by an agronomist	44%	70%**	17%**	63%**	29%**
Any form of in field test or trap	8%	13%	5%	12%	5%

*Indicates significant difference compared to the remaining sample at the 95% confidence level

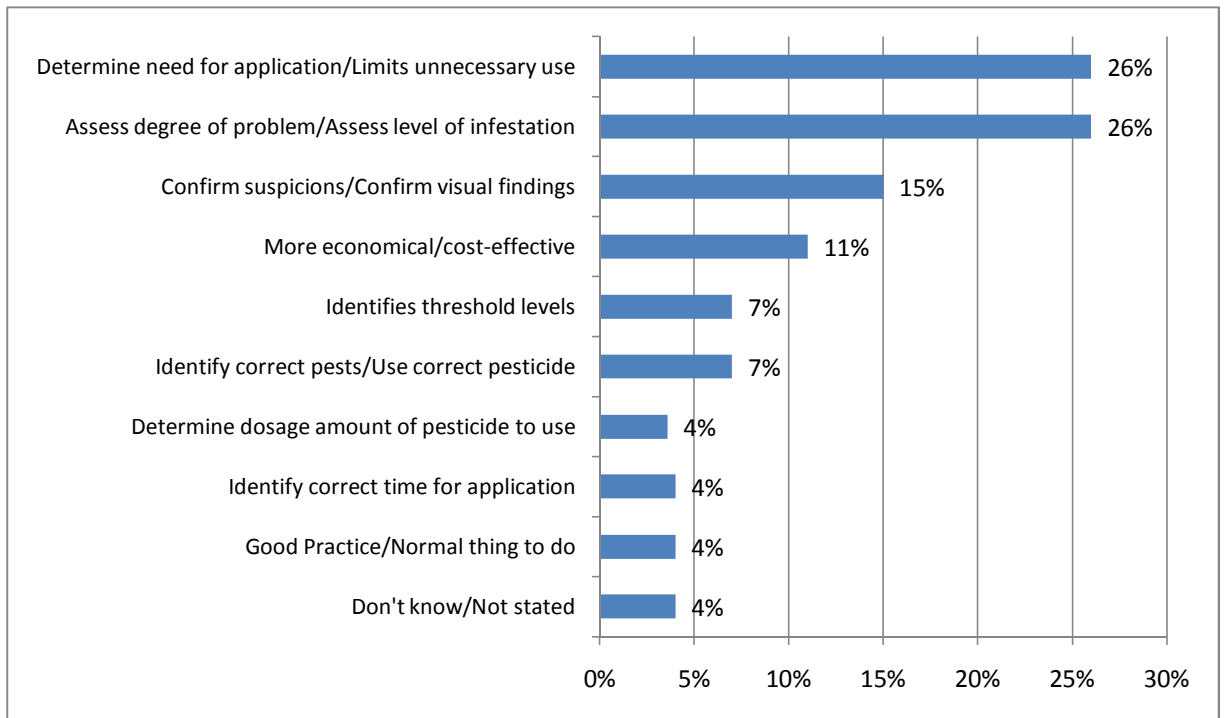
**Indicates significant difference compared to the remaining sample at the 99% confidence level

NB No stats applied to “Any form of in field test or trap”

⁹ It should be noted that not all the tests and trapping methods will apply to all crops, and may be different for weeds, pest and disease so some of the answers may be a reflection of the importance of the particular problem.

Regular crop inspections by the farmer were popular in all regions but particularly so in the North West, where this was by far the main form of assessment. Regular crop inspections by an agronomist and in field tests or traps were more common in the North East and South East of Scotland than elsewhere.

Figure 17 What if any are the benefits of using methods in addition to or instead of regular crop inspection?

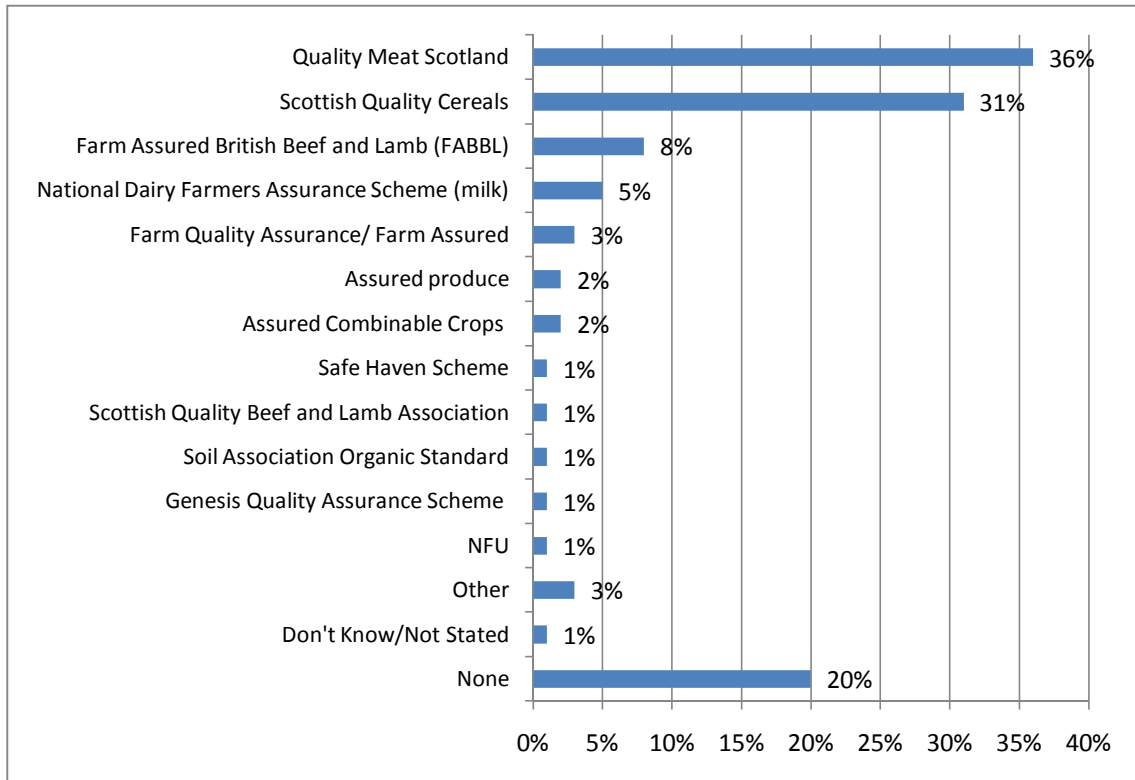


Base: All those who use in field tests or traps to assess pests, weeds or diseases n=27

The key benefits of using in field tests and traps included being able to determine the need for pesticide application and assess the level of the problem or infestation. The tests were also valuable in providing confirmation of weed, pest or disease development and for ensuring the most cost effective treatment.

Membership of farm assurance schemes

Figure 18 Which assurance schemes if any, is your farm a member of?



Base: All farms that apply pesticides n=320

80% of those that applied pesticides were a member of a farm assurance scheme, with the most common membership of Quality Meat Scotland (36%) and Scottish Quality Cereals (31%). This is higher than the UK average of 60%.

Farms operating under grandfather rights were less likely to be in any scheme (28% not in a scheme) compared to those with a spray operator under 44 years (9% not in a scheme). Farms operating without a spray contractor were also more likely not to be in a scheme than those who used a contractor to apply pesticides (farm only applies pesticides 25%, contractor only 15%).

The likelihood of the farms being in a scheme was substantially lower amongst farms of less than 1SLR (51%, significant difference when compared to the remaining sample). 19% of farms under 1SLR were members of Scottish Quality Cereals, whilst 14% were members of Quality Meat Scotland.

Table 30 Membership of assurance schemes by farm type

	Total	Cereals	General cropping	Dairy	Cattle and sheep (LFA)	Mixed	Other
<i>Base</i>	320	50	40	29	108	39	35
Scottish Quality Cereals	31%	72%**	78%**	7%	6%**	46%*	6%**
Quality Meat Scotland	36%	12%**	13%**	45%	65%**	36%	3%**
None	20%	4%**	5%**	3%	15%	15%	86%**

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The other farm type was the least likely to be in any scheme, (86%). As would be expected the arable farms were the most likely to be in the Scottish Quality Cereals scheme, whilst the cattle and sheep farms were the most likely to be in Quality Meat Scotland.

Table 31 Membership of assurance schemes by region

	Scotland total	NE	NW	SE	SW
<i>Base</i>	320	69	60	83	108
Scottish Quality Cereals	31%	58%**	8%**	55%**	7%**
Quality Meat Scotland	36%	28%	35%	23%**	51%**
None	20%	10%**	42%**	13%*	19%

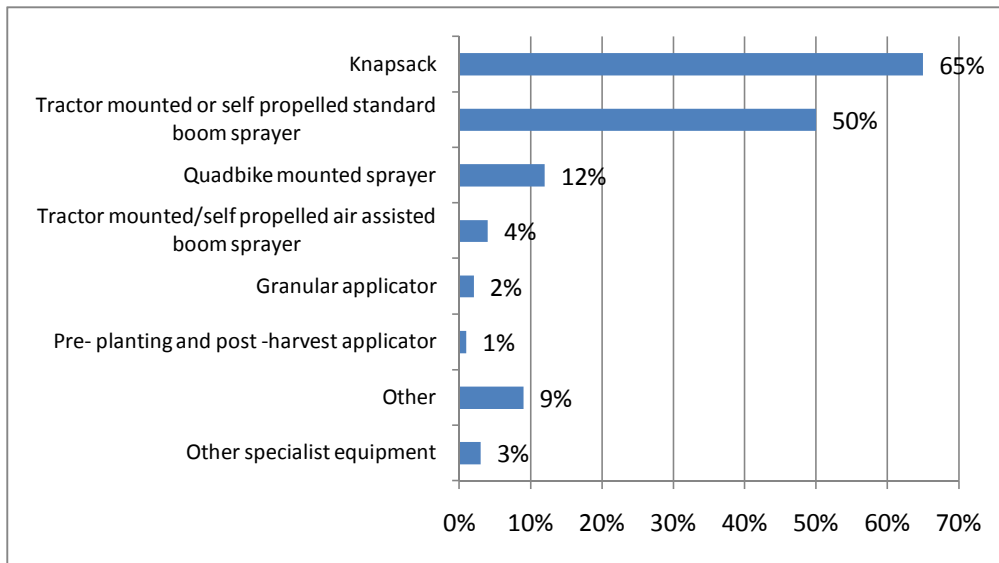
*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

Membership of Scottish Quality Cereals was most common in the North East and South East, whilst membership of Quality Meat Scotland was more common in the other regions, particularly the South West. Farmers in the North West were the most likely not to be a member of any scheme. Although not shown in the above table membership of the National Dairy Farmers Assurance Scheme was greatest in the South West of Scotland (12%).

3.6 Pesticide Application Equipment

Figure 19 What type of equipment do you or your farm workers use nowadays to apply the pesticides on your farm? (Excludes contractors equipment)



Base: Those who apply pesticides, excluding those who only use a contractor n=214

A knapsack was the most commonly used type of equipment (65%) amongst those who applied pesticides on their farm, followed by a tractor mounted/trailed or self propelled standard boom sprayer (50%). This is very similar to the UK where figures were 65% and 51% respectively.

66% of the farms operating under grandfather rights used knapsacks compared to 52% of the farms with a certified operator under 44 years and 71% of the certified operators over 44 years. The certified operators under 44 years (65%) were more likely to use a tractor mounted/trailed or self propelled boom sprayer than those operating under grandfather rights (45%).

Table 32 Type of equipment used to apply pesticides by farm size

	Scotland total	Under 1SLR	1-2SLR	2-3SLR	3-5SLR	5+SLR
<i>Base</i>	214	67	56	30	33	28
Knapsack	65%	72%	64%	83%**	67%	29%
Tractor mounted/trailed or self propelled standard boom sprayer	50%	33%**	57%	60%	55%	64%
Quadbike mounted/trailed sprayer	12%	13%	11%	10%	9%	14%

A tractor mounted/trailed or self propelled boom sprayer was the most commonly used equipment on very large farms over 5SLR, whereas knapsacks were the most common on other farm sizes, particularly farms between 2 and 3SLR.

Table 33 Type of equipment used to apply pesticides by farm type

	Total	Cereals	General cropping	Dairy	Cattle and sheep (LFA)	Mixed	Other
<i>Base</i>	214	35	24	15	80	23	26
Knapsack	65%	69%	38%	53%	74%*	39%	88%
Tractor mounted/trailed or self propelled standard boom sprayer	50%	83%**	63%	80%	36%**	83%	4%
Quadbike mounted/trailed sprayer	12%	14%	4%	7%	18%	4%	12%

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

Knapsacks were particularly common on the “other” farm type. A tractor mounted/trailed or self propelled boom sprayer was less likely to be used on the cattle and sheep and other farm types than the remaining sample.

Table 34 Type of equipment used to apply pesticides by region

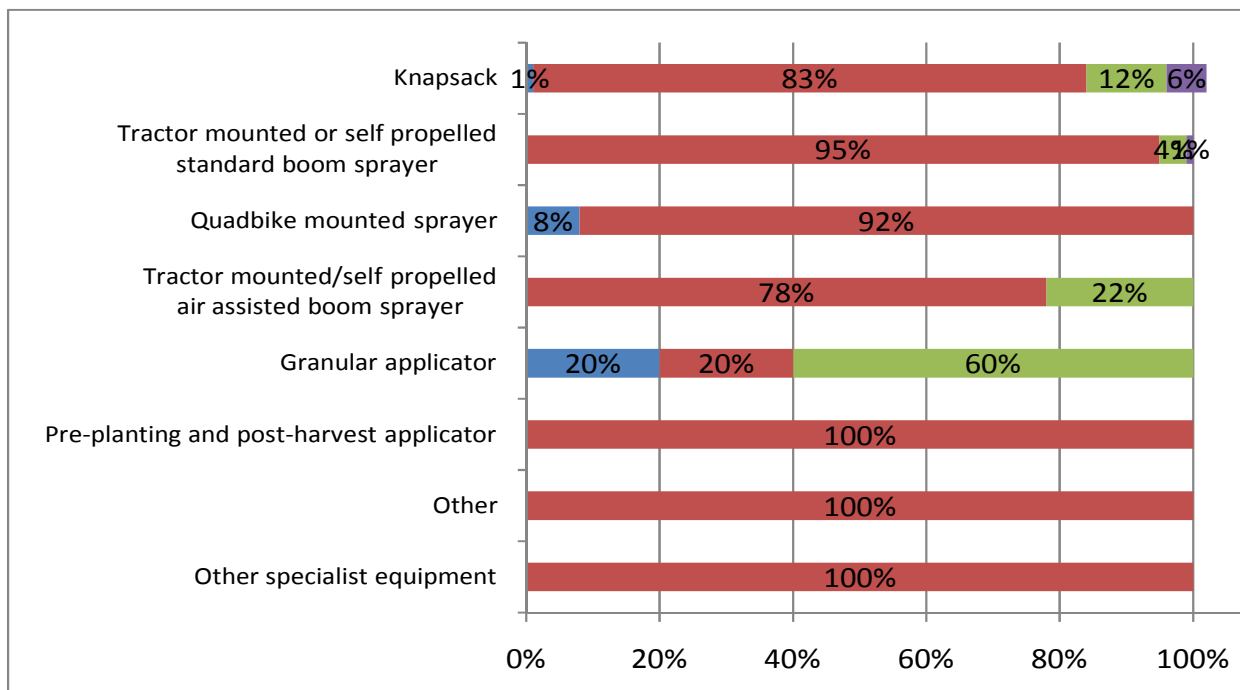
	Scotland total	NE	NW	SE	SW
Base	214	46	44	56	68
Knapsack	65%	54%	75%	59%	71%
Tractor mounted/trailed or self propelled standard boom sprayer	50%	72%**	32%**	50%	49%
Quadbike mounted/trailed sprayer	12%	9%	14%	9%	15%

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The tractor mounted/trailed or self propelled boom sprayers were most commonly used in the North East and least likely to be used in the North West. Although differences were not significant knapsacks appeared more common in the North West and South West than elsewhere.

Figure 20 How many ... (of each type of equipment) do you have on your farm?



Base: Those who apply pesticides, excluding those who only use a contractor n=214 (knapsack 139 , standard boom sprayer 108, quadbike 25, air assisted boom sprayer 9, granular applicator 5, pre-planting post-harvest applicator 2, other 7, other specialist 9)

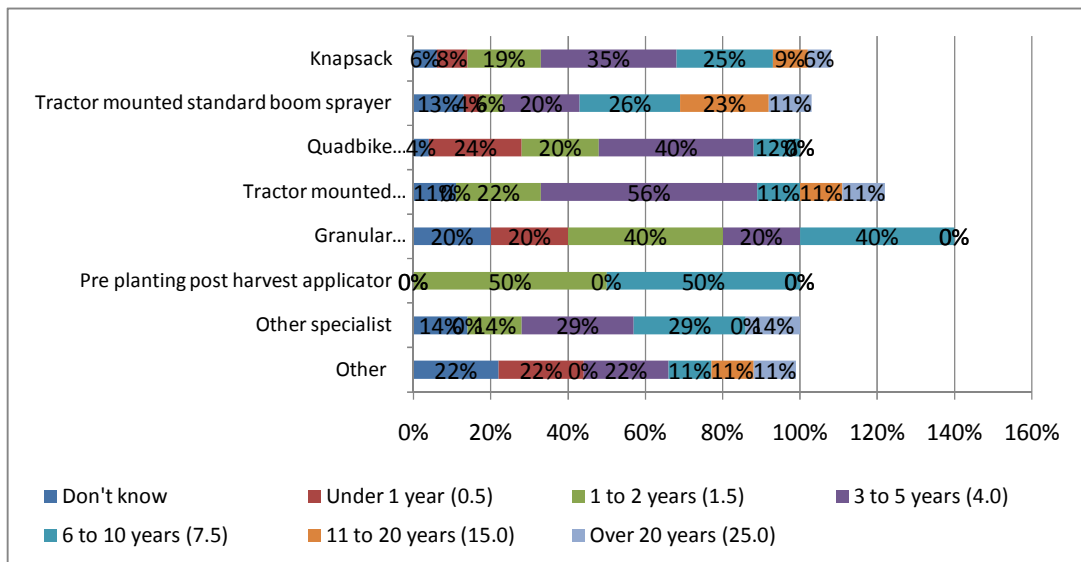
Most commonly farms had one of each type of equipment. In some instances the farm used rented machinery (denoted by zero equipment in the chart). Based on the numbers from the survey it is estimated that there are 9,800 knapsack sprayers on farms in Scotland, 7,300 boom sprayers and 1,200 quadbike sprayers.

Table 35 Numbers of each type of equipment owned by the farm

Equipment	Number within the survey sample	Estimated number within the farming population (rounded to nearest 100)
Knapsack	171	9,800
Tractor mounted/trailed boom sprayer	115	6,700
Quadbike mounted/trailed sprayer	23	1,200
Tractor mounted/trailed air assisted boom sprayer	11	600
Granular applicator	7	400
Pre-planting post-harvest applicator	2	100
Other	9	500
Other specialist	7	400
Total	345	19,700

NB Number within the farming population calculated by expressing number of farms with each type of equipment as % of total population of farms over zero gross margin.

Figure 21 How old is the application equipment?



Base: Those who apply pesticides, excluding those who only use a contractor n=214 (knapsack 139 , standard boom sprayer 108, quadbike 25, air assisted boom sprayer 9, granular applicator 5, pre-planting post-harvest applicator 2, other 9, other specialist 7)

NB Percentages add to over 100 where more than one of each type of machinery is present on a farm.

Table 36 Average age of application equipment

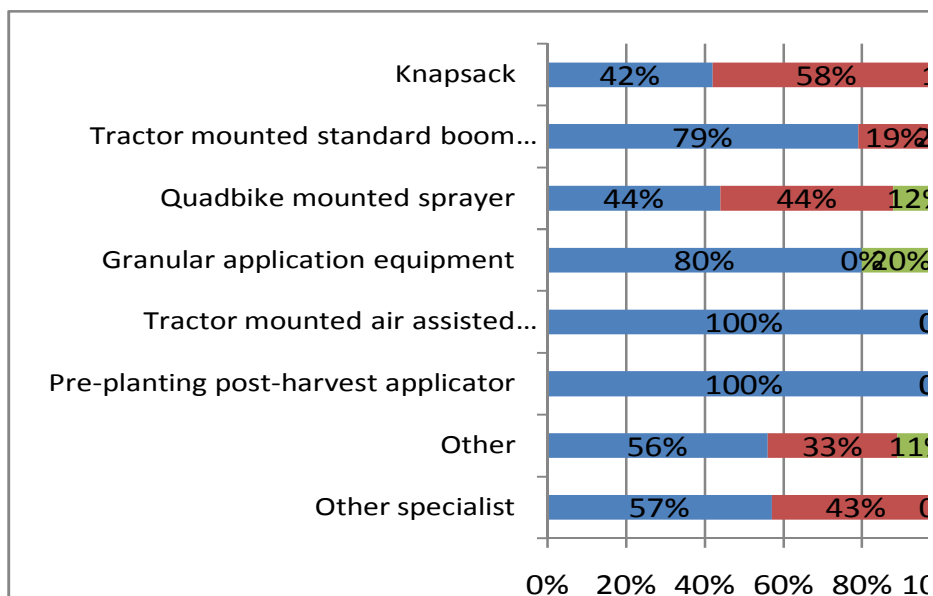
	Knapsack	Tractor mounted/trailed boom sprayer	Quadbike mounted/trailed	Tractor mounted/trailed air assisted boom sprayer	Granular applicator	Pre-planting post-harvest applicator	Other	Other specialist
Items of equipment	171	115	23	11	7	2	9	7
Mean no. years	6.32	10.14	3.04	7.05	3.75	4.5	8.07	8.25

Means are based on the midpoint of year ranges as shown within the chart legend.

The machinery held on farm by the respondents varied in age, however the tractor mounted/trailed standard boom sprayers recorded the highest average age of just over 10 years (UK 9 years), with 23% between 10-20 years old and 11% over 20 years old. This is a higher proportion of older machines compared to the UK where 8% were over 20 years old. Knapsack sprayers had an average age of just over 6 years (UK just over 5 years), air assisted boom sprayers in Scotland had an average age of 7 years (UK 7.5 years) and quadbikes 3 years (UK nearly 4 years).

Repair and maintenance of spray equipment

Figure 22 Do you regularly maintain or service the (equipment) or do you tend to just fix faults as they occur?

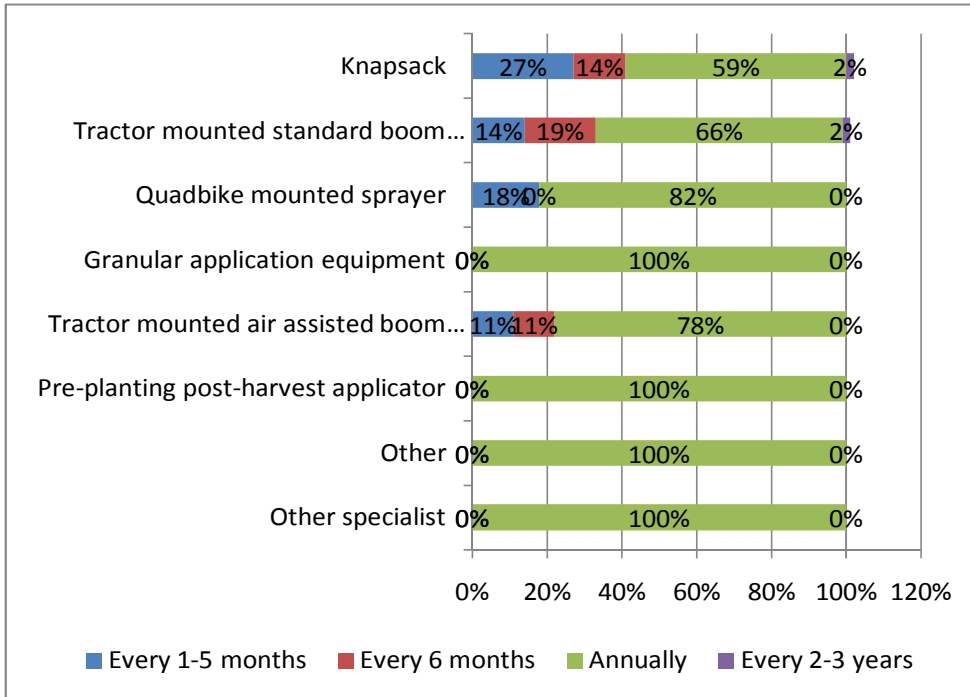


Base: Those who apply pesticides, excluding those who only use a contractor n=214 (knapsack 139, standard boom sprayer 108, quadbike 25, air assisted boom sprayer 9, granular applicator 5, pre-planting post-harvest applicator 2, other 9, other specialist 7)

NB Percentages add to over 100 where more than one of each type of machinery is present on a farm.

Most types of equipment were more likely to be maintained regularly, rather than fixing faults as they occurred, however faults with knapsacks were more likely to be fixed as they occurred. Quadbikes were as likely to be regularly maintained as faults fixed when they occurred.

Figure 23 How often is the (equipment) maintained or serviced?

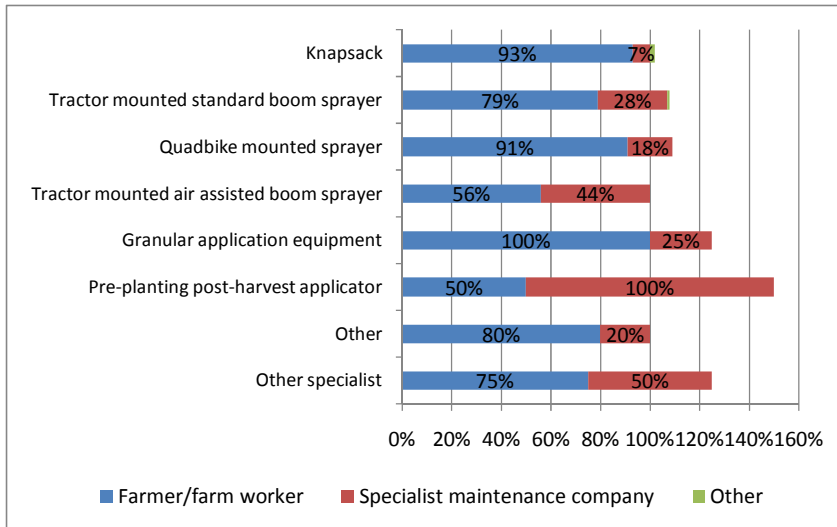


Base: Those who maintain/service the equipment: knapsack 59, tractor mounted/trailed sprayer 85, quadbike mounted/trailed sprayer 11, granular applicator 4, tractor mounted/trailed air assisted boom sprayer 9, pre-planting post-harvest applicator 2, other 5, other specialist 4

NB Percentages add to over 100 where more than one of each type of machinery is present on a farm.

In the main the equipment was maintained/serviced annually, although in some cases the equipment was tested more frequently i.e. every 1-5 months or every 6 months.

Figure 24 Who carries out the maintenance or servicing?

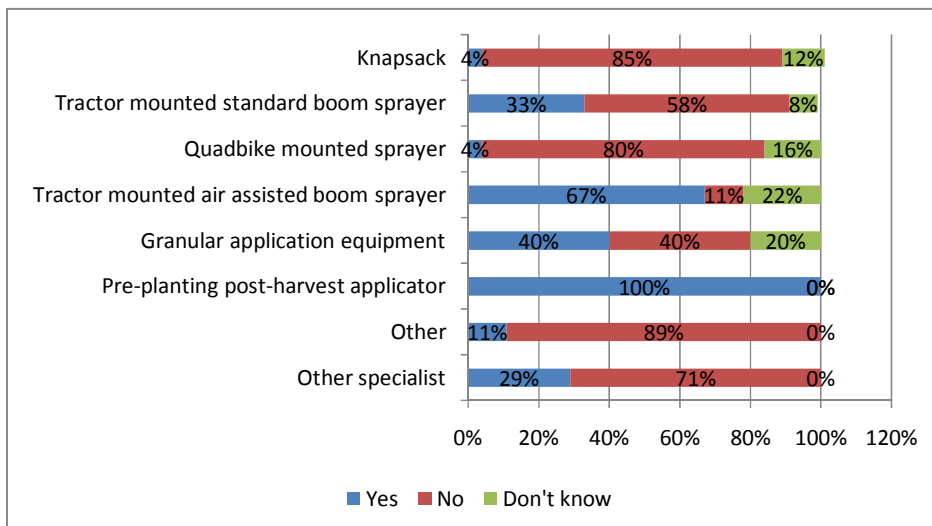


Base: Those who maintain/service the equipment: knapsack 59, tractor mounted/trailed sprayer 85, quadbike mounted/trailed sprayer 11, granular applicator 4, tractor mounted/trailed air assisted boom sprayer 9, pre-planting post-harvest applicator 2, other 5, other specialist 4

NB Percentages add to over 100 where more than one of each type of machinery is present on a farm.

In the majority of cases the maintenance was carried out by the farmer or farm worker, although a specialist maintenance company maintained a substantial proportion of the equipment.

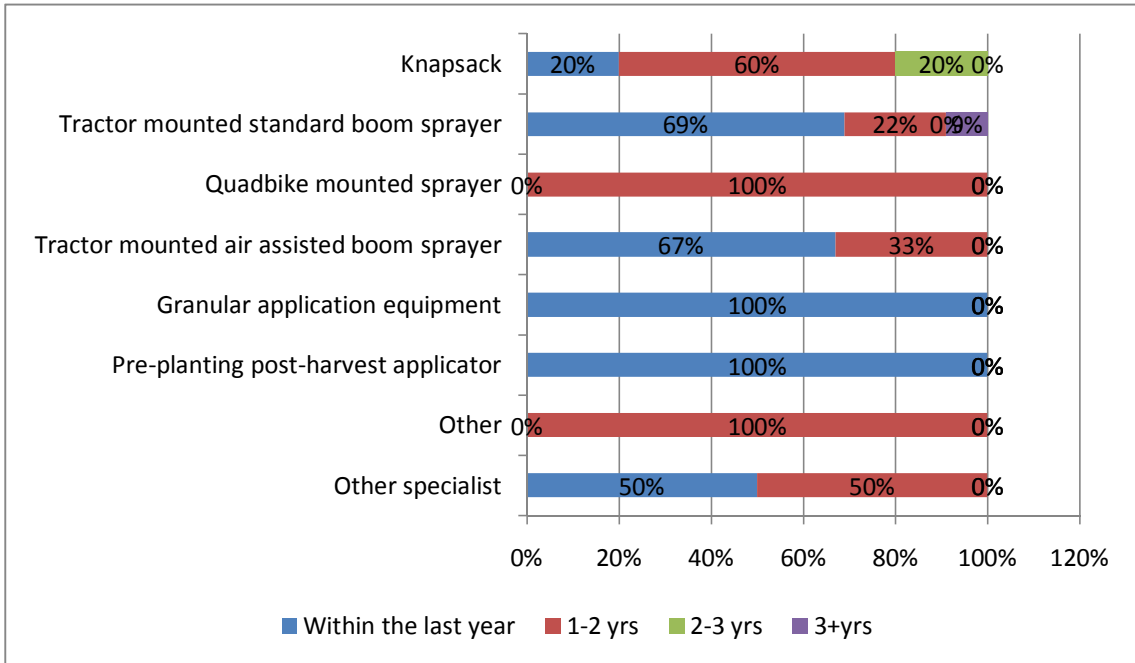
Figure 25 Has the (equipment) been tested through the National Sprayer Testing Scheme, otherwise known as NSTS?



Base: Those who apply pesticides, excluding those who only use a contractor n=214 (knapsack 139, standard boom sprayer 108, quadbike 25, air assisted boom sprayer 9, granular applicator 5, pre-planting post-harvest applicator 2, other 9, other specialist 7)

Only 4% of the knapsacks and 4% of the quadbikes had been tested through the NSTS scheme, however 100% of the pre planting post harvest applicators and 67% of the air assisted boom sprayers had been tested. 33% of the tractor mounted/trailed standard boom sprayers had been tested.

Figure 26 When was it last tested?



Base Those had the equipment tested (knapsack 5, standard boom sprayer 36, quadbike 1, granular applicator 2, air assisted boom sprayer 6, pre-planting post-harvest applicator 2, other 1, other specialist 2)

The majority of the equipment that had been tested through the NSTS had either been tested within the last year or within the last 1-2 years.

*Spray practices – nozzle height, boom width, forward speed***Table 37 What height are the nozzles on your boom sprayer usually set above the crop when you are applying pesticides?**

Height in cm	Standard boom sprayer	Quadbike	Air assisted boom sprayer
<i>Base</i>	83	18	3
15	2%	6%	0%
20	1%	0%	0%
30	2%	11%	0%
38	4%	0%	0%
40	2%	0%	0%
45	1%	0%	0%
46	20%	6%	0%
50	22%	6%	0%
51	8%	22%	33%
53	1%	0%	0%
60	4%	0%	0%
61	13%	17%	33%
64	2%	0%	0%
68	1%	0%	0%
70	1%	0%	0%
75	1%	6%	33%
76	2%	17%	0%
91	1%	0%	0%
100	4%	11%	0%
122	4%	0%	0%
127	1%	0%	0%

NB the bases only include farms that were able to provide the required information.

The height of the nozzles on the quadbike ranged from 15 to 100 cm. The height of the nozzles on the standard boom sprayers ranged from 15 to 127cm whilst the range for air assisted boom sprayers was from to 51 to 75cm. Most typically boom height was around 45-50cm above the crop.

Note: Some caution is needed in interpretation of these results. It was recorded whether measurements were made in imperial or metric but the broad range suggests an element of inaccurate assessment from the respondents.

Table 38 How many metres wide is the boom that you normally use?

Width in metres	Standard boom sprayer	Quadbike	Air assisted boom sprayer
<i>Base</i>	107	22	9
2	2%	41%	0%
3	0%	18%	11%
4	2%	14%	0%
5	2%	0%	0%
6	4%	5%	0%
7	2%	0%	11%
8	2%	0%	0%
9	4%	5%	0%
10	6%	0%	0%
12	29%	14%	22%
15	5%	0%	0%
16	0%	5%	0%
17	1%	0%	0%
18	10%	0%	11%
20	10%	0%	11%
21	6%	0%	0%
24	14%	0%	22%
32	0%	0%	11%
34	1%	0%	0%
48	1%	0%	0%

NB the bases only include farms that were able to provide the required information.

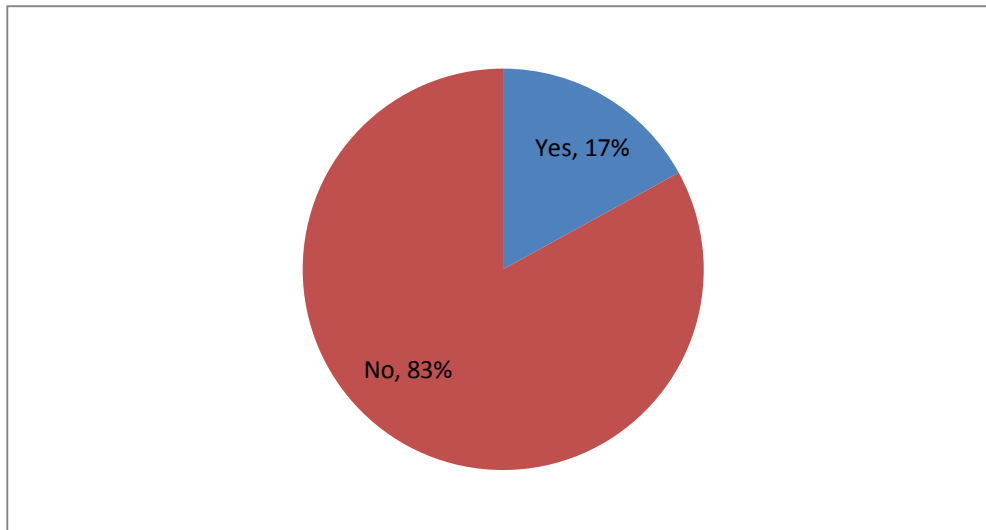
There was a wide variation in the width of boom used. The most common width for quadbike mounted sprayers was 2-3m (59%) although a proportion (14%) had 12m boom widths. For the standard boom sprayers, 40% had a boom width between 18m and 24m, 34% a boom width of 12-15m, 24% <12m and 2% >24m. For air assisted boom sprayers, 44% had a boom width between 18m and 24m, 22/5 a boom width of 12m, 22% <12m and 11% a boom width of more than 24m (note small base of air assisted boom sprayers).

Table 39 What miles per hour do you usually travel when applying pesticides from a boom sprayer?

Speed in miles per hour	Standard boom sprayer	Quadbike	Air assisted boom sprayer
<i>Base</i>	92	17	7
1	1%	0%	0%
2	1%	6%	0%
3	8%	18%	29%
4	15%	29%	14%
5	39%	41%	14%
6	20%	6%	14%
7	5%	0%	0%
8	7%	0%	14%
9	1%	0%	0%
10	2%	0%	14%
12	1%	0%	0%

NB The bases only include farms that were able to provide the required information.

The most typical speed of travel for boom sprayers and air assisted sprayers was between 5 and 6 miles per hour. For quadbikes the most typical speed was slightly slower at 4-5 miles per hour.

*Information adjacent residents prior to spraying***Figure 27** When pesticides are applied do you inform residents who live adjacent to the fields?

Base: All farms that apply pesticides n= 320

17% of all farms that applied pesticides informed neighbours who lived adjacent to the fields, prior to pesticides spraying. This is slightly lower than the UK where 23% of all farms that applied pesticides informed neighbours.

Results were fairly similar for farms that applied pesticides themselves (16%) and farms that used a contractor (20%), however farms with a certified spray operator were more likely to inform neighbours (under 44yrs 20%, over 44yrs 27%) than farms operating under the grandfather rights exemption (10%), (significantly different to the total sample at the 99% level).

Farms of 2-3 SLRs were the least likely to inform neighbours (9%), (significantly different to the remaining sample at the 99% level).

Table 40 Informing neighbours by farm type

	Scotland total	Cereals	General cropping	Dairy	Cattle and sheep (LFA)	Mixed	Other
Base	320	50	40	29	108	39	35
Yes	17%	26%	35%**	7%	10%*	10%	23%
No	83%	74%	65%**	93%	90%*	90%	77%

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The general cropping farms were more likely than the remaining sample to inform neighbours of pesticide application.

Table 41 Informing neighbours by region

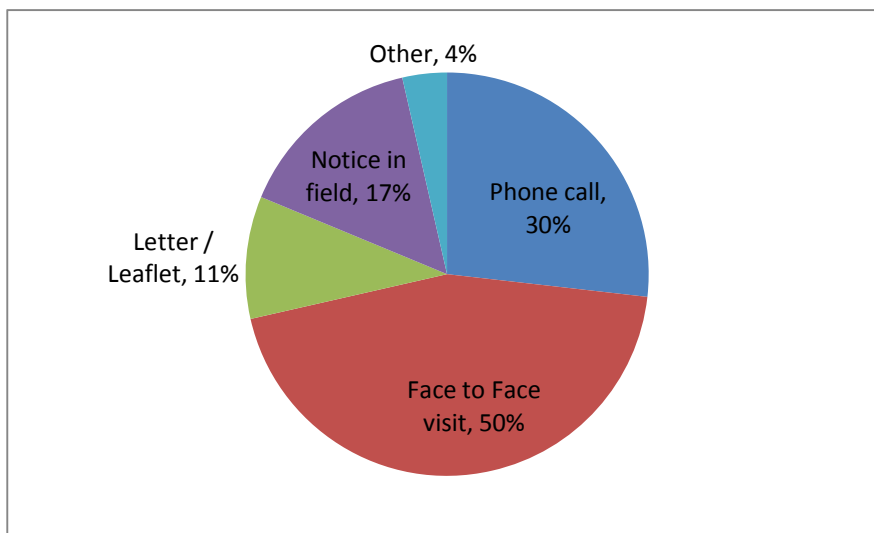
	Scotland total	NE	NW	SE	SW
Base	320	69	60	83	108
Yes	17%	13%	22%	24%	11%*
No	83%	87%	78%	76%	89%*

*Indicates significant difference compared to the remaining sample at the 95% confidence level

**Indicates significant difference compared to the remaining sample at the 99% confidence level

The farms in the South West followed by those in the North East were the least likely to inform neighbours.

Figure 28 How do you inform the residents?



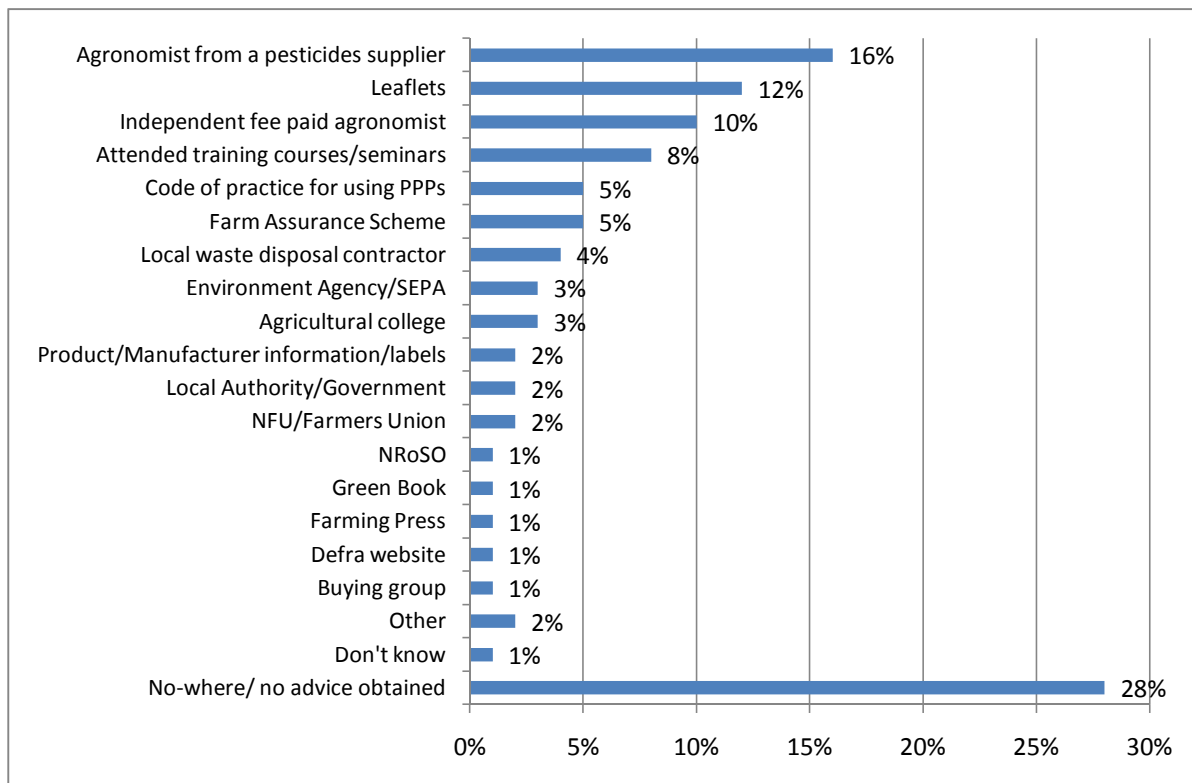
Base: Only those who inform neighbours about pesticide application n=54

Of those who informed neighbours about pesticide application 50% made contact face to face, whilst 30% did so via the telephone. This is different from the UK as a whole where 32% made contact face to face and 61% made contact via the telephone.

3.7 Disposal of Waste Pesticides and Pesticide Containers

Sources of advice

Figure 29 Where have you obtained advice or information about how to dispose of waste pesticides and pesticide containers?



Base: All farms that apply pesticides n=320

The most popular source of information on the disposal of pesticides was from agronomists (26% in total), followed by leaflets (10%) and training courses (8%). A substantial proportion, 28% of all those who applied pesticides had not obtained any information or advice.

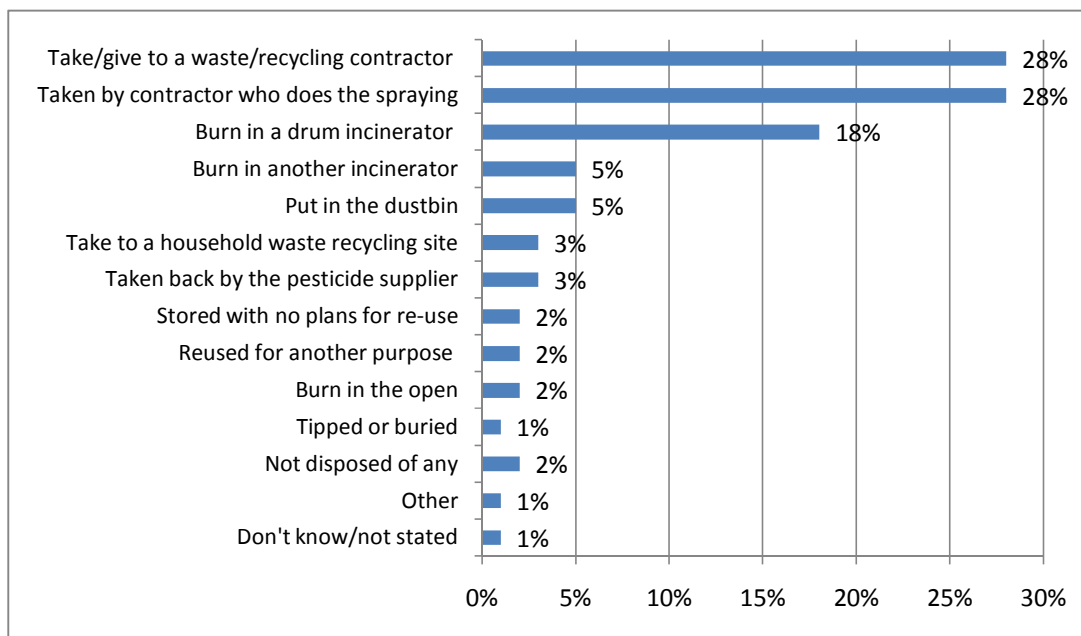
Farms operating under grandfather rights were more likely not to have obtained any information (35%) than those with a trained operator (under 44 years 11%, over 44yrs 12%). There was no clear difference between farms where a contractor or the farmer applied the pesticides.

The code of practice for using plant protection products was more commonly used on the larger farms of 5+SLR (19%, significantly different to the remaining sample at the 99% level). The farms of 1-2SLR appeared the more likely to have obtained information via training courses (17%, significantly different to the remaining sample at the 99% level).

With regard to farm type, the cereal farms were more likely to have obtained information from training courses and seminars than the remaining sample (22%, significantly different to the remaining sample at the 99% level). The arable farms were more likely than the remaining sample to have obtained information from some source (no advice obtained: cereal 10%, general cropping 15%, dairy 41%, cattle and sheep 32%, other 51%). Other farm types were significantly less likely than the remaining sample (99% level) to have obtained any information or advice.

Farms in the North West and South West appeared more likely than farms elsewhere not to have obtained information or advice on the disposal of pesticides and empty pesticide containers, however the differences were not significant.

Figure 30 How do you dispose of empty plastic pesticide containers?



Base: All farms that apply pesticides n= 320

The largest proportion of farms that applied pesticides disposed of the empty plastic containers via a waste or recycling contractor (28%) or had them taken away by the spray contractor (28%). 18% burned the containers in a drum incinerator. 3% actually took the containers to a household waste disposal site, whilst 5% placed them in a dustbin. Those who took the containers to a household waste site came from farms with and without a certified operator, whilst those who put the containers in the dustbin were primarily from farms operating under grandfather rights but also one farm applying pesticides without a certified operator.

Farms with a trained operator (under 44yrs 39%, over 44yrs 35%) were more likely than those operating under grandfather rights (18%) to burn the containers in a drum incinerator (significant difference at the 99% level). 75% of the farms who used a contractor to apply pesticides had the containers taken away by the contractor.

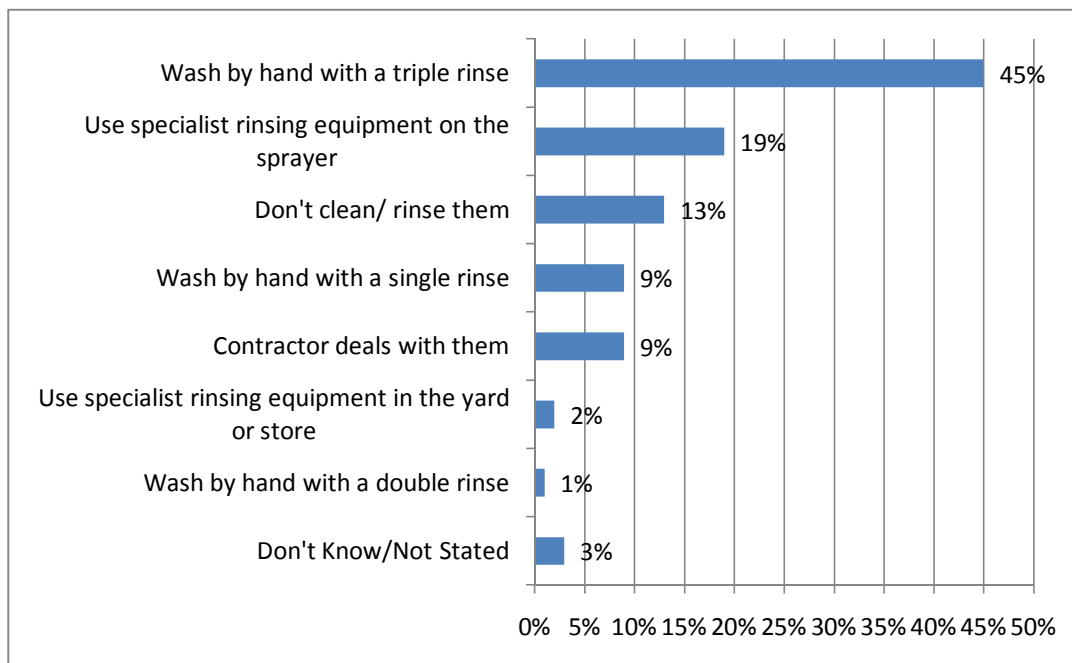
No clear differences were evident by farm size. The livestock farms were less likely than the arable and mixed farms to burn the containers in a drum incinerator (cereals 24%, general cropping 38%** , dairy 7%, cattle and sheep LFA 8%** , mixed 33%* , other 11%). (** denotes significant difference when compared to the remaining sample at the 99% level; * denotes significant difference when compared to the remaining sample at the 95% level). The arable farms appeared less likely than the livestock farms to have placed containers in the dustbin or household recycling site.

Farms in the North East (30%) and South East (29%) were more likely than farms elsewhere to burn the containers in a drum incinerator (North West 5%, South West 7%), (significant difference when compared to the remaining sample at the 99% level).

Considering the 2% of farms that stored the containers with no plans for re-use, 14% of these stored the containers in a purpose built or adapted pesticide store, whilst

71% stored them in a standard building. 14% mentioned another type of store. Farms that stored the containers in a standard store were primarily cattle and sheep LFA of a range of sizes.

Figure 31 When you dispose of empty pesticide containers how, if at all are they cleaned before disposal?



Base All farms that apply pesticides n=320

Just under half the farms (45%) cleaned the empty pesticide containers prior to disposal by washing by hand with a triple rinse, whilst 9% cleaned them with a single rinse and 1% with a double rinse. Thus in total 55% washed the containers by hand with at least 1 rinse. 19% used specialist rinsing equipment on the sprayer, whilst 2% used specialist rinsing equipment in the yard. In 9% of cases the contractor dealt with cleaning the containers. 13% of farms indicated they did not clean or rinse the containers on farm.

Those farms that used a contractor to spray pesticides were more likely to mention that they did not rinse or clean them (contractor 26%, farmer sprays 6%). 26% also mentioned that the contractor dealt with the containers. Farms that applied pesticides under the grandfather rights exemption (14%) were less likely than those with a certified operator to use specialist rinsing equipment on the sprayer (37%).

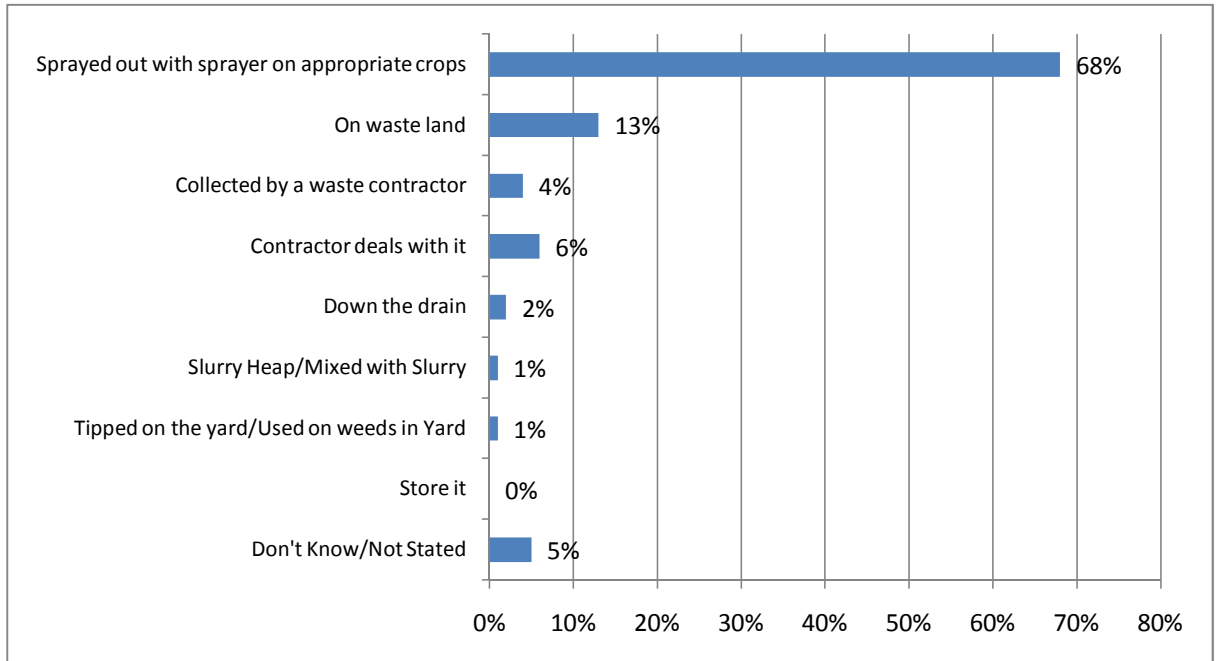
The likelihood of using specialist rinsing equipment on the sprayer generally increased with farm size (under 1SLR 5%, 5+SLR 35%).

The likelihood of not cleaning or rinsing the containers was similar across the farm types. The general cropping farms were the most likely to use specialist rinsing equipment on the sprayer (35%, significant difference when compared to the remaining sample at the 95% level).

Farms in the South West of Scotland were the most likely to clean or rinse the containers, with only 6% not doing so (significant difference compared to the remaining sample at the 99% level). Those in the South East were more likely than

the remaining sample to use specialist rinsing equipment on the sprayer (28%, significant difference at the 95% level).

Figure 32 How do you dispose of the rinsings after washing spray equipment or washing out containers?



Base: Farms that dispose of rinsings n= 280

On 68% of farms the rinsings were sprayed out with the sprayer on appropriate crops, whilst on 13% of farms the rinsings were disposed of on waste land. 2% admitted to disposing of the rinsings down the drain.

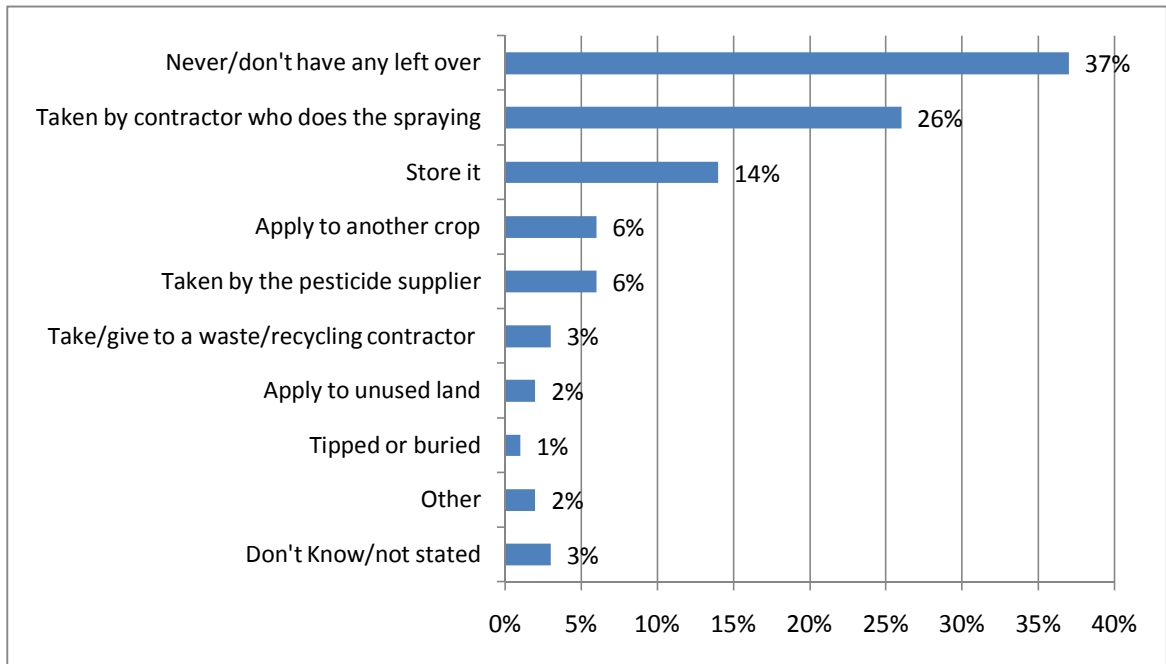
Farms that disposed of rinsings down the drain had a mix of certified operators and operators working under grandfather rights, were either livestock or other farm types and were all under 3SLR.

32% of farms that used a spray contractor indicated that the contractor dealt with or removed the rinsings, whilst 53% said that the rinsings were sprayed out on appropriate crops. Where no contractor was used 75% mentioned that the rinsings were sprayed onto other crops, whilst 17% disposed of rinsings on waste land. Only 6% of rinsings from farms using a contractor were disposed of on waste land. There were no clear differences between the behaviour on farms with a certified spray operator and those operating under grandfather rights.

The larger the farm the greater likelihood that the rinsings would be sprayed out with the sprayer onto appropriate crops (under 1SLR 51%, 5+SLR 87%).

Differences by farm type were unclear. Farms in the North West of Scotland were the most likely to dispose of the rinsings on waste land (27%) and least likely to spray them out with the sprayer on other crops (47%), (significant difference compared to the remaining sample at the 99% level).

Figure 33 How do you dispose of any waste undiluted pesticide that will not be used, for example because it is out of date, the product has been withdrawn or you no longer grow the crop?



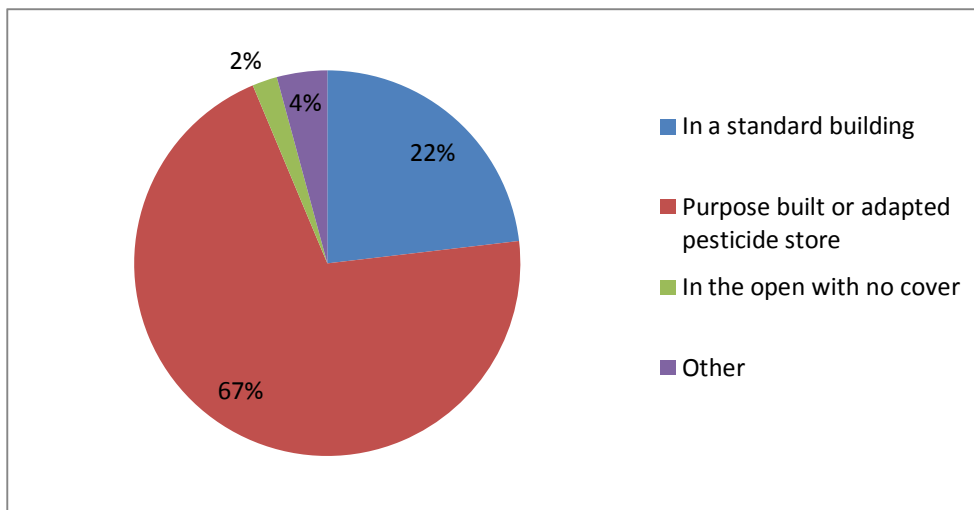
Base: All farms that apply pesticides n=320

The highest proportion of farms indicated that they did not have any waste undiluted pesticide, and therefore they did not have to dispose of it (37%). On 26% of the farms it was taken away by the spray contractor, whilst on 6% it was taken away by the pesticide supplier. 14% of farms stored it, and on 6% of farms it was applied to another crop. 1% indicated that they tipped or buried the pesticide concentrate. The latter farms applied pesticides under grandfather rights, were under 1SLR and of the “other” farm type.

Farms with operators over 44 years either operating under the grandfather rights exemption or with certification were more likely to store the pesticide (22% and 24%), than those using a certified operator aged under 44 years (7%). Farms with a certified operator under 44 years were more likely to apply the waste undiluted pesticide to another crop than other farms (17%, significant difference when compared to the remaining sample at the 95% level). The contractor took the pesticide away on 69% of farms that used a contractor to apply the pesticides.

The likelihood of storing the waste undiluted pesticide generally increased the smaller the farm (under 1SLR 21%, 5+SLR 9%). Differences by farm type were unclear.

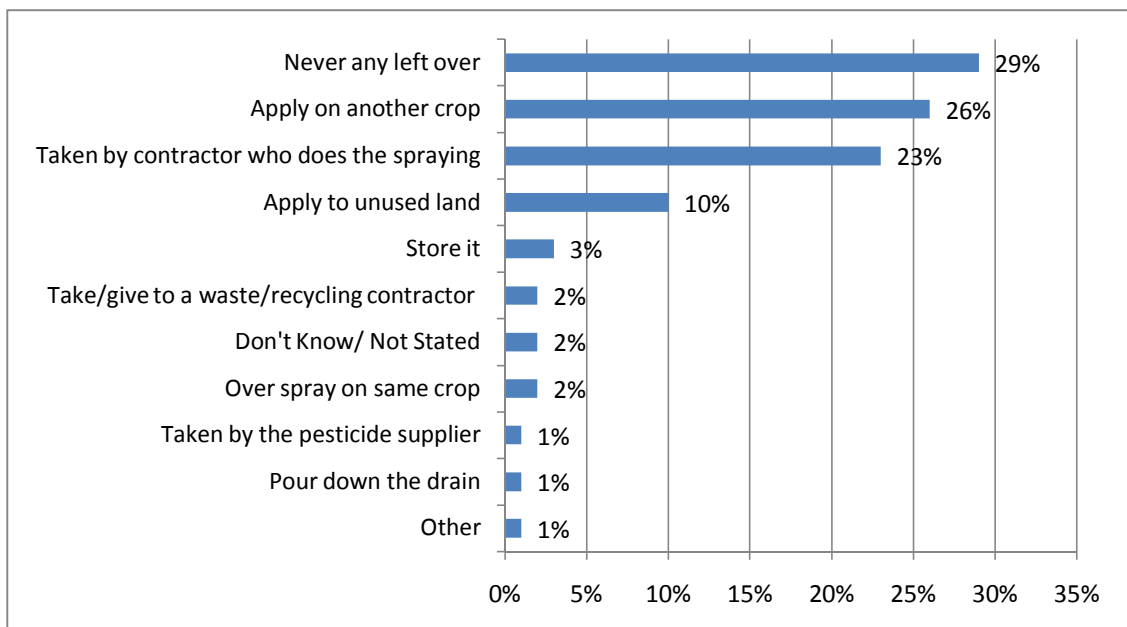
Farms in the South West of Scotland were the most likely not to have any undiluted waste pesticide left over (47%, significant difference compared to the remaining sample at the 99% level) and the least likely to store any waste undiluted pesticide (9%, significant difference compared to the remaining sample at the 95% level).

Figure 34 Where do you store the pesticide concentrate?

Base: Farms that stored the waste undiluted pesticide n=46

22% of those farms that stored waste undiluted pesticide did so in a standard store, whilst 67% stored it in an adapted or purpose built store. 2% stored it in the open with no cover.

The farm that stored the pesticide in the open operated under the grandfather rights exemption was under 1SLR and from the “other” farm type. Farms where the pesticide was stored in a standard building were cattle and sheep or other farm types, predominantly (but not exclusively) farms under 1 SLR with operators over 44 years (either certified or operating under grandfather rights).

Figure 35 How do you dispose of any diluted pesticide that is left over after application?

Base: All farms that apply pesticides n=320

29% of the sample did not have any diluted pesticide left over after application and as such did not have to dispose of it. 26% did however apply diluted waste pesticide to another crop, whilst on 23% of the farms the contractor took the waste pesticide away.

10% applied it to unused land, whilst 3% stored it. 1% admitted to pouring the waste diluted pesticide down the drain.

Farms operating under grandfather rights (41%) and those who applied the pesticides themselves (41%) were more likely to have no pesticide left over than those with a certified spray operator (under 44 years (33%, over 44yrs 31%)) or those who used a contractor to spray (13%). On 66% of farms that used a spray contractor the contractor took the left over diluted pesticide away.

On farms over 2SLR there was a greater chance that the pesticide would be applied to another crop (under 1SLR 13%, 1-2SLR 25%, 2+SLR 36%). Farms under 1SLR were more likely than larger farms not to have any pesticide left over (38%, significant difference compared to the remaining sample at the 99% level).

Other farm types were less likely than the remaining sample to apply left over diluted pesticide to another crop (6%, significant difference compared to the remaining sample at the 99% level), however no other clear differences by farm type were evident. No clear differences were evident by region.

Of the 3% of farms that stored the dilute left over pesticide 60% stored it in an old bottle or drum, 20% temporarily stored it in the tank or sprayer and 20% permanently stored it in the tank or sprayer.

4. Discussion and Conclusions

4.1 General points

The purpose of the research was to understand sprayer practices across Scotland, in all farm types and farm sizes, by holdings. Previous research has tended to focus on farms with arable crops only and many measures were based on area sprayed rather than individual holdings. These results provide a basis for policy decisions, many of which confirm previous estimates, but others providing new information and additional detail on sprayer practices, particularly on farm type and size.

Based on the survey results 27% of farms in Scotland apply pesticides on their holding (34% of UK farms) but this rises to over 60% for arable and mixed holdings. The following conclusions are based on the survey of those that do apply pesticides.

4.2 Training

Training is an important issue following scrutiny in the RCEP report on bystander exposure and proposals under the Sustainable Use Directive. It is very likely that the ability to apply pesticides under grandfather rights will be removed by 2015 and this may have serious consequences for the estimated 5,000 spray operators in Scotland utilising the rights (54% of all operators applying their own pesticides), depending on the implementation. Only 19% of holdings that apply pesticides have a spray operator with NRoSO registration (25% for the UK).

It will have a particular impact on livestock farms and smaller farm where there is often a sole spray operator and no alternative. The impact will depend on the type of equipment used and the detail of the requirements (e.g. does it cover knapsack use) and the response to the change. Some may choose to take up training, while others may choose to stop spraying and either use a contractor or other method of control. The costs of retraining are dependent on the type of course available. The foundation course and knapsack sprayer training course costs in the region of £530, while the foundation course and the boom sprayer training course is typically £730. There may be issues of willingness to retrain and perhaps access to training venues. Some guidance to farmer attitude towards changes to grandfather rights can be taken from the Scottish Government survey and report on the removal of grandfather rights in Scotland (publish date to be confirmed).

Further investigation is required into the estimated 350 spray operators who do not qualify for grandfather rights but do not have a certificate of competence, and could be operating illegally.

4.3 Decision making and influencing behaviour

The choice of products should be made by a suitably qualified person, normally someone with a BASIS certificate. However, BASIS qualified people were the main decision makers on only 28% of holdings. This may be an underestimate, as there also appears to be some lack of knowledge of the requirements as 45% holdings use an agronomist (54% in UK), who will all have BASIS certification, identified in the CRD agronomist survey¹⁰. The lack of availability or use is particularly noticeable on smaller farms and on cattle and sheep farms.

¹⁰ CRD (2009) UK Sprayer Practices Survey

The situation is not as bad as it first appears, as when asked about sources of information. Agronomists were used by 63% of all farms (60% in UK), up to 86-88% for arable farms (93-98% for UK), and 57% for cattle and sheep farms (33-35% for UK) with the lowest use in the other farm type group, showing that some use agronomists for advice but take their own decisions about which product to use.

This may be a reflection on the type of spraying with a significant proportion applied by knapsack where the products and problems are unlikely to change from year to year. This is supported in the use of support material which is heavily reliant on product manuals (labels) rather than the use of agronomist in small farms and livestock farms.

Clearly, in many situations where agronomist input is limited, the farmer is key to influencing product choice and decision about what and when to apply pesticides. Product manuals/labels are important areas for information as they were used by a higher proportion than any other source of information, although even here it was limited to only 43% of holdings although this may be an underestimate as the question asked about product manuals, rather than specifically labels.

Along with agronomists, articles in the farming press were an important source of information particularly in the cereal sector. Use of computer support programmes was limited amongst farmers even in the higher usage arable farms, but used by a majority of agronomists.

Influencing decision making through farm assurance schemes also has limited potential, with only 30-35% being members of farm assurance schemes with specific requirements for pesticide use (Assured Combinable Crops, Scottish Quality Cereals, Genesis, Assured Produce, LEAF marquee). There is generally good uptake of farm assurance schemes in Scotland with 80% being members of at least one scheme. Membership of farm assurance schemes in the cattle and sheep farm types was up to 85% in Scotland, much higher than the UK figures of 42- 49%. Despite a high uptake of livestock schemes they tend to have less stringent requirements for pesticide use. There is however higher membership of farm assurance schemes in the arable sector with 95% of cereal and general cropping farms being members of an assurance scheme.

Farmers who use contractors generally take less responsibility for decisions on what and when to apply pesticides, including decisions on reducing drift.

4.4 Use of integrated pest management

Use of integrated pest management (IPM) methods by farmer respondents in Scotland was quite limited, but they were widely supported by agronomists¹¹. The low use in Scotland is partly a reflection of the farm types, with more development of tests for the higher value arable crops.

4.5 Spray equipment

The age and maintenance of sprayers is relevant to the proposed changes in the Sustainable Use Directive that will require sprayers to be regularly tested. Knapsacks and quadbike mounted/trailed sprayers tend to have a younger age profile with only 15% and 0% being over 10 years old respectively. Tractor mounted/trailed boom sprayers (standard and air assisted) have 22-34% of machines over 10 years old (similar to UK), of which up to 11% are over 20 years old (mainly standard boom sprayers) (8% for UK). Based on estimated total

¹¹ CRD (2009) UK Sprayer Practices Survey

numbers this could mean that there are almost 750 standard boom sprayers over 20 years old.

The age of machinery is not in itself an issue if it is well maintained, and it seems that the majority is well maintained with 80% of boom sprayers being regularly maintained or serviced (same as UK) (although slightly lower for quadbike sprayers), with the majority being maintained or serviced at least annually. Most maintenance was carried out on the farm, but there was a tendency for more specialist machines to be serviced by a machinery company. The quality of the maintenance was not established in the survey.

Testing through the National Sprayer Testing Scheme (NSTS) was highest for boom sprayers with over 33% being tested within the last 2 years (50% in the UK). This reflects the introduction of the requirement for sprayer testing in many of the arable farm assurance schemes in the last 2 years. Testing of other equipment was lower.

4.6 Disposal of pesticides

There was some very good understanding of the requirements for waste disposal on a good proportion of holdings (56% of holdings disposed of containers correctly (70% in UK), 75% of holdings washed out containers correctly (78% in UK), 92% disposed of holdings disposed of washings correctly (84% in UK), 77% of holdings disposed of dilute pesticides correctly) but there is a core of holdings where there is limited understanding of the requirements and a greater degree of variation in the disposal of concentrated pesticides.

There were some worrying outcomes in the questions over disposal of pesticides containers. In particular the fact that a small proportion of holdings (5%) admitted putting containers in the dustbin. This probably only represents a very small proportion of the total pesticide containers, as these farms tended to be the small farms and the lower use farm types. There was also 13% who did not rinse out containers at all (10% in UK) – again more common on livestock farms.

There was more variation in response to the disposal of concentrated pesticides that have been withdrawn, or are no longer needed on the farm. A high proportion (37%) claimed that there was never any left over (47% in UK). 14% stored the chemicals while 8% used it on waste land or other crops, and a further 35% passed the responsibility on to contractors, pesticides suppliers or others. Only 3% of holdings used a waste contractor to dispose of any left over chemicals (4% in UK).

There was a high reliance on contractors for the correct disposal of pesticide containers, washings and concentrated pesticides. This was reflected in the UK contractor survey which indicated responsible disposal methods were used.

5. Appendix – Survey Questionnaire

Serial number. |__|__|__|__|__|

TITLE. Title from sample

NAME. Name from sample

INITIAL. Initial from sample

|__|__|__|__|__|__|__|

SURNAME. Surname from sample

JOB. Job Title from sample

COMPANY. Company name from sample

ADD1. Address Line 1 from sample

ADD2. Address Line 2 from sample

ADD3. Address Line 3 from sample

ADD4. Address Line 4 from sample

-2-

REGION. REGION from Sample		
NE Scotland		01
NW Scotland		02
SE Scotland		03
SW Scotland		04
NW Wales		05
NE Wales		06
Powys		07
Ceredigion		08
Pembrokeshire		09
Carmarthanshire		10
South Wales		11
England - North East		12
England - North West		13
England - Yorkshire and Humber		14
England - East Midlands		15
England - West Midlands		16
England - Eastern		17
England - South East (inc London)		18
England - South West		19
Nth Ireland		20

FARMSIZE. Farm Size from sample		
Very Small - Under 0.25 SLR		1
Very Small - 0.5 to 1 SLR		2
Small 1 to 2 SLR		3
Medium 2 to 3 SLR		4
Large 3 to 5 SLR		5
Very Large 5+ SLR		6
Very Small - 0.25 to 0.5 SLR		7

TELNUM. Phone Number	

INTRO. Good [VTODS] my name isand I am calling on |
behalf of ADAS. ADAS has been commissioned by the |
Pesticide Safety Directorate to conduct a survey amongst |
farmers across the UK. The survey aims to provide a |
greater understanding of the practices associated with |
the application of pesticides to control weeds, pests or |
diseases. We wrote to you a few weeks ago to let you |
know we may give you a call. |

-3-

START. Your name has been selected at random from information | |
 collected during the June Agricultural Census. The | |
 survey is voluntary and will take about 12 minutes to | |
 complete. It will be conducted in line with the Market | |
 Research Society code of conduct. The information you | |
 provide will remain confidential and will only be used | |
 for the purpose of this survey. A report of the findings | |
 will be produced but this will not release the names of | |
 participants in the survey - Are you willing to | |
 participate? | |

INTERVIEWER: Press F12 and "continue later" to make an | |
 appointment - (Wales only) If farmer asks to be interviewed in Welsh check | |
 name and best time for a Welsh speaker to call back - TELL YOUR | |
 SUPERVISOR | |

Yes		1	
No		2	<in-
			elig-
			ible>

Q1. Can I firstly confirm your role on the farm? | |
 | |

INTERVIEWER: READ OUT - Respondent must be one of these - F12 | |
 to make appointment to speak to correct person | |

Farmer		1	
Director		2	
Business Partner		3	
Farm Manager		4	

Q1B. I would now like to ask you about the use of pesticides on | |
 your farm. By pesticides I mean chemicals obtained from | |
 agricultural suppliers that are used to control weeds, | |

pests or diseases. Does anyone, including a contractor,		
ever apply pesticides on crops, grassland or weeds around		
buildings on your farm using equipment such as a knapsack,		
quad bike, tractor mounted sprayer or any other specialist		
equipment, such as for applying slug pellets or seed		
treatments?		
	Yes	1
	No	2

ASK: No Pesticides sprayed		
Q1C. Why do you not apply pesticides on your farm ?		
INTERVIEWER: Probe fully		

ASK: No Pesticides sprayed		
AND: False		
Q1CV. Why do you not apply pesticides on your farm ?		
INTERVIEWER: Probe fully		

-4-

ASK: Pesticides Sprayed |

TEXT1. Whenever I mention pesticides from now on I mean the |

types of chemicals, uses and methods that I have just |

described. |

INTERVIEWER: By pesticides I mean chemicals obtained from |

agricultural suppliers that are used to control weeds, pests or |

diseases. |

ASK: Pesticides Sprayed |

Q2. How many acres or hectares are pesticides applied to on |

your farm in an average year? Include pesticides applied by |

you, your farm workers and contractors by any method in |

your answer. |

INTERVIEWER: Prompt for best estimate - Acres or Hectares |

|_|_|_|_|_|_|_|_|_|

ASK: Pesticides Sprayed | |

Q2X. Was that response in acres or hectares ? | |

Acres | 1 |

Hectares | 2 |

ASK: Pesticides Sprayed | |

Q3. Who applies the pesticides on your farm? Again please think | |

about all chemicals for weed, pest or disease control; | |

whether using a knapsack, granular applicator, boom sprayer | |

or other specialist equipment such as for applying slug | |

pellets or seed treatments. | |

| |

INTERVIEWER: READ OUT - Code all that apply - If the respondent |
 says himself record as farmer /manager - If respondent doesn't |
 say himself code Respondent Does Not Spray |

Farmer / Farm manager / Respondent | 1 |

Family member | 2 |

Other farm worker | 3 |

Contractor | 4 |

Respondent DOES NOT SPRAY | 5 |

ASK: Pesticides Sprayed |

|

Q4. Excluding contractors, how many people in total apply |
 pesticides on your farm? |

|

INTERVIEWER: If only use a contractor put 0 |

|__|__| |

ASK: Family member |

|

Q4FAM. How many family members apply pesticides on your farm ? |

|__|__| |

-5-

ASK: Other farm worker |

Q4WORK. How many farm workers apply pesticides on your farm ? |

|__|__| |

ASK: Respondent sprays on farm | |

Q5RESP. Which of the following applies to [V3TEXT] ? | |

INTERVIEWER: READ OUT |

Hold a certificate of competence to spray pesticides | |

for example PA1, PA2, PA4, PA6 and up to PA13 | 1 |

Operates under supervision of someone with a | |

certificate of competence, but doesn't have the | |

certificate themselves | 2 |

Operates under the supervision of someone with | |

experience, but neither have a certificate of | |

competence | 3 |

Operates through experience, without a certificate of | |

competence | 4 |

ASK: Respondent sprays on farm | |

Q6RESP. Were [V3TEXT] born on, before or after 31st December | |

1964? | |

INTERVIEWER: If they were born on or before 31st December 1964 |

they would be aged 44 or over. |

On / Before | 1 |

After | 2 |

ASK: Respondent sprays on farm |

-6-

ASK: First Family Member		
Q6FAM1. Were they born on, before or after 31st December 1964?		
INTERVIEWER: If they were born on or before 31st December 1964		
they would be aged 44 or over.		
	On / Before	1
	After	2

ASK: First Family Member	
Q7FAM1. Approximately how many days a year does this FIRST	
family member apply pesticides on your farm?	
	<u> </u>

ASK: First Family Member	
Q8FAM1. Of ALL pesticides applied to your farm, [V3TEXT2],	
approximately what percentage do they apply?	
	<u> </u>

ASK: Second Family Member		
Q5FAM2. Which of the following applies to the SECOND family		
member sprayer of pesticides ?		
INTERVIEWER: READ OUT		
Hold a certificate of competence to spray pesticides		
for example PA1, PA2, PA4, PA6 and up to PA13	1	
Operates under supervision of someone with a		
certificate of competence, but doesn't have the		
certificate themselves	2	

Operates under the supervision of someone with		
experience, but neither have a certificate of		
competence		3
Operates through experience, without a certificate of		
competence		4

ASK: Second Family Member		
Q6FAM2. Were they born on, before or after 31st December 1964?		
INTERVIEWER: If they were born on or before 31st December 1964		
they would be aged 44 or over.		
	On / Before	1
	After	2

ASK: Second Family Member	
Q7FAM2. Approximately how many days a year does this SECOND	
family member apply pesticides on your farm?	
	<u> </u>

ASK: Second Family Member	
Q8FAM2. Of ALL pesticides applied to your farm, [V3TEXT2]	
approximately what percentage do they apply?	
	<u> </u>

-7-

ASK: Third Family Member | |

| |

Q5FAM3. Which of the following applies to the THIRD family | |

member sprayer of pesticides ? | |

| |

INTERVIEWER: READ OUT |

Hold a certificate of competence to spray pesticides | |

for example PA1, PA2, PA4, PA6 and up to PA13 | 1 |

Operates under supervision of someone with a | |

certificate of competence, but doesn't have the | |

certificate themselves | 2 |

Operates under the supervision of someone with | |

experience, but neither have a certificate of | |

competence | 3 |

Operates through experience, without a certificate of | |

competence | 4 |

ASK: Third Family Member | |

| |

Q6FAM3. Were they born on, before or after 31st December 1964? | |

| |

INTERVIEWER: If they were born on or before 31st December 1964 |

they would be aged 44 or over. |

On / Before | 1 |

After | 2 |

ASK: Third Family Member |

|

Q7FAM3. Approximately how many days a year does this THIRD |

family member apply pesticides on your farm? |

|__|__|__| |

_____ |

ASK: Third Family Member |

|

Q8FAM3. Of ALL pesticides applied to your farm, [V3TEXT2] |

approximately what percentage do they apply? |

|__|__|__| |

_____ |

ASK: Fourth Family Member | |

| |

Q5FAM4. Which of the following applies to the FOURTH family | |

member sprayer of pesticides ? | |

| |

INTERVIEWER: READ OUT |

Hold a certificate of competence to spray pesticides | |

for example PA1, PA2, PA4, PA6 and up to PA13 | 1 |

Operates under supervision of someone with a | |

certificate of competence, but doesn't have the | |

certificate themselves | 2 |

Operates under the supervision of someone with | |

experience, but neither have a certificate of | |

competence | 3 |

Operates through experience, without a certificate of | |

competence | 4 |

-8-

ASK: Fourth Family Member | |

| |

Q6FAM4. Were they born on, before or after 31st December 1964? | |

| |

INTERVIEWER: If they were born on or before 31st December 1964 |

they would be aged 44 or over. |

On / Before | 1 |

After | 2 |

ASK: Fourth Family Member |

|

Q7FAM4. Approximately how many days a year does this FOURTH |

family member apply pesticides on your farm? |

|_||_||_|| |

_____ |

ASK: Fourth Family Member |

|

Q8FAM4. Of ALL pesticides applied to your farm, [V3TEXT2] |

approximately what percentage do they apply? |

|_||_||_|| |

_____ |

ASK: First Farm Worker | |

| |

Q5WORK1. Which of the following applies to the FIRST farm | |

worker sprayer of pesticides ? | |

| |

INTERVIEWER: READ OUT |

Hold a certificate of competence to spray pesticides | |

for example PA1, PA2, PA4, PA6 and up to PA13 | 1 |

Operates under supervision of someone with a | |

certificate of competence, but doesn't have the | |

certificate themselves | 2 |

Operates under the supervision of someone with		
experience, but neither have a certificate of		
competence		3
Operates through experience, without a certificate of		
competence		4

ASK: First Farm Worker		
Q6WORK1. Were they born on, before or after 31st December 1964?		
INTERVIEWER: If they were born on or before 31st December 1964		
they would be aged 44 or over.		
	On / Before	1
	After	2

ASK: First Farm Worker		
Q7WORK1. Approximately how many days a year does this FIRST		
farm worker apply pesticides on your farm?		
		_ _ _

ASK: First Farm Worker		
Q8WORK1. Of ALL pesticides applied to your farm, [V3TEXT2]		
approximately what percentage do they apply?		
		_ _ _

-9-

ASK: Second Farm Worker | |

| |

Q5WORK2. Which of the following applies to the SECOND farm | |

worker sprayer of pesticides ? | |

| |

INTERVIEWER: READ OUT | |

Hold a certificate of competence to spray pesticides | |

for example PA1, PA2, PA4, PA6 and up to PA13 | 1 |

Operates under supervision of someone with a | |

certificate of competence, but doesn't have the | |

certificate themselves | 2 |

Operates under the supervision of someone with | |

experience, but neither have a certificate of | |

competence | 3 |

Operates through experience, without a certificate of | |

competence | 4 |

ASK: Second Farm Worker | |

| |

Q6WORK2. Were they born on, before or after 31st December 1964? | |

| |

INTERVIEWER: If they were born on or before 31st December 1964 | |

they would be aged 44 or over. | |

On / Before | 1 |

After | 2 |

ASK: Second Farm Worker | |

| |

Q7WORK2. Approximately how many days a year does this SECOND | |

farm worker apply pesticides on your farm? | |

|__|__|__| | |

ASK: Second Farm Worker | |

| |

Q8WORK2. Of ALL pesticides applied to your farm, [V3TEXT2] | |

approximately what percentage do they apply? | |

|_|_|_|_| | |

ASK: Third Farm Worker | |

| |

Q5WORK3. Which of the following applies to the THIRD farm | |

worker sprayer of pesticides ? | |

| |

INTERVIEWER: READ OUT | |

Hold a certificate of competence to spray pesticides | |

for example PA1, PA2, PA4, PA6 and up to PA13 | 1 |

Operates under supervision of someone with a | |

certificate of competence, but doesn't have the | |

certificate themselves | 2 |

Operates under the supervision of someone with | |

experience, but neither have a certificate of | |

competence | 3 |

Operates through experience, without a certificate of | |

competence | 4 |

-10-

ASK: Third Farm Worker | |

| |

Q6WORK3. Were they born on, before or after 31st December 1964? | |

| |

INTERVIEWER: If they were born on or before 31st December 1964 |

they would be aged 44 or over. |

On / Before | 1 |

After | 2 |

ASK: Third Farm Worker |

|

Q7WORK3. Approximately how many days a year does this THIRD |

farm worker apply pesticides on your farm? |

|_||_||_|| |

_____ |

ASK: Third Farm Worker |

|

Q8WORK3. Of ALL pesticides applied to your farm, [V3TEXT2] |

approximately what percentage do they apply? |

|_||_||_|| |

_____ |

ASK: Fourth Farm Worker | |

| |

Q5WORK4. Which of the following applies to the FOURTH farm | |

worker sprayer of pesticides ? | |

| |

INTERVIEWER: READ OUT |

Hold a certificate of competence to spray pesticides | |

for example PA1, PA2, PA4, PA6 and up to PA13 | 1 |

Operates under supervision of someone with a | |

certificate of competence, but doesn't have the | |

certificate themselves | 2 |

Operates under the supervision of someone with		
experience, but neither have a certificate of		
competence		3
Operates through experience, without a certificate of		
competence		4

ASK: Fourth Farm Worker		
Q6WORK4. Were they born on, before or after 31st December 1964?		
INTERVIEWER: If they were born on or before 31st December 1964		
they would be aged 44 or over.		
	On / Before	1
	After	2

ASK: Fourth Farm Worker	
Q7WORK4. Approximately how many days a year does this FOURTH	
farm worker apply pesticides on your farm?	
	_ _ _ _ _ _

ASK: Fourth Farm Worker	
Q8WORK4. Of ALL pesticides applied to your farm, [V3TEXT2]	
approximately what percentage do they apply?	
	_ _ _ _ _ _

-12-

ASK: Pesticides Sprayed		
Q11. Which qualifications relevant to applying pesticides does this person have?		
INTERVIEWER: READ OUT - Code all that apply		
BASIS certificate of crop protection		01
Certificate of Competence to spray pesticides		02
NRoSO membership		03
NONE		97
Don't know		98
Other		99

ASK: Other		
Q110TH. Other - please specify		

ASK: Pesticides Sprayed		
Q12. Who is the MAIN person who usually decides WHEN pesticide spraying will take place?		
INTERVIEWER: READ OUT		
You/ other farm managers		01
Other spray operator based on your farm		02
Independent fee paid agronomist		03
Agronomist from the pesticide supplier		04
Contractor		05

-13-

ASK: Pesticides Sprayed		
Q13. Which qualifications relevant to applying pesticides does this person have?		
INTERVIEWER: READ OUT - Code all that apply		
BASIS certificate of crop protection		01
Certificate of Competence to spray pesticides		02
NRoso membership		03
NONE		97
Don't know		98
Other		99

ASK: Other		
Q13OTH. Other - please specify		

ASK: Pesticides Sprayed		
Q14. What factors are taken into account when deciding WHEN to spray pesticides on your farm?		
INTERVIEWER: DO NOT PROMPT - Code all that apply		
Wind speed		01
Ground conditions		02
Whether or not it will rain		03
Crop growth stage		04
NONE		98
Other		99

ASK: Other		
------------	--	--

Q140TH. Other - please specify

ASK: Pesticides Sprayed | |

Q15. How is drift into water courses and other non-target areas | |
 such as neighbours land, reduced when spraying pesticides | |
 on your farm? | |

INTERVIEWER: DO NOT PROMT - Code all that apply |

- Use low drift nozzles | 01 |
- Use air induction nozzles | 02 |
- Buffer strips | 03 |
- LERAP requirements | 04 |
- Large droplets | 05 |
- Spray in low wind/ do not spray in windy conditions | 06 |
- Spray when wind blowing away from watercourses and | |
- other sensitive areas | 07 |
- Shut off part of the boom near water courses and other | |
- sensitive areas | 08 |
- Physical barriers such as plant hedges, fences | 09 |
- Don't know | 98 |
- Other | 99 |

Decision support systems such as Disease or Weed			
manager or sclerotinia decision guide		15	
Training courses		16	
NONE		99	

-15-

ASK: Pesticides Sprayed		
Q17. How do you assess the development of weeds, pests and diseases in your crops and grassland?		
INTERVIEWER: READ OUT - Code all mentioned		
Regular crop inspection by the farm manager or staff		01
Regular crop inspection by an agronomist		02
In field tests to check for diseases for example potato virus diagnostic test, potato blight confirmation		03
Laboratory tests to check for diseases		04
Slug trapping		05
Wireworm trapping		06
Soil tests for pests for example wireworms, leatherjackets, wheat bulb fly, nematodes		07
Sticky traps for pests e.g. orange wheat blossom midge, carrot fly, thrips		08
Pheremone traps for pests e.g. orange wheat blossom midge, moths		09
Water traps for cabbage stem flea beetle		10
NONE		98
Other		99

ASK: Other		
Q17OTH. Other - please specify		

ASK: In field tests or traps to check for diseases		
Q18. What if any, are the benefits of using methods in addition to or instead of regular crop inspection?		

INTERVIEWER: Probe Fully

ASK: In field tests or traps to check for diseases

AND: False

Q18V. What if any, are the benefits of using methods in
addition to or instead of regular crop inspection?

INTERVIEWER: Probe Fully

Q20. What type of equipment do you or your farm workers use
 nowadays to apply the pesticides on your farm? Please
 don't include any equipment used by an external contractor
 in your answer.

INTERVIEWER: READ OUT - Code all that are mentioned

- | | | | |
|--|--|----|--|
| Knapsack | | 01 | |
| Granular applicator, for example for applying slug
pellets | | 02 | |
| Quadbike mounted sprayer | | 03 | |
| Tractor mounted or self propelled air assisted boom
sprayer | | 04 | |
| Tractor mounted or self propelled standard boom sprayer | | 05 | |
| Pre- planting and post -harvest applicator | | 06 | |
| Other specialist equipment | | 98 | |
| Other | | 99 | |

ASK: Other specialist equipment

Q200THSPOTH. Other specialist equipment - please specify

-17-

ASK: Other |

Q20OTHER. Other - please specify |

----- |

ASK: Knapsack |

Q21KNAP. How many Knapsacks do you have on your farm? |

INTERVIEWER: If rent equipment put 0 |

|_|_| |

ASK: Knapsack | |

Q22KNAP. How old is the Knapsack application equipment | |

INTERVIEWER: MULTICODE if they have more than one |

Under 1 year		1	
1 to 2 years		2	
3 to 5 years		3	
6 to 10 years		4	
11 to 20 years		5	
Over 20 years		6	
Don't know		7	

ASK: Knapsack | |

Q23KNAP. Do you regularly maintain or service the Knapsack or | |

do you tend to just fix faults as they occur? | |

INTERVIEWER: MULTICODE IF NECESSARY |

Regular maintenance / service		1	
-------------------------------	--	---	--

Just fix faults		2	
Don't know		3	

ASK: Regular maintenance / service			

Q24KNAP. How often is the Knapsack usually maintained or serviced?			

INTERVIEWER: MULTICODE IF THEY HAVE MORE THAN ONE			
Every 1 to 5 months		1	
Every 6 months		2	
Annually		3	
Every 2 to 3 years		4	
Every 4 + years		5	

ASK: Regular maintenance / service			

Q25KNAP. And who carries out the maintenance or servicing?			
Farmer / Farm worker		01	
Specialist maintenance company / contractor		02	
Other		99	

ASK: Other			
Q25KNAPOTH. Other - please specify			

INTERVIEWER: MULTICODE if they have more than one		
Under 1 year		1
1 to 2 years		2
3 to 5 years		3
6 to 10 years		4
11 to 20 years		5
Over 20 years		6
Don't know		7

ASK: Granular applicator, for example for applying slug pellets		
Q23GRAN. Do you regularly maintain or service the Granular		
Applicator or do you tend to just fix faults as they		
occur?		

INTERVIEWER: MULTICODE IF NECESSARY		
Regular maintenance / service		1
Just fix faults		2
Don't know		3

-19-

ASK: Regular maintenance / service		
Q24GRAN. How often is the Granular Applicator usually maintained or serviced?		
INTERVIEWER: MULTICODE IF THEY HAVE MORE THAN ONE		
Every 1 to 5 months		1
Every 6 months		2
Annually		3
Every 2 to 3 years		4
Every 4 + years		5

ASK: Regular maintenance / service		
Q25GRAN. And who carries out the maintenance or servicing?		
Farmer / Farm worker		01
Specialist maintenance company / contractor		02
Other		99

ASK: Other		
Q25GRANOTH. Other - please specify		

ASK: Granular applicator, for example for applying slug pellets		
Q26GRAN. Has the Granular Applicator been tested through the National Sprayer Testing Scheme, otherwise known as the NSTS?		
Yes		1
No		2
Don't know		3

-20-

ASK: Quadbike mounted sprayer		
Q22QUAD. How old is the Quadbike mounted sprayers application equipment		
INTERVIEWER: MULTICODE if they have more than one		
Under 1 year		1
1 to 2 years		2
3 to 5 years		3
6 to 10 years		4
11 to 20 years		5
Over 20 years		6
Don't know		7

ASK: Quadbike mounted sprayer		
Q23QUAD. Do you regularly maintain or service the Quadbike mounted sprayers or do you tend to just fix faults as they occur?		
INTERVIEWER: MULTICODE IF NECESSARY		
Regular maintenance / service		1
Just fix faults		2
Don't know		3

ASK: Regular maintenance / service		
Q24QUAD. How often is the Quadbike mounted sprayer usually maintained or serviced?		
INTERVIEWER: MULTICODE IF THEY HAVE MORE THAN ONE		
Every 1 to 5 months		1
Every 6 months		2

	Annually	3
	Every 2 to 3 years	4
	Every 4 + years	5
<hr/>		
ASK: Regular maintenance / service		
Q25QUAD. And who carries out the maintenance or servicing?		
	Farmer / Farm worker	01
	Specialist maintenance company / contractor	02
	Other	99
<hr/>		
ASK: Other		
Q25QUADOTH. Other - please specify		

<hr/>		
ASK: Quadbike mounted sprayer		
Q26QUAD. Has the Quadbike mounted sprayer been tested through		
the National Sprayer Testing Scheme, otherwise known		
as the NSTS?		
	Yes	1
	No	2
	Don't know	3

-21-

ASK: Quadbike mounted sprayer has been tested | |

| |

Q27QUAD. When was it last tested? | |

| |

INTERVIEWER: MUTLTICODE IF MORE THAN ONE |

Within the last year | 1 |

1 to 2 years | 2 |

2 to 3 years | 3 |

3 to 4 years | 4 |

4 to 5 years | 5 |

Over 5 years | 6 |

ASK: Quadbike mounted sprayer |

|

Q28QUAD. How many metres wide is the boom that you usually use? |

|

INTERVIEWER: Typical Boom Widths - 12m, 18m, 24m - Can be up-to |

48m Double check if over 50m |

|__|__| |

_____ |

ASK: Quadbike mounted sprayer |

|

Q29QUAD. What miles per hour do you usually travel when |

applying pesticides from a boom sprayer ? |

|__|__|__| |

_____ |

ASK: Quadbike mounted sprayer |

|

Q30QUADA. What height are the nozzles on your boom usually set |

above the crop when you are applying pesticides? |

|__|__|__| |

_____ |

-22-

ASK: Tractor mounted or self propelled air assisted boom		
sprayer		
Q22AIR. How old is the Tractor mounted or self propelled air		
assisted boom sprayer application equipment		
INTERVIEWER: MULTICODE if they have more than one		
Under 1 year		1
1 to 2 years		2
3 to 5 years		3
6 to 10 years		4
11 to 20 years		5
Over 20 years		6
Don't know		7

ASK: Tractor mounted or self propelled air assisted boom		
sprayer		
Q23AIR. Do you regularly maintain or service the Tractor		
mounted or self propelled air assisted boom sprayer or		
do you tend to just fix faults as they occur?		
INTERVIEWER: MULTICODE IF NECESSARY		
Regular maintenance / service		1
Just fix faults		2
Don't know		3

ASK: Regular maintenance / service		
Q24AIR. How often is the Tractor mounted or self propelled air		
assisted boom sprayer usually maintained or serviced?		
INTERVIEWER: MULTICODE IF THEY HAVE MORE THAN ONE		

Every 1 to 5 months		1	
Every 6 months		2	
Annually		3	
Every 2 to 3 years		4	
Every 4 + years		5	

ASK: Regular maintenance / service			
Q25AIR. And who carries out the maintenance or servicing?			
Farmer / Farm worker		01	
Specialist maintenance company / contractor		02	
Other		99	

ASK: Other			
Q25AIROTH. Other - please specify			

-23-

ASK: Tractor mounted or self propelled air assisted boom		
sprayer		
Q26AIR. Has the Tractor mounted or self propelled air assisted		
boom sprayer been tested through the National Sprayer		
Testing Scheme, otherwise known as the NSTS?		
	Yes	1
	No	2
	Don't know	3

ASK: Tractor mounted or self propelled air assisted boom		
sprayer has been tested		
Q27AIR. When was it last tested?		
INTERVIEWER: MUTLTICODE IF MORE THAN ONE		
	Within the last year	1
	1 to 2 years	2
	2 to 3 years	3
	3 to 4 years	4
	4 to 5 years	5
	Over 5 years	6

ASK: Tractor mounted or self propelled air assisted boom	
sprayer	
Q28AIR. How many metres wide is the boom that you usually use?	
INTERVIEWER: Typical Boom Widths - 12m, 18m, 24m - Can be up-to	
48m Double check if over 50m	
	<u> </u> <u> </u>

ASK: Tractor mounted or self propelled air assisted boom |
 sprayer |

Q29AIR. What miles per hour do you usually travel when applying |
 pesticides from a boom sprayer ? |

INTERVIEWER: Don't know = 999 |
 |
 |
 |
 |

ASK: Tractor mounted or self propelled air assisted boom |
 sprayer |

Q30AIRA. What height are the nozzles on your boom usually set |
 above the crop when you are applying pesticides? |

INTERVIEWER: Don't know = 999 |
 |
 |
 |

ASK: Tractor mounted or self propelled air assisted boom | |
 sprayer | |

Q30AIRB. Was that in Centimetres or Inches ? | |
 Centimetres | 1 |
 Inches | 2 |

-24-

ASK: Tractor mounted or self propelled standard boom sprayer		
Q21BOOM. How many Tractor mounted or self propelled standard boom sprayers do you have on your farm?		
INTERVIEWER: If rent equipment put 0		
		__ __

ASK: Tractor mounted or self propelled standard boom sprayer		
Q22BOOM. How old is the Tractor mounted or self propelled standard boom sprayer application equipment		
INTERVIEWER: MULTICODE if they have more than one		
		Under 1 year 1
		1 to 2 years 2
		3 to 5 years 3
		6 to 10 years 4
		11 to 20 years 5
		Over 20 years 6
		Don't know 7

ASK: Tractor mounted or self propelled standard boom sprayer		
Q23BOOM. Do you regularly maintain or service the Tractor mounted or self propelled standard boom sprayer or do you tend to just fix faults as they occur?		
INTERVIEWER: MULTICODE IF NECESSARY		
		Regular maintenance / service 1
		Just fix faults 2
		Don't know 3

ASK: Regular maintenance / service		
Q24BOOM. How often is the Tractor mounted or self propelled		
standard boom sprayer usually maintained or serviced?		
INTERVIEWER: MULTICODE IF THEY HAVE MORE THAN ONE		
Every 1 to 5 months		1
Every 6 months		2
Annually		3
Every 2 to 3 years		4
Every 4 + years		5

ASK: Regular maintenance / service		
Q25BOOM. And who carries out the maintenance or servicing?		
Farmer / Farm worker		01
Specialist maintenance company / contractor		02
Other		99

ASK: Other		
Q25BOOMOTH. Other - please specify		

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ASK: Tractor mounted or self propelled standard boom sprayer		
Q26BOOM. Has the Tractor mounted or self propelled standard boom sprayer been tested through the National Sprayer Testing Scheme, otherwise known as the NSTS?		
Yes		1
No		2
Don't know		3

ASK: Tractor mounted or self propelled standard boom sprayer has been tested		
Q27BOOM. When was it last tested?		
INTERVIEWER: MUTLTICODE IF MORE THAN ONE		
Within the last year		1
1 to 2 years		2
2 to 3 years		3
3 to 4 years		4
4 to 5 years		5
Over 5 years		6

ASK: Tractor mounted or self propelled standard boom sprayer	
Q28BOOM. How many metres wide is the boom that you usually use?	
INTERVIEWER: Typical Boom Widths - 12m, 18m, 24m - Can be up-to 48m Double check if over 50m	

ASK: Tractor mounted or self propelled standard boom sprayer	

Q29BOOM. What miles per hour do you usually travel when
 applying pesticides from a boom sprayer ?

INTERVIEWER: Don't know = 999

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ASK: Tractor mounted or self propelled standard boom sprayer

Q30BOOMA. What height are the nozzles on your boom usually set
 above the crop when you are applying pesticides?

INTERVIEWER: Don't know = 999

|_|_|_|_| |

ASK: Tractor mounted or self propelled standard boom sprayer

Q30BOOMB. Was that in Centimetres or Inches ?

Centimetres | 1 |

Inches | 2 |

ASK: Pre- planting and post -harvest applicator

Q21APPLI. How many Pre-Planting and Post-Harvest Applicators do
 you have on your farm?

INTERVIEWER: If rent equipment put 0

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ASK: Pre- planting and post -harvest applicator		
Q22APPLI. How old is the Pre-Planting and Post-Harvest Applicator equipment		
INTERVIEWER: MULTICODE if they have more than one		
Under 1 year		1
1 to 2 years		2
3 to 5 years		3
6 to 10 years		4
11 to 20 years		5
Over 20 years		6
Don't know		7

ASK: Pre- planting and post -harvest applicator		
Q23APPLI. Do you regularly maintain or service the Pre-Planting and Post-Harvest Applicator or do you tend to just fix faults as they occur?		
INTERVIEWER: MULTICODE IF NECESSARY		
Regular maintenance / service		1
Just fix faults		2
Don't know		3

ASK: Regular maintenance / service		
Q24APPLI. How often is the Pre-Planting and Post-Harvest Applicator usually maintained or serviced?		
INTERVIEWER: MULTICODE IF THEY HAVE MORE THAN ONE		
Every 1 to 5 months		1
Every 6 months		2

	Annually	3
	Every 2 to 3 years	4
	Every 4 + years	5
<hr/>		
ASK: Regular maintenance / service		
Q25APPLI. And who carries out the maintenance or servicing?		
	Farmer / Farm worker	01
	Specialist maintenance company / contractor	02
	Other	99
<hr/>		
ASK: Other		
Q25APPLIOTH. Other - please specify		

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ASK: Pre- planting and post -harvest applicator		
Q26APPLI. Has the Pre-Planting and Post-Harvest Applicator been		
tested through the National Sprayer Testing Scheme,		
otherwise known as the NSTS?		
	Yes	1
	No	2
	Don't know	3

ASK: Have an Other Specialist equipment on the farm		
AND: Other specialist equipment		
Q230THSP. Do you regularly maintain or service the [Q200THSP]		
or do you tend to just fix faults as they occur?		
INTERVIEWER: MULTICODE IF NECESSARY		
Regular maintenance / service		1
Just fix faults		2
Don't know		3

ASK: Regular maintenance / service		
Q240THSP. How often is the [Q200THSP] usually maintained or		
serviced?		
INTERVIEWER: MULTICODE IF THEY HAVE MORE THAN ONE		
Every 1 to 5 months		1
Every 6 months		2
Annually		3
Every 2 to 3 years		4
Every 4 + years		5

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ASK: Regular maintenance / service		
Q250THSP. And who carries out the maintenance or servicing?		
Farmer / Farm worker		01
Specialist maintenance company / contractor		02
Other		99

ASK: Other		
Q250THSPOTH. Other - please specify		

ASK: Have an Other Specialist equipment on the farm		
AND: Other specialist equipment		
Q260THSP. Has the [Q200THSP] been tested through the National Sprayer Testing Scheme, otherwise known as the NSTS?		
Yes		1
No		2
Don't know		3

ASK: Other Specialist Equipment has been tested		
Q270THSP. When was it last tested?		
INTERVIEWER: MUTLTICODE IF MORE THAN ONE		
Within the last year		1
1 to 2 years		2
2 to 3 years		3
3 to 4 years		4
4 to 5 years		5
Over 5 years		6

ASK: Other |

Q21OTHER. How many [Q20OTHER] do you have on your farm? |

INTERVIEWER: If rent equipment put 0 |

_____|

ASK: Other | |

Q22OTHER. How old is the [Q20OTHER] equipment | |

INTERVIEWER: MULTICODE if they have more than one |

Under 1 year | 1 |

1 to 2 years | 2 |

3 to 5 years | 3 |

6 to 10 years | 4 |

11 to 20 years | 5 |

Over 20 years | 6 |

Don't know | 7 |

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ASK: Other		
Q230THER. Do you regularly maintain or service the [Q200THER]		
or do you tend to just fix faults as they occur?		
INTERVIEWER: MULTICODE IF NECESSARY		
Regular maintenance / service		1
Just fix faults		2
Don't know		3

ASK: Regular maintenance / service		
Q240THER. How often is the [Q200THER] usually maintained or		
serviced?		
INTERVIEWER: MULTICODE IF THEY HAVE MORE THAN ONE		
Every 1 to 5 months		1
Every 6 months		2
Annually		3
Every 2 to 3 years		4
Every 4 + years		5

ASK: Regular maintenance / service		
Q250THER. And who carries out the maintenance or servicing?		
Farmer / Farm worker		01
Specialist maintenance company / contractor		02
Other		99

ASK: Other	
Q250THEROTH. Other - please specify	

<hr/>		
ASK: Other		
Q26OTHER. Has the [Q20OTHER] been tested through the National		
Sprayer Testing Scheme, otherwise known as the NSTS?		
Yes		1
No		2
Don't know		3
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ASK: Other Equipment has been tested		
Q27OTHER. When was it last tested?		
INTERVIEWER: MUTLTICODE IF MORE THAN ONE		
Within the last year		1
1 to 2 years		2
2 to 3 years		3
3 to 4 years		4
4 to 5 years		5
Over 5 years		6

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ASK: Pesticides Sprayed		
Q31. When pesticides are applied do you inform residents who live adjacent to the fields?		
Yes		1
No		2

ASK: Inform adjacent residents		
Q32. How do you inform the residents?		
INTERVIEWER: Code all mentioned		
Phone call		01
Letter / Leaflet		02
Notice in field		03
Other		99

ASK: Other		
Q32OTH. Other - please specify		

ASK: England / Nth Ireland / Wales		
AND: Pesticides Sprayed		
Q33. Are you aware of the NFU good neighbour initiative guide?		
Yes		1
No		2

ASK: Pesticides Sprayed		
TEXT2. I would now like to ask you some questions about the		

disposal of waste pesticides and pesticide containers.		
<hr/>		
ASK: Pesticides Sprayed		
Q34. Where have you obtained advice or information about how to		
dispose of waste pesticides and empty pesticide		
containers?		
INTERVIEWER: DO NOT PROMPT - Code all that apply		
Defra website		01
Code of practice for using plant protection products		02
Leaflets		03
Local waste disposal contractor		04
Independent fee paid agronomist		05
Agronomist from a pesticides supplier		06
No-where/ no advice obtained		98
Other		99

ASK: Other		
Q34OTH. Other - please specify		

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ASK: Pesticides Sprayed		
Q35. How do you dispose of empty plastic pesticide containers?		
INTERVIEWER: DO NOT PROMPT - Code all that apply		
Burn in the open		01
Burn in a drum incinerator (a drum incinerator is a 205		
litre drum with holes in)		02
Burn in another incinerator		03
Put in the dustbin		04
Take to a household waste recycling site		05
Take/give to a waste/recycling contractor (NOT		
household waste)		06
Taken back by the pesticide supplier		07
Taken by contractor who does the spraying		08
Tipped or buried		09
Stored with no plans for re-use		10
Reused for another purpose e.g. water feeders, storage		11
Other		99

ASK: Other		
Q350TH. Other - please specify		

ASK: Pesticides Sprayed		
Q36. When you dispose of the EMPTY pesticide containers how, if		
at all are they cleaned before disposal?		
INTERVIEWER: READ OUT - Code all that apply		
Don't clean/ rinse them		01

Use specialist rinsing equipment on the sprayer		02	
Use specialist rinsing equipment in the yard or store		03	
Wash by hand with a single rinse		04	
Wash by hand with a triple rinse		05	
Other		99	

ASK: Other	
Q360TH. Other - please specify	

Q380TH. Other - please specify

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ASK: Pesticides Sprayed		
Q39. How do you dispose of any WASTE UNDILUTED pesticide that		
will not be used, for example because it is out of date,		
the product has been withdrawn or you no longer grow the		
crop?		
INTERVIEWER: DO NOT PROMPT - Code all that apply		
Store it		01
Apply to another crop		02
Apply to unused land		03
Put in a biobed		04
Processed on farm through a pesticide waste handling		
plant such as sentinel		05
Put in the dustbin		06
Take to a household waste recycling site		07
Take/give to a waste/recycling contractor (NOT		
household waste)		08
Taken by the pesticide supplier		09
Tipped or buried		10
Taken by the contractor who does the spraying		11
Pour down the drain		12
Put in nearby rivers/ watercourses		13
Give to a neighbour		14
Other		99

ASK: Other		
Q390TH. Other - please specify		

ASK: Store it		
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Q40. Where do you store the pesticide concentrate?		
INTERVIEWER: READ OUT - Code all that apply		
In the open with no cover		01
Purpose built or adapted pesticide store		02
In a standard building		03
Other		99

ASK: Other		
Q400TH. Other - please specify		

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ASK: Pesticides Sprayed		
Q41. How do you dispose of any DILUTED pesticide that is left over after application?		
INTERVIEWER: DO NOT PROMPT - Code all that apply		
Store it		01
Apply to unused land		02
Apply on another crop		03
Put in a biobed		04
Processed on farm through a pesticide waste handling plant such as sentinel		05
Put in the dustbin		06
Take to a household waste recycling site		07
Take/give to a waste/recycling contractor (NOT household waste)		08
Taken by the pesticide supplier		09
Tipped or buried		10
Taken by the contractor who does the spraying		11
Pour down the drain		12
Put in nearby rivers/ watercourses		13
Give to a neighbour		14
Other		99

ASK: Other		
Q41OTH. Other - please specify		

ASK: Store it		
Q42. Where do you store the dilute pesticides ?		

INTERVIEWER: READ OUT - Code all that apply		
Temporarily store in the tank or sprayer		01
Permanently store in the tank or sprayer		02
In an old bottle or drum		03
Other		99

ASK: Other		
Q42OTH. Other - please specify		

ASK: Pesticides Sprayed		
Q43. Thank you very much for agreeing to take part in this		
survey, the information you have given us will be very		
useful. In order to gain an even greater understanding of		
pesticide application on farms such as yours ADAS are		
likely to carry out further interviews within the next 6		
months. Would you be willing to help us again by taking		
part in a follow up survey?		
	Yes	1
	No	2

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QNAME. Finally can I confirm your name is [NAME] [SURNAME] ? |

INTERVIEWER: If correct put Y otherwise write in full |

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ENDTEXT. Thankyou for your help with that - My name is |

from ADAS commissioned by the Pesticide Safety |

Directorate - I can assure you again that all your |

responses are treated with complete confidentiality. |