



PESTICIDE USAGE IN NORTHERN IRELAND SURVEY REPORT 208

Grassland and Fodder Crops 2005



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A National Statistics Publication

Department of Agriculture & Rural Development for Northern Ireland



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PESTICIDE USAGE SURVEY REPORT 208

NORTHERN IRELAND

GRASSLAND AND FODDER CROPS

2005

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The County Regions of Northern Ireland



SUMMARY

This is the fifth survey examining pesticide usage practices on grassland and fodder crops in Northern Ireland, providing data comparative to that obtained from previous surveys in 1989 (Jess *et al.*, 1992), 1993 (Jess *et al.*, 1995), 1997 (Jess *et al.*, 2000) and 2003 (Withers *et al.*, 2005). In this survey information on all aspects of pesticide usage was collected from 294 farms throughout the Province, representing 2.2% of the total area of grassland and fodder crops grown. Quantitative data obtained were adjusted to provide estimates of total pesticide usage.

Overall, the area of grassland and fodder crops grown in 2005 decreased by 3% and 6% when compared to 1997 and 2003, respectively. The area of established grassland crops also decreased by 4% throughout this period. Conversely, the area of fodder crops grown in Northern Ireland in 2003 had increased four-fold since 1997 with a further increase of 28% being recorded in 2005. This was principally due to the increase in fodder maize production. A fourth cut of silage was recorded for the first time in 2005.

The area of grassland and fodder crops receiving pesticide treatment decreased by 28% when compared to that recorded in 2003. However, there was an increase of 17%, 41% and 7% when compared to that recorded in 1989, 1993 and 1997, respectively. A total of 86 tonnes of pesticides was applied to 128,786 spray hectares of grassland and fodder crops during 2005. This represented a 16% reduction in the weight of pesticides applied compared to 2003. Herbicides accounted for 92% of the pesticide-treated area, representing 98% of the weight of pesticides applied. Seed treatments accounted for a further 4% of the treated area. The weight of active ingredients applied as seed treatments represented less than 1% of the total active ingredients. Fungicides, insecticides and growth regulators collectively accounted for the remainder of the total pesticide usage. No molluscicide use was recorded during this survey.

The areas of enclosed grazing and grass silage treated with pesticides decreased when compared to the 2003 survey, returning to a level similar to that recorded in 1997. However, the weight of pesticide applied to enclosed grazing was comparable to that recorded in 2003. Pesticide usage on sown grassland crops decreased significantly when compared with 2003, returning to levels similar to those recorded in 1997. The increase in the area of fodder crops grown when compared to 2003 was mainly attributed to a 66% increase in the area of fodder maize grown. Although the pesticide treated area of the maize crop decreased by 10% the weight of pesticides applied more than doubled from 2.6t to 5.7t.

Herbicides remained the most extensively used pesticide type on grassland and fodder crops. However, the trend for increased use of herbicides since 1989 seems to have reversed, as it decreased by 21% in 2005 when compared with 2003. In contrast, the trend for reduced weight of herbicide applied since 1989 continued. The formulation of fluroxypyr/triclopyr was the most frequently-used herbicide, principally applied to the first-cut of grass silage to control docks (*Rumex* spp.).

A total of sixty-one products comprising thirty nine active ingredients was recorded in use in this survey.

DEFINITIONS AND NOTES

- 'Basic area'. This refers to the actual planted area of crop which was treated with a given pesticide.
- 'Treated area'. This refers to the total area treated with a pesticide, which includes all repeated applications to the basic area. This is measured in 'spray-hectares'.
- 'Reasons for use'. This refers to the perceived reasons reported by the farmer for the use of a particular pesticide. These reasons may sometimes be inappropriate.
- 'Rounding'. Due to rounding of figures there may be slight differences in totals both within and between tables.
- 'Spray applications'. This refers to the number of treatments by any pesticide type to the treated areas.
- 'General weed control'. This refers to post emergence weed control.
- 'Ground preparation'. This refers to treatments applied before or during seed bed preparation.
- 'Sealer'. This refers to the application of herbicides to the crop, usually during sowing, to kill weed seedlings as they emerge.
- 'Grass silage'. Prior to 1997, the survey areas of grass silage from multiple cuts were reported as a single crop. However, in keeping with 1997 & 2003 the 2005 survey areas and pesticide treatments on individual cuts of silage were recorded separately.
- 'Rough grazing'. Is defined as land containing semi-natural vegetation including heathland, heather moorland, bog and rough grassland suitable only for use as grazing.
- 'Enclosed grazing'. Is defined as land which has been improved by management practices such as liming, top dressing and fencing etc., where there is not a significant presence of sensitive plant species, and could be cultivated for other purposes.
- 'Arable silage'. Is defined as arable crops which have been ensiled and have not been combined for grain.
- 'Arable silage (undersown)'. Is defined as arable crops grown as a nurse crop for a green cover crop, such as ryegrass, and have been ensiled rather than combined for grain.
- 'Cereals (undersown)'. Are defined as cereal crops which have been grown as a nurse crop for a green cover crop, such as ryegrass, and have been combined for grain.

INTRODUCTION

As a participant of the UK Working Party on Pesticide Usage Surveys, the Department of Agriculture and Rural Development (DARD), conducts a cyclical programme of surveys to examine pesticide usage in all sectors of the agricultural and horticultural industries. Principally, the data collected provides information for consideration by the Advisory Committee on Pesticides. However, pesticide usage data may also be used by those involved in residue testing, for public information, provision of data for research and evaluation of trends in pesticide usage.

This is the fifth survey of pesticide usage on grassland and fodder crops in Northern Ireland. The previous surveys of this sector were conducted in 1989 (Jess *et al.*, 1992), 1993 (Jess *et al.*, 1995), 1997 (Jess *et al.*, 2000), and 2003 (Withers *et al.*, 2005), data from which are included in this report for comparative purposes.

A list of published Northern Ireland Pesticide Usage Survey reports is shown in Appendix 1.

METHODS

The sample of holdings to be surveyed was selected from each of the six counties, on the basis of the total area of grassland and fodder crops grown, using data from the Northern Ireland Agricultural Census, June 2004 (Anon., 2005). This comprised the areas grown of established grassland crops and sown grassland and fodder crops.

In each region the sample holdings were stratified into six size groups according to the total area of grassland and fodder crops grown. Holdings were selected at random from within each of the size groups, the number of holdings being proportional to the total area of grassland and fodder crops grown.

The purpose of the survey was explained to the occupiers of selected holdings in preliminary correspondence. A total of 294 holdings were surveyed by telephone interview from October 2005 to March 2006. The data collected included; the area of crops grown, area treated, the target crop, pesticides used and the number of treatments applied. The growers' perceived reasons for pesticide use, including inappropriate usage, were also recorded. Holdings selected in the original sample which proved unable to provide data were replaced with those from the same county and size group held on a reserve list. During analysis, the sample data were raised to the total population level using raising factors calculated from the ratio of the number of farms sampled to the number of farms in the population within each region and size group. A further adjustment factor corrected the data in accordance with the areas of grassland and fodder crops published in the Northern Ireland Agricultural Census, June 2005 (Anon., 2006). The total number of farms in each size group and the number of farms sampled are shown in Table 1.

The collected data were entered using Oracle, a relational database programme. Validated data were downloaded for analysis using SPSS software.

RESULTS AND DISCUSSION

CROPS

Information collected from 294 farms provided data concerning 1,120 examples of fourteen grassland and fodder crop types (Table 2). The area surveyed represented approximately 2% of the total area of grassland and fodder crops grown in Northern Ireland in 2005. Areas of grassland and fodder crops grown in the six counties were estimated using raising factors discussed earlier (Table 3, Figure 1). Collectively, Counties Antrim and Tyrone accounted for approximately 45% of the area of grassland and fodder crops grown, with Counties Down and Londonderry together accounting for a further 32%. Counties Fermanagh and Armagh accounted for 13% and 10%, respectively.





Land used for enclosed and rough grazing represented 46% and 13% of the total area of grassland and fodder crops, respectively (Table 3, Figure 2). The area assigned to first-cut silage production was 23% with total silage production accounting for 37% of the grassland and fodder crop area. The area for hay production represented a further 1% of the total area of grassland and fodder crops. Reseeds, comprising arable silage (both undersown and non-undersown), undersown cereals and grass reseeds, collectively accounted for 2% of the total area. Fodder crops, including small areas of fodder beet, kale, maize, rape and turnip, accounted for less than 1% of the total area of grassland and fodder crops.

Figure 2 The proportional distribution of grassland and fodder crops grown in Northern Ireland in 2005.



REGIONAL PESTICIDE USAGE

County Antrim, which contributed 22% of the estimated area of grassland and fodder crops grown regionally in Northern Ireland in 2005 (Table 3), was the only county recorded where all five pesticide groups were applied, representing 31% and 29% of the pesticide-treated area and weight applied, respectively (Tables 4 & 5). County Tyrone accounted for 19% of the pesticide-treated area and 25% of the total weight of pesticides used on grassland and fodder crops. Approximately 50% of all herbicide applications were recorded in Counties Antrim and Tyrone. Fungicides, herbicides, insecticides and seed treatments were recorded in Counties Down and Londonderry, accounting for 30% of the pesticide-treated area and 21% of the weight of pesticides applied. County Armagh represented 12% of the total land used for grassland and fodder crops, accounting for 7% of the total pesticide-treated area and 9% of the total weight of pesticide applied.

PESTICIDE USAGE ON CROPS

Established grassland crops represented 80% and 81% of the pesticide-treated area and weight of active ingredients applied to grassland and fodder crops in Northern Ireland in 2005, respectively (Tables 6 & 7). Sown crops, including arable silage, reseeds and fodder crops, accounted for the remaining 20% and 19% of the pesticide-treated area and weight of pesticides applied, respectively. Grassland, used for

enclosed grazing or silage production, including grass, arable and fodder maize, represented 94% of the total treated area of grassland and fodder crops and 93% of the total weight of pesticides applied. A majority of crop types received herbicide treatment, with the exceptions of fourth-cut silage, fodder kale, rape and turnip. The use of fungicides was confined to arable crops. Seed treatments were applied to arable silage, undersown arable silage, undersown cereals and grass reseeds. Fourth-cut grass silage, fodder turnip and kale received no applications of any pesticide type. Grassland used for rough grazing represented 4% of the total pesticide-treated area (Tables 6 & 7).

PROPORTION OF CROPS TREATED

The proportion of each crop treated with the different pesticide groups and the number of pesticide applications to each crop type is shown in Table 8. Approximately 9% of the total area of grassland and fodder crops grown in 2005 received at least a single treatment with pesticides. Generally, pesticide application was confined to seed treatment and a single herbicide application. More than 12% of the area assigned for first-cut grass silage production received herbicide treatments. However, 10% and 4% of the areas assigned for 2nd and 3rd silage cuts received herbicides, respectively. Approximately 94% of the area of arable silage was treated with a herbicide, receiving on average, 1.4 applications. It was estimated that 84% of maize crop area received herbicide and 80% was sown with treated seed. Fungicides were applied to 20% of the arable silage crop area. All fodder beet crops received, on average, 2 applications of herbicides and 31% of the fodder rape crop area was sown with treated seed.

TOTAL PESTICIDE USAGE

An estimated total of 85.9 tonnes of pesticides were applied to 128,786 spray hectares of grassland and fodder crops during 2005 (Tables 9 & 10). Herbicides accounted for 92% of the pesticide-treated area and represented approximately 98% of the weight of pesticides applied. Seed treatments and fungicides accounted for a further 4% and 2% of the treated area respectively. The weight of seed treatment and fungicide active ingredients applied both represented less than 1% of the total active ingredients used. Insecticides and growth regulators collectively accounted for the remainder of the total pesticide usage. No molluscicides were recorded in use during the survey period.

Fungicides were recorded in use only on arable crops. The most extensively used fungicide was the active ingredient epoxiconazole, used only on arable silage representing 29% of the fungicide treated area but only 5% of the weight of fungicides applied.

Grassland used for silage production and enclosed grazing accounted for 82% of the total area of herbicide applications. The most extensively used herbicide formulation on grassland and fodder crops was fluroxypyr/triclopyr, accounting for 30% of the herbicide-treated area. The herbicide most frequently used on fodder crops was the triazine herbicide atrazine, accounting for 53% of the herbicide-treated area of fodder crops. Atrazine was used exclusively on fodder maize.

Chlorpyrifos, deltamethrin, esfenvalerate and lambda-cyhalothrin were the only insecticide active ingredients recorded. Chlorpyrifos was the most extensively used insecticide representing 51% of the insecticide-treated area and 97% of the weight of insecticide active ingredients applied. It was applied to

control leatherjackets (*Tipula spp.*) on enclosed grazing and cutworms (*Agrotis spp.*) on both enclosed grazing and arable silage.

The single active ingredients chlormequat and trinexapac-ethyl were the only growth regulators recorded. Trinexapac-ethyl was applied to arable silage whereas chlormequat was applied to both undersown and non-undersown arable silage.

Fodder maize accounted for 43% of the grassland and fodder crops sown with treated seed. The remainder comprised arable silage (28%), undersown arable silage (16%), grass reseeds (7%), undersown cereals (6%) and fodder rape (1%). The seed treatment fludioxonil, applied either as a single active ingredient or in formulation with metalalaxyl-M, accounted for approximately 64% of the total area sown with treated seed whereas methiocarb represented 27%.

The thirty-nine active ingredients recorded in use on grassland and fodder crops, ranked by spray area and weight applied, are shown in Tables 11 and 12, respectively. The top eleven active ingredients in each category were herbicides including triclopyr, MCPA, fluroxpyr, mecoprop-P, dicamba, glyphosate, and metsulfuron-methyl.

PESTICIDE USAGE ON ESTABLISHED GRASSLAND CROPS

Enclosed grazing (Table 13)

Herbicides and insecticides were the only pesticides applied to enclosed grazing areas. Control of dock (*Rumex* spp.) and rushes (*Juncus* spp.) accounted for 41% and 26% of the herbicide application to this crop, respectively. Eleven herbicides were used to control docks with approximately 62% of applications using the formulation fluroxypyr/triclopyr. The phenoxyacetic herbicide MCPA was most extensively used for the control of rushes (*Juncus* spp.) contributing 65% of herbicide applications for this purpose.

Chlorpyrifos was used to control leatherjackets (Tipula spp.) and cutworms (Agrotis spp.) on this crop.

Grass silage first cutting (Table 14)

An estimated 259,213 hectares of first-cut grass silage were grown in Northern Ireland in 2005 with County Tyrone accounting for 22% (Table 3). Approximately 14% of land allocated to the first cutting of grass silage received applications of pesticide. Herbicides and insecticides were the only pesticide groups applied to this area. Herbicides to control docks (*Rumex* spp.) accounted for 75% of the area of application. The formulation fluroxypyr/triclopyr was most extensively used for this purpose.

Insecticide applications were exclusively for the control of leatherjackets (Tipula spp.).

Grass silage second cutting (Table 15)

The area of grassland allocated for second cutting of grass silage was estimated to be 135,426 hectares, representing 52% of that in the first cut (Table 3). Herbicides were the only pesticide applied to grassland areas in the interval between the first and second cutting of grass silage. Dock (*Rumex* spp.) control accounted for 93% of herbicide applications. Approximately 6% of herbicide applications were for

general weed control with the remaining 1% to control rushes (*Juncus* spp.). The formulation fluroxypyr/triclopyr was the most extensively used herbicide formulation comprising 49% of all herbicide applications to this crop type.

Grass silage third cutting (Table 16)

Approximately 10% of ground allocated for second-cut grass silage production was cut on a third occasion, totalling 13,791 hectares (Table 3). Mecoprop was the only pesticide recorded, used to treat 539 spray hectares to control docks (*Rumex spp.*).

Grass silage fourth cutting

Fourth-cut grass silage was recorded for the first time and was estimated to be 1275 hectares. This represented 9% of ground allocated for third cut silage. No pesticides were recorded as applied to this area.

Hay (Table 17)

An estimated 16,744 hectares were allocated to hay production in Northern Ireland in 2005 (Table 3). Less than 2% of this crop received a single application of herbicide, the only pesticide group applied to this crop type. MCPA was used to control rushes (*Juncus* spp.) on 260 hectares of this crop.

Rough grazing (Table 18)

Approximately 3% of the rough grazing area received herbicide treatment, the only pesticide group applied to this crop type (Table 8). Control of rushes (*Juncus* spp.), was the principal single reason given for pesticide application, accounting for 77% of the treated area. MCPA was the most frequently-used herbicide active ingredient for this purpose. Briars (*Rubus spp.*), thistles (*Cirsium spp.*) and docks (*Rumex spp.*) were also controlled.

PESTICIDE USAGE ON SOWN CROPS

Arable silage (Table 19)

Approximately 2,667 hectares of arable silage were grown in Northern Ireland in 2005 (Table 3). An estimated 41% was grown in County Down and 37% in County Antrim. Applications of herbicides and desiccants to arable silage accounted for 41% of the pesticide-treated area (78% of the weight of pesticide applied), seed treatments 23% (1%), fungicides 15% (11%), insecticides 15% (6%) and growth regulators 6% (6%) (Tables 9 & 10).

The herbicide most extensively used was glyphosate, applied exclusively for weed control during ground preparation. However, the formulation dicamba/MCPA/mecoprop-P and the single active ingredient mecoprop-p were also commonly used. Approximately 65% of herbicides were applied for general weed control with 24% ground preparation and 11% to control chickweed.

The systemic protectant and curative triazole fungicide epoxiconazole, applied as a single active ingredient, was the most extensively used fungicide accounting for 48% of the fungicide-treated area and 10% of the weight applied.

Chlorpyrifos was applied to control cutworms (*Agrotis spp.*) with deltamethrin, esfenvalerate and lambdacyhalothrin applied for 'general insect control'.

Chlormequat and trinexapac-ethyl were applied as single active ingredients for growth regulation.

Approximately 58% of the arable silage area was sown with treated seed (Table 8). The formulation fludioxonil/metalaxyl-M was the most extensively-used seed treatment representing 73% of the area sown with treated seed and 55% of the weight of seed treatment active ingredients applied (Table 9 & 10).

Arable silage (undersown) (Table 20)

Herbicides accounted for 69% of the pesticide-treated area of undersown arable silage (92% of the weight of pesticide applied), seed treatments 20% (<1%), fungicides 6% (6%), insecticides 4% (<1%) and growth regulators 2% (2%) (Tables 9 & 10). The single active ingredient glyphosate, used primarily for weed control during ground preparation, accounted for 34% of the herbicide-treated area and 59% of the weight of herbicide active ingredients applied. Approximately 66% of herbicides were applied for 'general weed control'.

The single active ingredient chlorothalonil, along with the formulation propiconazole/tebuconazole were the only fungicides used.

Esfenvalerate and chlormequat were the only insecticides and growth regulators applied, respectively.

Cereals (undersown) (Table 21)

Fungicides, herbicides and seed treatments were applied to this crop type (Table 9 & 10). Fungicides were applied to 21% of undersown cereals for 'general disease control' in the cereal component of the crop. Three active ingredients were recorded, used either individually or in formulation.

Herbicides were applied to 66% of undersown cereal crops. 'General weed control' was the primary reason provided for herbicide applications and the single active ingredient metsulfuron-methyl was most frequently used, accounting for 36% of the herbicide-treated area.

Approximately 21% of undersown cereals were sown with fludioxonil-treated seed (Tables 8, 9 & 10).

Grass reseeds (Table 22)

Herbicides were generally applied as one spray application to 23% of grass reseeds (Table 8). Glyphosate, used during 'pre-sowing ground preparation', accounted for 76% of herbicide usage.

The seed treatment fludioxonil was applied to 2% of grass reseeds, representing 7% of the pesticidetreated area and less than 1% of the weight of pesticides applied (Tables 8, 9 & 10).

PESTICIDE USAGE ON FODDER CROPS

A total of 3,092 hectares of fodder crops were grown in Northern Ireland in 2005. This represented less than 1% of the total area of grassland and fodder crops grown. County Antrim accounted for 52% of the total fodder crops grown, which was entirely due to the production of fodder maize. Counties Londonderry, Down and Armagh accounted for 23%, 22% and 3%, respectively (Table 3). No fodder crops were grown in Counties Fermanagh and Tyrone. Pesticide usage on fodder crops represented approximately 5% of the pesticide-treated area and 7% of the total weight of pesticides used (Table 9 & 10).

Fodder beet (Table 23)

Fodder beet had not been recorded as grown during 2003. However, 85 hectares were grown in 2005, exclusively in County Down. This received two spray applications of the single active ingredient metamitron for general weed control.

Fodder kale

The growing of fodder kale was confined to 17 hectares in County Down, representing less than 1% of the total area of fodder crops sown in Northern Ireland in 2005. This compared with 335 hectares grown in 2003 and 45 hectares grown in 1997. No pesticide applications were recorded for fodder kale.

Fodder maize (Table 24)

Fodder maize had not been recorded in previous surveys conducted in 1989 and 1993, and only 10 hectares was recorded in 1997. However, in 2003, 1,463 hectares of fodder maize were recorded, with 92% occurring in County Tyrone. In 2005 2,423 hectares were recorded, with 66% being grown in County Antrim, 30% in County Londonderry and 4% in County Armagh (Table 3). Pesticide usage on fodder maize represented 96% and 90% of the pesticide-treated area and weight of pesticides applied to fodder crops, respectively. In 2005, approximately 80% of fodder maize was sown using seed treated with the single active ingredient methiocarb along with the formulation fludioxonil/metalaxyl-M (Tables 8, 9 &10). The herbicide atrazine was applied to 2,028 spray hectares of fodder maize and pendimethalin 1,138 spray hectares.

Fodder rape

In 2005, an approximate total of 192 hectares of fodder rape was grown entirely in County Down representing 6% of the area of fodder crops grown (Table 3). Fodder rape was previously been recorded in 1997 and 2003. No pesticide sprays were applied and 31% of fodder rape was sown with seed treated with thiram (Tables 8, 9 &10).

Fodder turnip

No pesticides or seed treatments were applied to the 375 hectares of fodder turnips grown exclusively in Co Down during 2005.

COMPARISON WITH PREVIOUS SURVEYS

Comparison of the areas of grassland and fodder crops surveyed (Table 25)

Overall, the area of grassland and fodder crops grown decreased by 3% and 6% when compared to that previously recorded in 1997 and 2003. Areas of established grassland crops showed a small reduction of 4% to those recorded in these years. The areas of sown crops have decreased by 46% and the area of fodder crops grown in Northern Ireland in 2005 increased by 28% when compared with 2003. This represents an approximate six fold increase when compared with 1997.

Established grassland crops (Figure 3)

The decline in the area of rough grazing ground recorded between 1989 and 2003 continued with a further 8% reduction observed in 2005. However, the area of hay grown in 2005 increased by 40% when compared to that grown in 2003 but was only approximately 50% of that grown in 1997 and 1993. The area of grassland used for enclosed grazing and grass silage had remained relatively constant between 1989 and 1993, but increased by 28% in 1997. During 2003 this showed a further increase of 4%. However, in 2005 these crops returned to levels similar to those recorded in 1997. In keeping with 1997 and 2003, the areas and pesticide treatments on individual grass silage cuttings were recorded separately.





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Sown crops (Figure 4)

In Northern Ireland the area of sown crops grown had increased from 19,830 hectares in 1997 to 46,600 hectares during 2003, with all sown crops, except for undersown cereals, showing increased production. However, 2005 data show a reversal of this with all sown crops showing a 46% decrease to 25,197

hectares being recorded. The arable silage area, which had increased by more than eleven-fold between 1997 and 2003, reduced by three-fold when compared with 2003. No arable silage production was recorded in 1993. Undersown arable silage production, which had increased by 97% between 1997 and 2003, reduced over two-fold whenever compared with 2003. Grass reseeds decreased by 33% to 18,350 hectares when compared with 2003 and were 48% below the 35,434 hectares first recorded in 1989.





Fodder crops (Figure 5)

Approximately 3,092 hectares of fodder crops were grown in 2005. This was a 28% increase compared to that recorded in 2003. This increase was mainly due to a significant increase in fodder maize production, from 10 hectares in 1997, 1,463 hectares in 2003 to 2,423 hectares in 2005. The area of fodder kale grown, which had increased by more than seven-fold when between 1997 and 2003, decreased to the lowest recorded area of 17 hectares, exclusively grown in County Down. During 2005, the area of fodder rape grown increased by 22% when compared with 2003. However, the area of fodder turnips grown decreased by 19% over the same period. Undersown kale was not recorded as grown in the 2003 survey.



Figure 5 The area of fodder crops grown in Northern Ireland, 1989 - 2005.

Survey years

Comparison of pesticide usage (Table 26 & Figures 6, 7, 8, 9, 10 & 11)

The area of grassland and fodder crops receiving pesticide treatment decreased by 28% when compared to 2003. However this represented increases of 7%, 41% and 17% when compared to previous surveys conducted in 1997, 1993 and 1989, respectively. In contrast, the weight of pesticides applied in 2005 decreased by 16% (compared to 2003), 49% (1997), 36% (1993) and 30% (1989). This was due to the significant reduction of pesticides applied to sown crops, although applications to established grassland crops also reduced. However, the weight of pesticide applied per spray hectare increased by 16% when compared with 2003.

During 2005, the pesticide-treated area and weight of pesticides applied to established grassland crops reduced by 18% and 10%, respectively, when compared with 2003. This was due to reductions in applications to both enclosed grazing and grass silage. However, these reductions were partially offset by increases in applications to areas of hay and rough grazing.

Pesticide usage on sown grassland crops had increased significantly in 2003 when compared with previous surveys conducted in 1993 and 1997 but had decreased when compared with 1989, although the areas grown during 2003 are similar to the earlier survey. During 2005, pesticide applications returned to levels similar to 1997. This trend was repeated with the weight of pesticides applied and a 54% decrease was observed when comparing 2003 to 2005. The pesticide-treated area of arable silage decreased by 72% when compared with 2003 while the weight of pesticide applied decreased by 74% during the same period. This also reflected the reduction in area grown.

The pesticide-treated area of fodder crops had increased significantly from 1,370 spray hectares in 1997 to 7,496 spray hectares in 2003 due to the significant increase in the production of fodder maize. However, in



Figure 6 The area treated (spray hectares) of established grassland crops in Northern Ireland, 1989 - 2005.

Survey years





Survey years

2005 the pesticide-treated area decreased by 17% to 6,222 spray hectares when compared to 2003. This reduction can partially be attributed to a decrease in seed treatments being applied to fodder maize. The weight of pesticide applied increased from 3.4 tonnes to 6.4 tonnes. This was due to a 66% increase in the area of fodder maize grown along with a 74% increase in atrazine application rates.



Figure 8 The area treated (spray hectares) of fodder crops in Northern Ireland, 1989 - 2005.

Survey years

Figure 9 The weight of pesticides applied (tonnes) to established grassland crops in Northern Ireland, 1989 - 2005.



Survey years

A comparison of usage of different pesticide types on grassland and fodder crops between 1989 and 2005, with relative differences, are shown in Tables 27 and 28. Fungicide usage, which had increased in the four-year period 1997 to 2003 decreased by 78% during 2005. This was due to the overall decrease of the area of sown crops grown along with reduced applications. Propiconazole was the only fungicide active ingredient recorded in 1989, and triadimenol/tridemorph were the fungicides recorded in use in 1993. In 1997 the fungicides propiconazole/tridemorph and tebuconazole, used on undersown cereals, and mancozeb, applied to undersown fodder kale, were recorded. In 2003, ten fungicides were specified as applied to undersown and non-undersown arable silage and undersown cereals. Of these, tebuconazole was the most extensively used. During 2005, seven fungicides were applied to these arable crops with epoxiconazole the most extensively used.

Herbicides remained the most extensively used pesticide type on grassland and fodder crops. Applications of this pesticide type had increased when 2003 data was compared with 1989, 1993 and 1997, along with the weight applied decreasing over these periods. However, between 2003 and 2005 a 21% reduction in herbicide-treated area was recorded along with a further 14% reduction of weight of herbicides applied. In 2005, triclopyr, MCPA and fluoxypyr were the most frequently used herbicide active ingredients. The main reason given for herbicide applications was dock (*Rumex* spp.) control.





In 1989, chlorfenvinphos was used on fodder turnips to control cabbage root fly (*Delia radicum*) and a small area of grass undersown with cereals was treated with deltamethrin. No insecticide was recorded in use on any crop type in 1993. Insecticide usage in 1997 was minimal and restricted to 8 hectares of fodder turnips receiving treatments of γ -HCH for flea beetle (*Phyllotreta* spp.) control. During 2003 insecticide application increased significantly. Cypermethrin was applied to both arable silage and undersown cereals

to control aphids and chlorpyrifos was applied to fodder kale and grass reseeds to control caterpillars and leatherjackets (*Tipula spp.*), respectively. In 2005, insecticide applications again increased significantly. Chlorpypifos was applied to enclosed grazing to control leatherjackets (*Tipula spp.*) and cutworm (*Agrotis spp.*). Although the area of arable silage grown reduced, the insecticide-treated area increased with 'general insect control' being the main reason for use.

Prior to 1997, growth regulators had not been recorded in use on grassland and fodder crops. However, in 1997, 2-chloroethylphosphonic acid was applied to 4% of undersown cereal crops for straw/stem length regulation. Applications of growth regulators increased significantly in 2003, with chlormequat the only growth regulator recorded as used. This was applied to 1,615 spray hectares of arable silage and 255 spray hectares of undersown arable silage. In 2005, growth regulator applications reduced almost fourfold when compared with 2003. Chlormequat was applied to 83 hectares of undersown arable silage. However, both trinexapac-ethyl and chlormequat applications were recorded on a total of 403 hectares of non-undersown arable silage.





Survey years

In 2003 the area of crops sown with treated seed increased by 75% when compared with 1997. However, during 2005 a 69% reduction was observed when compared with the previous survey and was 85% less than first recorded in 1989. The weight of seed treatment applied in 2005 showed a 34%, 62% and 81% decrease when compared to 2003, 1997 and 1989, respectively. In contrast, this has more than doubled when compared to seed treatments in 1993.

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Table 1 Number of farms in each size class with grassland and fodder crops in the Northern Ireland June 2005 census and the number of samples from each class.

	< 10		10 < 20		20 <30		30 -	< 50	50 <	< 100	10	00+	Te	otal
County	Holdings in strata	Holdings sampled												
Antrim	798	3	843	4	664	3	929	12	974	20	432	21	4,640	63
Armagh	1,070	2	1,071	5	614	3	592	9	345	2	70	6	3,762	27
Down	1,285	3	1,182	7	751	4	854	8	692	19	210	8	4,974	49
Fermanagh	430	3	751	3	573	5	694	7	539	11	183	7	3,170	36
Londonderry	654	3	737	3	497	5	651	7	645	13	297	15	3,481	46
Tyrone	1,108	3	1,492	9	1,109	11	1,313	15	1,090	20	351	15	6,463	73
Northern	E 245	17	6.076	21	4 200	21	5 0 2 2	50	4 295	05	1 5 4 2	70	26 400	204
Ireland	5.345	1/	0.0/0	31	4.208	31	5.033	20	4.200	00	1.545	12	20.490	294

Size group (hectares)

Table 2The total number and area (hectares) of crops sampled, and the proportion (%) of the total area of grassland and fodder crops surveyed in
Northern Ireland, 2005.

CROP	Number of crops surveyed	Survey area (ha)	Proportion of crops surveyed (%)
Established grassland crops			
Enclosed grazing	281	10,455	2.0
Grass silage 1st cut	269	5,039	1.9
Grass silage 2nd cut	178	2,939	2.2
Grass silage 3rd cut	25	404	2.9
Grass silage 4th cut	1	49	3.8
Hay	76	245	1.5
Rough grazing	151	4,645	3.1
Sown crops			
Arable silage	10	77	2.9
Arable silage (undersown)	15	73	2.7
Cereals (undersown)	10	44	2.9
Grass reseed	86	356	1.9
Fodder crops	18	60	1.9
All crops	1,120	24,385	2.2

Table 3Estimated area (hectares) of grassland and fodder crops grown regionally in Northern Ireland 2005.

CROP	Antrim	Armagh	Down	Fermanagh	Londonderry	Tyrone	Northern Ireland
Established grassland crops							
Enclosed grazing	108.924	43,493	90.584	65,898	81.299	126.848	517.045
Grass silage 1st cutting	48,852	34,669	43,409	39,912	34,983	57,388	259,213
Grass silage 2nd cutting	27,276	22,329	24,168	17,022	19,638	24,992	135,426
Grass silage 3rd cutting	2,051	1,544	7,644	1,400	864	288	13,791
Grass silage 4th cutting	•	•	1,275	•			1,275
Hay	4,606	1,838	3,242	3,283	2,220	1,554	16,744
Rough grazing	43,752	2,514	10,704	20,665	29,192	41,758	148,586
Sown crods							
Arable silage	994	156	1,095		422		2,667
Arable silage (undersown)	658				1,519	506	2,683
Cereals (undersown)	759	123	52		564		1,497
Grass reseed	3,730	3,219	3,299	2,086	1,914	4,102	18,350
Fodder crops							
Fodder beet			85				85
Fodder kale			17				17
Fodder maize	1,602	101			719		2,423
Fodder rape	•		192				192
Fodder turnip			375				375
All crops	243,204	109,986	186,141	150,267	173,333	257,437	1,120,368

Table 4Estimated area (spray hectares) of grassland and fodder crops treated regionally with each pesticide type in Northern Ireland 2005.

Pesticide type	Antrim	Armagh	Down	Fermanagh	Londonderry	Tyrone	Northern Ireland
Fungicides	1,119		319		339		1,776
Herbicides	34,696	15,828	13,806	9,148	20,523	24,497	118,499
Insecticides	437		212		1,396	453	2,498
Growth regulators	486						486
Seed treatments	3,008	123	642		1,755		5,527
Total	39,746	15,951	14,979	9,148	24,013	24,950	128,786

County

Table 5Estimated quantity (kilograms) of pesticides applied to grassland and fodder crops regionally in Northern Ireland 2005.

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							Northern
Pesticide type	Antrim	Armagh	Down	Fermanagh	Londonderry	Tyrone	Ireland
Fungicides	371		46		85		502
Herbicides	23,946	13,760	6,825	7,361	10,952	21,377	84,221
Insecticides	158		1		442	66	667
Growth regulators	159						159
Seed treatments	226	1	6		71		304
Total	24,860	13,761	6,879	7,361	11,550	21,443	85,854

Table 6The total area (spray hectares) and the basic area (hectares), (in parentheses), of grassland and fodder crops treated, in Northern Ireland 2005, with
each pesticide type.

Pesticide type

		Growth												
	Fungicides		Herbicides		Insec	ticides	Regul	ators	Seed trea	atments	All pesti	cides		
CROP	sp ha	(ha)	sp ha	(ha)	sp ha	(ha)	Sp ha	(ha)	sp ha	(ha)	sp ha	(ha)		
Established grassland crops														
Enclosed grazing			46,237	(36,883)	1,166	(1,166)					47,403	(37,184)		
Grass silage 1st cutting			36,408	(31,105)	134	(134)					36,543	(31,240)		
Grass silage 2nd cutting			14,059	(13,248)							14,059	(13,248)		
Grass silage 3rd cutting			539	(539)							539	(539)		
Grass silage 4th cutting														
Нау			260	(260)							260	(260)		
Rough grazing			4,637	(4,622)	•		•			•	4,637	(4,622)		
Sown crops														
Arable silage	1,055	(509)	2,775	(2,089)	1,037	(931)	403	(403)	1,544	(1,544)	6,814	(2,511)		
Arable silage (undersown)	241	(241)	2,949	(2,181)	161	(161)	83	(83)	867	(867)	4,301	(2,181)		
Cereals (undersown)	480	(480)	1,530	(1,133)					312	(312)	2,323	(1,133)		
Grass reseed			5,303	(4,258)					383	(383)	5,685	(4,641)		
Fodder crops														
Fodder beet			85	(85)							170	(85)		
Fodder kale														
Fodder maize			2,028	(2,028)					2,362	(1,927)	5,993	(2,028)		
Fodder rape									59	(59)	59	(59)		
Fodder turnip										•		•		
All grons	1 776	(1 231)	118 /00	(08 /31)	2 109	(2 302)	186	(186)	5 527	(5.001)	128 786	(00.730)		
Anciops	1,770	(1,401)	110,477	()0,431)	2,770	(2,5)2)	400	(100)	3,341	(3,071)	120,700	(),130)		

Table 7Total weight (kilograms) of each pesticide type applied to grassland and fodder crops in Northern Ireland 2005.

CROP	Fungicides	Herbicides	Insecticides	Growth regulators	Seed treatments	Total
	0			8		
Established grassland crops						
Enclosed grazing		31,312	519			31,832
Grass silage 1st cutting		23,729				23,729
Grass silage 2nd cutting		8,688				8,688
Grass silage 3rd cutting		324				324
Grass silage 4th cutting						
Нау		340				340
Rough grazing		4,700				4,700
Sown crops						
Arable silage	271	1,984	148	121	20	2,544
Arable silage (undersown)	110	1,708	1	38	7	1,865
Cereals (undersown)	120	1,168			3	1,291
Grass reseed		4,192			2	4,194
Fodder crops						
Fodder beet		612				612
Fodder kale						
Fodder maize		5,464			271	5,735
Fodder rape					1	1
Fodder turnip						
All crops	502	84.221	667	159	304	85.854

CROP	Fungicides		Herb	Herbicides		Insecticides		owth lators	Seed treatments	All pesticides	
	%	sp apps	%	sp apps	%	sp apps	%	sp apps	%	%	sp apps
Established grassland crops											
Enclosed grazing			7.1	(1.0)	0.2	(1.0)				7.2	(1.0)
Grass silage 1st cutting			12.0	(1.1)	>0.1	(1.0)				12.1	(1.1)
Grass silage 2nd cutting			9.8	(1.0)						9.8	(1.0)
Grass silage 3rd cutting			3.9	(1.0)						3.9	(1.0)
Grass silage 4th cutting											•
Hay			1.6	(1.0)						1.6	(1.0)
Rough grazing			3.1	(1.0)						3.1	(1.0)
Sown crops											
Arable silage	19.1	(2.0)	78.3	(1.4)	34.9	(1.2)	15.1	(1.0)	57.9	94.2	(1.4)
Arable silage (undersown)	9.0	(1.0)	81.3	(1.4)	6.0	(1.0)	3.1	(1.0)	32.3	81.3	(1.3)
Cereals (undersown)	32.1	(1.0)	75.6	(1.2)		•		•	20.9	75.6	(1.1)
Grass reseed		•	23.2	(1.0)					2.1	25.3	(1.0)
Fodder crops											
Fodder beet			100.0	(2.0)						100.0	(2.0)
Fodder kale											
Fodder maize			83.7	(1.7)					79.5	83.7	(1.7)
Fodder rape									30.8	30.8	
Fodder turnip											
All crops	0.1	(1.3)	8.8	(1.1)	0.2	(1.1)	>0.1	(1.0)	0.5	8.9	. (1.1)

 Table 8
 The proportional area (%) of each crop treated with pesticides and the number of spray applications (in parentheses) in Northern Ireland, 2005.

Table 9

Estimated area (spray hectares) of grassland and fodder crops treated with pesticide formulations in Northern Ireland in 2005.

	Enclosed	Silara	Silara	Silara		Dough	Anabla	Arable	Canada	Crease	Foddon	Foddor	Foddon	A 11
Pesticide type & formulation	grazing	Shage 1st cut	Shage 2nd cut	Shage 3rd cut	Hay	grazing	silage	snage (undersown)	(undersown)	Grass	maize	beet	rape	crops
Fungicides														
Azoxystrobin							106							106
Chlorothalonil							166	83						250
Cyproconazole/propiconazole							106							106
Epoxiconazole							509							509
Fluquinconazole/prochloraz							166							166
Propiconazole									339					339
Propiconazole/tebuconazole								108	142					250
Unknown fungicide								50						50
e														
All fungicides							1,055	241	480					1,776
Herbicides														
Amidosulfuron	211	211												423
Asulam	169	1,008				407								1,584
Atrazine											2,028			2,028
Benazolin/2,4-DB/MCPA	286								308					594
Clopyralid/fluroxypyr/triclopyr	563					622								1,185
Clopyralid/triclopyr	349	288				24								662
2,4-D	202													202
2,4-D/dicamba/triclopyr	204		407											611
2,4-D/MCPA	60													60
2,4-DB/linuron/MCPA									123					123
Dicamba/MCPA/mecoprop-P	2,817	1,093	1,959				591	56	64					6,580
Dicamba/mecoprop-P	1.394	4,404	2.750											8.548
Diquat	,	1.352	,							84				1.436
Fluroxypyr		,					106							106
Fluroxypyr/triclopyr	11,988	16,287	6,818		•					144				35,237

Pesticide type & formulation	Enclosed grazing	Silage 1st cut	Silage 2nd cut	Silage 3rd cut	Hay	Rough grazing	Arable silage	Arable silage (undersown)	Cereals (undersown)	Grass reseed	Fodder maize	Fodder beet	Fodder rape	All crops
Herbicides (contd.)														
Glyphosate	1,204				•		661	996	339	4,030	465			7,694
Isoproturon					•		283							283
MCPA	20,724	4,648	95		260	3,522		381						29,630
MCPB								108	142					250
Mecoprop	672	1,163	539	539				83		192				3,189
Mecoprop-P	336	5,313	1,141				544							7,335
Metamitron												170		170
Metsulfuron-methyl	1,494	588	349				483	711	556	382				4,561
Pendimethalin							106				1,138			1,244
Triclopyr		54												54
Unknown herbicide	3,564				•	61	•	614		471	•			4,711
All herbicides	46,237	36,408	14,059	539	260	4,637	2,775	2,949	1,530	5,303	3,630	170		118,499
Insecticides														
Chlorpyrifos	1,031						236							1,268
Deltamethrin	•						212							212
Esfenvalerate							422	161						582
Lambda-cyhalothrin							166							166
Unknown insecticide	134	134												269
All insecticides	1,166	134					1,037	161						2,498
Growth regulators														
Chlormequat		•		•		•	166	83				•	•	250
Trinexapac-ethyl							236							236
All growth regulators							403	83						486

Table 9 (contd.) Estimated area (spray hectares) of grassland and fodder crops treated with pesticide formulations in Northern Ireland in 2005.

 Table 9 (contd.)
 Estimated area (spray hectares) of grassland and fodder crops treated with pesticide formulations in Northern Ireland in 2005.

Pesticide type & formulation	Enclosed grazing	Silage 1st cut	Silage 2nd cut	Silage 3rd cut	Hay	Rough grazing	Arable silage	Arable silage (undersown)	Cereals (undersown)	Grass reseed	Fodder maize	Fodder beet	Fodder rape	All crops
Seed treatments														
Fludioxonil							1,122	867	312	383				2,684
Fludioxonil/metalaxyl-m											869			869
Imazalil/triticonazole							422							422
Thiram													59	59
Methiocarb	•	•		•			•				1,494			1,494
All seed treatments							1,544	867	312	383	2,362		59	5,527
All pesticides	47,403	36,543	14,059	539	260	4,637	6,814	4,301	2,323	5,685	5,993	170	59	128,786

Table 10Estimated weight (kilograms) of pesticides applied to grassland and fodder crops in Northern Ireland in 2005.

	Enclosed	Silage	Silage	Silage		Rough	Arable	Arable silage	Cereals	Grass	Fodder	Fodder	Fodder	All
Pesticide type & formulation	grazing	1st cut	2nd cut	3rd cut	Hay	grazing	silage	(undersown)	(undersown)	reseed	maize	beet	rape	crops
Fungicides														
Azoxystrobin							16							16
Chlorothalonil							166	83						250
Cyproconazole/propiconazole							17							17
Epoxiconazole							26							26
Fluquinconazole/prochloraz							46							46
Propiconazole									85					85
Propiconazole/tebuconazole								27	35					62
•														
All fungicides							271	110	120					502
Herbicides	10	10												10
Amidosulfuron	10	10	•	•	•		•	•	•	•		•	•	19
Asulam	213	1,270		•	•	513				•		•		1,996
Atrazine		•	•	•	•	•	•			•	3,346	•	•	3,346
Benazolin/2,4-DB/MCPA	352		•	•		•	•	•	378				•	730
Clopyralid/fluroxypyr/triclopyr	360					420				•	•			780
Clopyralid/triclopyr	305	251		•		4							•	560
2,4-D	249			•									•	249
2,4-D/dicamba/triclopyr	275		550											825
2,4-D/MCPA	142													142
2,4-DB/linuron/MCPA									90					90
Dicamba/MCPA/mecoprop-P	3,311	750	2,491				738	52	60					7,402
Dicamba/mecoprop-P	1,132	3,126	1,577											5,835
Diquat		608								38				646
Fluroxypyr							11							11
Fluroxypyr/triclopyr	4,864	5,652	2,334							65				12,915
Glyphosate	780						545	1,004	321	3,972	431			7,053

Table 10 (contd.)	Estimated weight (ki	lograms) of pesticides	applied to grassland a	and fodder crops in Norther	n Ireland in 2005.
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Pesticide type & formulation	Enclosed grazing	Silage 1st cut	Silage 2nd cut	Silage 3rd cut	Hay	Rough grazing	Arable silage	Arable silage (undersown)	Cereals (undersown)	Grass reseed	Fodder maize	Fodder beet	Fodder rape	All crops
Herbicides (contd.)														
Isoproturon							220							220
MCPA	18,087	5,030	124		340	3,763		408						27,752
MCPB								216	317					533
Mecoprop	849	698	324	324				25		115				2,334
Mecoprop-P	379	6,300	1,288				364							8,330
Metamitron		•	•									612		612
Metsulfuron-methyl	5	1	1				2	3	2	2				15
Pendimethalin							105				1,687			1,792
Triclopyr	•	35	•				•			•	•		•	35
All herbicides	31,312	23,729	8,688	324	340	4,700	1,984	1,708	1,168	4,192	5,464	612		84,221
Insecticides														
Chlorpyrifos	519						128							647
Deltamethrin	517	•	·	•	•		120					•		1
	•	•			•	•	1	1	•	·	•	•	•	1
		•	•	•	•		17	1		•		•	•	3
Lambda-cynaiothrin		•			·		1 /			•			•	1/
All insecticides	519		•	•			148	1						667
Growth regulators														
Chlormequat							77	38						115
Trinexapac-ethyl							44							44
All growth regulators							121	38						159

Table 10 (contd.) Estimated weight (kilograms) of pesticides applied to grassland and fodder crops in Northern Ireland in 2005.

Pesticide type & formulation	Enclosed grazing	Silage 1st cut	Silage 2nd cut	Silage 3rd cut	Hay	Rough grazing	Arable silage	Arable silage (undersown)	Cereals (undersown)	Grass reseed	Fodder maize	Fodder beet	Fodder rape	All crops
Seed treatments														
Fludioxonil							11	7	3	2				24
Fludioxonil/metalaxyl-m											1			1
Imazalil/triticonazole							9							9
Thiram													1	1
Methiocarb											270	•		270
All seed treatments						•	20	7	3	2	271	•	1	304
All pesticides	31,832	23,729	8,688	324	340	4,700	2,544	1,865	1,291	4,194	5,735	612	1	85,854

Table 11	The thirty active ingredients used most extensively on grassland and fodder
	crops in Northern Ireland in 2005, ranked by area treated (spray hectares).

	Active ingredient	Treated area (sp ha)
1	Triclopyr	37,750
2	MCPA	36,987
3	Fluroxypyr	36,529
4	Mecoprop-P	22,462
5	Dicamba	15,739
6	Glyphosate	7,694
7	Metsulfuron-methyl	4,561
8	Месоргор	3,189
9	Atrazine	2,028
10	Clopyralid	1,847
11	Asulam	1,584
12	Diquat	1,436
13	Chlorpyrifos	1,268
14	Pendimethalin	1,244
15	2,4-D	873
16	2,4-DB	717
17	Propiconazole	695
18	Benazolin	594
19	Esfenvalerate	582
20	Epoxiconazole	509
21	Amidosulfuron	423
22	Isoproturon	283
23	Chlorothalonil	250
24	MCPB	250
25	Chlormequat	250
26	Tebuconazole	250
27	Trinexapac-ethyl	236
28	Deltamethrin	212
29	Metamitron	170
30	Fluquinconazole	166

Table 12	The thirty active ingredients used most extensively on grassland and fodder
	crops in Northern Ireland in 2005, ranked by weight applied (kilograms).

	Active ingredient	Weight (kg)
1	МСРА	30,526
2	Mecoprop-P	16,457
3	Triclopyr	7,447
4	Glyphosate	7,053
5	Fluroxypyr	6,728
6	Atrazine	3,346
7	Dicamba	2,721
8	Mecoprop	2,334
9	Asulam	1,996
10	Pendimethalin	1,792
11	2,4-D	783
12	Chlorpyrifos	647
13	Diquat	646
14	2,4-DB	634
15	Metamitron	612
16	MCPB	533
17	Clopyralid	285
18	Chlorothalonil	250
19	Isoproturon	220
20	Propiconazole	127
21	Chlormequat	115
22	Benazolin	64
23	Trinexapac-ethyl	44
24	Prochloraz	35
25	Tebuconazole	31
26	Epoxiconazole	26
27	Amidosulfuron	19
28	Lambda-cyhalothrin	17
29	Azoxystrobin	16
30	Metsulfuron-methyl	15

Table 13 Enclosed grazing: pesticide-treated area (spray-hectares), weight of pesticide applied (kilograms) and reason for use.

																Basic	
	General					Thistles		Docks	Rushes				Docks			area	
	weed	Rag	Leather-		Chick-	&		&	&		Butter-		&	Cut-	All	(ha) of	Weight
Pesticide type & formulation	control	-wort	jackets	Docks	weed	nettles	Rushes	thistles	thistles	Thistles	cup	Nettles	nettles	worm	reasons	treatment	(kg)
Herbicides																	
Amidosulfuron				211											211	211	10
Asulam							169								169	169	213
Benazolin/2,4-DB/MCPA				286											286	286	352
Clopyralid/fluroxypyr/triclopyr				120								443			563	563	360
Clopyralid/triclopyr				18				123		208					349	349	305
2,4-D		202													202	202	249
2,4-D/dicamba/triclopyr				204											204	204	275
2,4-D/MCPA		60													60	60	143
Dicamba/MCPA/mecoprop-P				2,817											2,817	2,817	3,311
Dicamba/mecoprop-P				1,394											1,394	1,394	1,132
Fluroxypyr/triclopyr	166			11,721									102		11,988	11,529	4,864
Glyphosate							1,204								1,204	1,204	780
МСРА	1,682	1,568		224		4,770	7,958		1,703	568	2,253				20,724	20,614	18,087
Mecoprop		•			672						•				672	672	849
Mecoprop-P				336											336	336	379
Metsulfuron-methyl				1,494											1,494	1,494	5
Unknown herbicide							2,829			735					3,564	3,564	
411.1 . 1 1	1.0.40	1.020		10.025	(70)	4 550	12160	100	1 500	1 7 1 1	0.050	112	102		46.005	45 ((0)	21.212
All herbicides	1,848	1,830	•	18,825	6/2	4,770	12,160	123	1,703	1,511	2,253	443	102	•	46,237	45,669	31,312
Insecticides			21 0											014	1 1	1 0 2 1	510
Chlorpyritos	•	•	218	•	•	•	•	•	•	•	•	•	•	814	1,031	1,031	519
Unknown insecticide		·	134		•	•	·		•	•	•	·	•	•	134	134	
All insecticides			352											814	1,166	1,166	519

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Pesticide type & formulation	General weed control	Leather- jackets	Docks	Chickweed	Rushes	Docks & thistles	Thistles	Buttercup	Rushes & docks	Docks & chickweed	Docks & nettles	All reasons	Basic area (ha) of treatment	Weight (kg)
Herbicides														
Amidosulfuron			211									211	211	10
Asulam			1,008									1,008	1,008	1,270
Clopyralid/triclopyr						11	278					288	288	251
Dicamba/MCPA/mecoprop-P			235						858			1,093	1,093	750
Dicamba/mecoprop-P	2,162		2,242									4,404	3,323	3,126
Diquat	1,352		•									1,352	1,352	608
Fluroxypyr/triclopyr	•		15,663							623		16,287	15,755	5,652
МСРА			1,448	955	695		263	1,287				4,648	4,648	5,030
Mecoprop			539							623		1,163	1,163	698
Mecoprop-P			5,313									5,313	5,313	6,300
Metsulfuron-methyl			588									588	588	1
Triclopyr			•		•				•	•	54	54	54	35
All herbicides	3,514		27,247	955	695	11	541	1,287	858	1,247	54	36,408	34,796	23,729
<i>Insecticides</i> Unknown insecticide		134										134	134	
All insecticides		134										134	134	

Table 15 Grass silage 2nd cutting: pesticide-treated area (spray-hectares), weight of pesticide applied (kilograms) and reason for use.

	General weed			All	Basic area (ha)	Weight
Pesticide type & formulation	control	Docks	Rushes	reasons	of treatment	(kg)
Herbicides						
2,4-D/dicamba/triclopyr		407		407	407	550
Dicamba/MCPA/mecoprop-P		1,878	81	1,959	1,959	2,491
Dicamba/mecoprop-P	811	1,939		2,750	2,345	1,577
Fluroxypyr/triclopyr		6,818		6,818	6,818	2,334
MCPA			95	95	95	124
Mecoprop		539		539	539	324
Mecoprop-P		1,141		1,141	1,141	1,288
Metsulfuron-methyl		349		349	349	1
All herbicides	811	13,072	176	14,059	13,654	8,688

 Table 16
 Grass silage 3rd cutting: pesticide-treated area (spray-hectares), weight of pesticide applied (kilograms) and reason for use.

Pesticide type & formulation	Docks	All reasons	Basic area (ha) of treatment	Weight (kg)
Herbicides Mecoprop	539	539	539	324
All herbicides	539	539	539	324

Table 17 Hay: pesticide-treated area (spray-hectares), weight of pesticide applied (kilograms) and reason for use.

Pesticide type & formulation	Rushes	All reasons	Basic area (ha) of treatment	Weight (kg)
<i>Herbicides</i> MCPA	260	260	260	340
All herbicides	260	260	260	340

 Table 18
 Rough grazing: pesticide-treated area (spray-hectares), weight of pesticide applied (kilograms) and reason for use.

Pesticide type & formulation	Rushes	Briars	Thistles	Rushes & docks	All reasons	Basic area (ha) of treatment	Weight (kgs)
Herbicides							
Asulam				407	407	407	513
Clopyralid/fluroxypyr/triclopyr			622		622	622	420
Clopyralid/triclopyr		24			24	24	4
MCPA	3,522				3,522	3,506	3,763
Unknown herbicide	62				62	62	
All herbicides	3,583	24	622	407	4,637	4,622	4,700

Table 19 Arable silage: pesticide-treated area (spray-hectares), weight of pesticide applied (kilograms) and reason for use.

Pesticide type & formulation	General weed control	General disease control	Ground preparation	Chickweed	Growth regulator	Cutworm	General insect control	All reasons	Basic area (ha) of treatment	Weight (kgs)
Fungicides										
Azoxystrobin		106						106	106	16
Chlorothalonil		167						167	167	167
Cyproconazole/propiconazole		106						106	106	17
Epoxiconazole		509						509	509	26
Fluquinconazole/prochloraz		167				•		167	167	46
All fungicides		1,055						1,055	1,055	271
Herhicides										
Dicamba/MCPA/mecopron-P	591							591	591	738
Fluroxypyr	106	•		•		•	•	106	106	11
Glyphosate	100	•	661	·		•	•	661	661	545
Isoproturon	283		001				•	283	283	220
Mecoprop-P	237			308				1 00 544	544	364
Metsulfuron-methyl	483							483	483	2
Pendimethalin	106							106	106	105
All herbicides	1,806		661	308				2,775	2,775	1,984
	, ,							, ,	,	, i i i i i i i i i i i i i i i i i i i
Insecticides						227		227	227	100
Chlorpyrifos		•		•		237		237	237	128
Deltamethrin		•		•		•	213	213	106	l
Esfenvalerate							422	422	422	2
Lambda-cyhalothrin							167	167	167	17
All insecticides						237	801	1,037	931	148

 Table 19 (contd.)
 Arable silage: pesticide-treated area (spray-hectares), weight of pesticide applied (kilograms) and reason for use.

Pesticide type & formulation	General weed control	General disease control	Ground preparation	Chickweed	Growth regulator	Cutworm	General insect control	All reasons	Basic area (ha) of treatment	Weight (kgs)
Growth regulators Chlormequat Trinexapac-ethyl					167 237			167 237	167 237	77 44
All growth regulators					403			403	403	121

Table 20	Arable silage (undersown): pesticide-treated area (spray-hectares), weight of pesticide applied (kilograms) and reason for use.
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Pesticide type & formulation	General weed control	General disease control	Ground preparation	Chickweed	Growth regulator	General insect control	All reasons	Basic area (ha) of treatment	Weight (kgs)
<i>Fungicides</i> Chlorothalonil Propiconazole/tebuconazole Unknown fungicide		83 108 50					83 108 50	83 108 50	83 27
All fungicides		241					241	241	110
Herbicides Dicamba/MCPA/mecoprop-P Glyphosate MCPA MCPB Mecoprop Metsulfuron-methyl Unknown herbicide	56 381 108 83 711 615		875	121	· · · ·		56 996 381 108 83 711 615	56 875 381 108 83 711 615	53 1,004 408 216 25 3
All herbicides	1,954		875	121			2,949	2829	1,708
Insecticides Esfenvalerate						161	161	161	1
All insecticides						161	161	161	1
<i>Growth Regulators</i> Chlormequat					83		83	83	38
All growth regulators					83		83	83	38

Table 21 Cereals (undersown): pesticide-treated area (spray-hectares), weight of pesticide applied (kilograms) and reason for use.

Pesticide type & formulation	General weed control	General disease control	Ground preparation	All reasons	Basic area (ha) of treatment	Weight (kgs)
Fungicides						
Propiconazole		339		339	339	85
Propiconazole/tebuconazole		142		142	142	35
All fungicides		480		480	480	120
Herbicides						
Benazolin/2,4-DB/MCPA	308			308	308	378
2,4-DB/linuron/MCPA	123			123	123	90
Dicamba/MCPA/mecoprop-P	64			64	64	60
Glyphosate			339	339	339	321
MCPB	142			142	142	317
Metsulfuron-methyl	556			556	556	3
All herbicides	1,192		339	1,530	1,530	1,168

Table 22 Grass reseed: pesticide-treated area (spray-hectares), weight of pesticide applied (kilograms) and reason for use.

Pesticide type & formulation	General weed control	Docks	Ground preparation	Chickweed	Rushes	All reasons	Basic area (ha) of treatment	Weight (kgs)
Herbicides								
Diquat					84	84	84	38
Fluroxypyr/triclopyr		144				144	144	65
Glyphosate			4,030			4,030	4,030	3,972
Mecoprop				192		192	192	115
Metsulfuron-methyl	382					382	382	2
Unknown herbicide	150			321		471	471	
All herbicides	531	144	4,030	514	84	5,303	5,303	4,192

Table 23Fodder beet: pesticide-treated area (spray-hectares), weight of pesticide applied (kilograms) and reason for use.

Pesticide type & formulation	General weed control	All reasons	Basic area (ha) of treatment	Weight (kgs)
Herbicides Metamitron	170	170	85	612
All herbicides	170	170	85	612

Table 24 Fodder maize: pesticide-treated area (spray-hectares), weight of pesticide applied (kilograms) and reason for use.

Pesticide type & formulation	General weed control	Ground preparation	Sealer	All reasons	Basic area (ha) of treatment	Weight (kgs)
Herbicides						
Atrazine	1,927		101	2,028	2,028	3,346
Glyphosate		465		465	465	432
Pendimethalin	1,138			1,138	1,138	1,687
All herbicides	3,064	465	101	3,630	3,630	5,464

Table 25Comparison of the area (hectares) of grassland and fodder crops grown in Northern Ireland, 1989-2005.

Survey year

	1989	1993	1997	2003	2005
Сгор	Area grown (ha)				
Established grassland crops					
Enclosed grazing	481,059	476,209	512,819	537,735	517,045
Grass silage	243,149	252,502	422,650	430,542	409,704
Нау	66,001	33,017	32,303	11,997	16,744
Rough grazing	212,930	173,239	165,005	162,330	148,586
All established grassland crops	1,003,139	934,967	1,132,777	1,142,603	1,092,079
Sown crops					
Arable silage	3,762		766	8,720	2,667
Arable silage (undersown)		2,073	3,308	6,512	2,683
Cereals (undersown)	6,213	5,907	4,284	4,086	1,497
Grass reseed	35,434	5,380	11,472	27,282	18,350
All sown crops	45,409	13,360	19,830	46,600	25,197

Table 25 (contd.) Comparison of the area (hectares) of grassland and fodder crops grown in Northern Ireland, 1989-2005.

Survey year

	1989	1993	1997	2003	2005	
Сгор	Area grown (ha)					
Fodder crops						
Fodder beet			70		85	
Fodder kale		72	45	335	17	
Fodder kale (undersown)			58			
Fodder maize			10	1,463	2,423	
Fodder rape			99	157	192	
Fodder turnip	371		250	464	375	
All fodder crops	371	72	532	2,419	3,092	
All crops	1.048.919	948,400	1,153,138	1,191,622	1,120,368	

Table 26 Comparison of pesticide usage on grassland & fodder crops in Northern Ireland 1989-2005, area treated (spray hectares) and weight applied (tonnes).

	Survey year									
	1989		199	1993 1997			2003		2005	
Сгор	Area (sp ha)	Weight (t)	Area (sp ha)	Weight (t)	Area (sp ha)	Weight (t)	Area (sp ha)	Weight (t)	Area (sp ha)	Weight (t)
<i>Established grassland crops</i> Enclosed grazing Grass silage Hay Rough grazing	25,252 26,921 2,673 2,736	43.11 42.17 2.82 3.48	35,051 41,091 490 1,866	55.38 64.57 0.57 3.75	48,536 50,209 843 1,710	80.41 74.49 1.34 2.75	65,821 57,309 238 2,591	34.96 40.38 0.23 1.99	47,403 51,141 260 4,637	31.83 32.74 0.34 4.70
All established grassland crops	57,582	91.58	78,498	124.27	101,298	158.99	125,959	77.56	103,441	69.61
<i>Sown crops</i> Arable silage Arable silage (undersown) Cereals (undersown) Grass reseed	8,138 11,190 32,344	3.66 11.62 15.33	3,632 5,212 4,090	0.38 6.70 3.51	2,299 2,830 4,804 7,377	1.59 0.15 4.73 2.91	24,175 9,186 4,421 6,912	9.68 2.40 1.60 8.01	6,814 4,301 2,323 5,685	2.54 1.86 1.29 4.19
All sown crops	51,672	30.61	12,934	10.59	17,310	9.39	44,694	21.69	19,123	9.89
<i>Fodder crops</i> Fodder beet Fodder kale Fodder kale (undersown) Fodder maize Fodder rape Fodder turnip	- - - 621	0.33	98	0.02	227 105 203 20 164 651	0.09 0.21 0.25 0.03 0.25 0.35	670 6,669 157	0.78 2.58 0.00	170 5,993 59	0.61 5.73 0.00
All fodder crops	621	0.33	98	0.02	1,370	1.18	7,496	3.36	6,222	6.35
All crops	109,875	122.47	91,529	134.87	119,978	169.55	178,149	102.61	128,786	86

 Table 27
 Comparison of pesticide usage on grassland and fodder crops in Northern Ireland 1989-2005, area treated (spray hectares), weight applied (kilograms) and the area grown (hectares).

	Survey year									
	19	989	19	1993 1997			2003		2005	
Pesticide type	Area (sp ha)	Weight (kg)								
Fungicides	251	235	180	59	421	161	7,933	2,417	1,776	502
Herbicides	73,637	120,551	85,151	134,680	109,253	168,545	149,630	97,976	118,499	84,221
Insecticides										
Carbamates										
Organochlorines					8	4				
Organophosphates	91	51					415	379	1,268	647
Pyrethroids	258	4					558	14	960	21
Unknow insecticides		•		•	•				269	•
All insecticides	349	55			8	4	974	393	2,498	667
Growth regulators					176	42	1,870	1,369	486	159
Seed treatments	35,635	1,624	6,199	129	10,121	793	17,741	458	5,527	304
All pesticides	109,874	122,465	91,529	134,869	119,978	169,545	178,148	102,613	128,786	85,854
Area grown (ha)	1,	048,919		948,400		1,153,138	1	,191,622		1,120,368

Table 28 The proportional differences (%) of pesticide usage on grassland and fodder crops in Northern Ireland during 2005 compared to 1989, 1993, 1997 and 2003.

Survey year comparison

	1989	cf 2005	1993	cf 2005	1997	cf 2005	2003	cf 2005
Pesticide type	Area	Weight	Area	Weight	Area	Weight	Area	Weight
Fungicides	608	114	887	751	322	212	-78	-79
Herbicides	61	-30	39	-37	8	-50	-21	-14
Insecticides	616	1113			31125	16575	156	70
Growth regulators					176	279	-74	-88
Seed treatments	-84	-81	-11	136	-45	-62	-69	-34
All pesticides	17	-30	41	-36	7	-49	-28	-16
Area grown (ha)	7	7%	1	8%	-	3%	-	6%

Northern Ireland	Appendix 1	
Report No.	Report title	ISBN
99	Grassland & Fodder Crops 1989	1-855 27 079 X
105	Arable Crops 1990	1-855 27 130 3
106	Soft Fruit Crops 1990	1-855 27 149 4
109	Vegetable Crops 1991	1-855 27 137 0
110	Protected Crops 1991 (edible & ornamental)	1-855 27 283 0
111	Mushroom Crops 1991	1-855 27 150 8
117	Arable Crops 1992	1-855 27 193 1
118	Top Fruit Crops 1992	1-855 27 194 X
124	Grassland & Fodder crops 1993	1-855 27 221 0
131	Forestry 1993	1-855 27 282 2
132	Arable Crops 1994	1-855 27 314 4
139	Vegetable Crops 1995	1-855 27 346 2
140	Mushroom Crops 1995	1-855 27 347 0
146	Arable Crops 1996	1-855.27.469.8
147	Top fruit 1996	1-855.27.470.1
156	Grassland and Fodder Crops 1997	1-855.27.506.6
157	Sheep Treatments 1997	1-855.27.425.6
167	Soft Fruit 1998	1-85527.540.6
168	Arable Crops 1998	1-85527.536.8

169	Vegetable Crops 1999	1-85527.561.9
170	Mushroom Crops 1999	1-85527.549.X
177	Arable Crops 2000	1-85527.670.4
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194	Arable Crops 2002	1-85527.674.7
199	Hardy Nursery Stock Crops 2003	1-85527.789.1
201	Protected Ornamental Crops 2003	1-85527.739.5
206	Arable Crops 2004	1-85527.833.2
207	Vegetable Crops 2004	1-85527.869.3

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