

A Synthesis of Diffuse Pollution Research in England and Wales funded by Defra and EA.

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Executive Summary

During the last 10 years Defra, and the EA have funded around 200 catchment related pollution projects at a cost of around £70 M. Of these Defra funded 178 and the EA around 25 diffuse agricultural pollution studies. The majority of the projects funded by Defra and the EA focus on water pollution, air pollution, soil protection and agricultural systems. Much of this work was focused on process based studies such as nutrient mobilisation and transport. The main outcomes of this research has been presented in Defra research project ES0127 (Defra Research in Agriculture and Environmental Protection Between 1999 and 2005: Summary and analysis). As expected previous research shows that agricultural land is the major source of nitrates in waters from unused fertilizers, manures and other organic amendments, leys and legumes. Ammonium nitrite, BOD, and Pathogens are also transferred from agricultural systems to water courses. Phosphorus (P) is a limiting nutrient in eutrophication but diffuse P losses from agriculture can be difficult to quantify. Field drains are often conduits for P and sediment loss. Air pollution is estimated to be around be 277 kt NH₃-N, (336 kt NH₃), of which 80% are from agriculture (of which cattle accounts for 56%). Defra funded research investigating farming systems with more recent funding directed towards measures to reduce diffuse pollution and an increase in model capability. Various models were developed to support use by policy to inform policy development and implementation of policy. The Knowledge Exchange (KE) component of research projects has typically been in the form of project reports with a summary document. In some instances many research projects have been policy driven from the initiation of the project allowing KE to begin at an early stage while others KE was a added component at completion or near completion of the project. Within the EA KE methods are similar to Defra with a communications group undertaking KE at project completion, however, often policy input was instrumental during the project life.

Contents	Page
1. Introduction	4
2. Focus of Diffuse Agricultural Pollution Research	6
2.1 Source Mitigation Research	7
2.2 Mobilisation Mitigation Research	8
2.3 Disconnection of Pathways Research	9
2.4 Catchment Scale Research	9
3. Knowledge Exchange	10
4. Conclusion	13
5. References	14

Appendices

Appendix 1 Defra water theme funded research 2000 – 2010	16
Appendix 2 EA Science Group diffuse pollution theme funded research 2005- 2010	26

Figures

Figure 1. Direction of resource as a percentage of spend	5
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Tables

Table 1 Individual projects by themes principally Defra projects	6
Table 2 KE projects funded by Defra	11
Table 3 Defra projects focusing on KE and implementation	12

1. Introduction

Background

Defra is committed to supporting and developing British farming, encouraging sustainable food production and helping to enhance the environment and bio diversity to improve the quality of life by reducing pollution. The Water Framework Directive (WFD) obliges member states to identify water bodies in poor ecological status, to identify the causes for poor status and to put in place cost effective mitigation. These are challenging objectives, meeting them requires new science and a catchment focus.

Aim

This report is a brief review of recent agricultural pollution research undertaken in England and Wales. It focus on research funded by Defra, and the Environment Agency. It has been prepared to support the Knowledge Exchange (KE) module within the Demonstration Test Catchments Programme. Its aim is in highlighting previous Defra and EA funded diffuse pollution research and associated mitigation of its effects. Its purpose is not to review extensively past research but to briefly put in context previous research for the challenges ahead.

Approach

1. Activities undertaken in preparation of this report were to produce a single list of projects undertaken by Defra and the EA
2. Information for this list would be collated directly from the EA and Defra as lists supplied and discussions with relevant staff.
3. Projects identified would be categorised by selected themes with relevant output types identified.
4. Brief outcomes from identified projects relating to diffuse agricultural pollution mitigation would be summarised via source, mobilisation, pathway and receptor themes.
5. Relevant KE approaches would be identified and discussed.
6. Recommendations will be discussed

The last ten years has seen significant resource allocated to diffuse agricultural pollution. Much of this resource has extended our knowledge of catchment based processes and the impact of agriculture on the environment. Defra and the Environment Agency have allocated funds of around £70 million to aid this understanding. While much of this work has focused on water quality issues, there has also been research directed towards soils, water resources and more recently greenhouse gases. With the emergence of directives from Europe such as the Water Framework Directive and the Groundwater Directive there has been more of a focus on catchment scale pollution. Additional policy drivers such as the implementation of the Nitrates Directive have driven a clear direction towards nitrogen pollution.

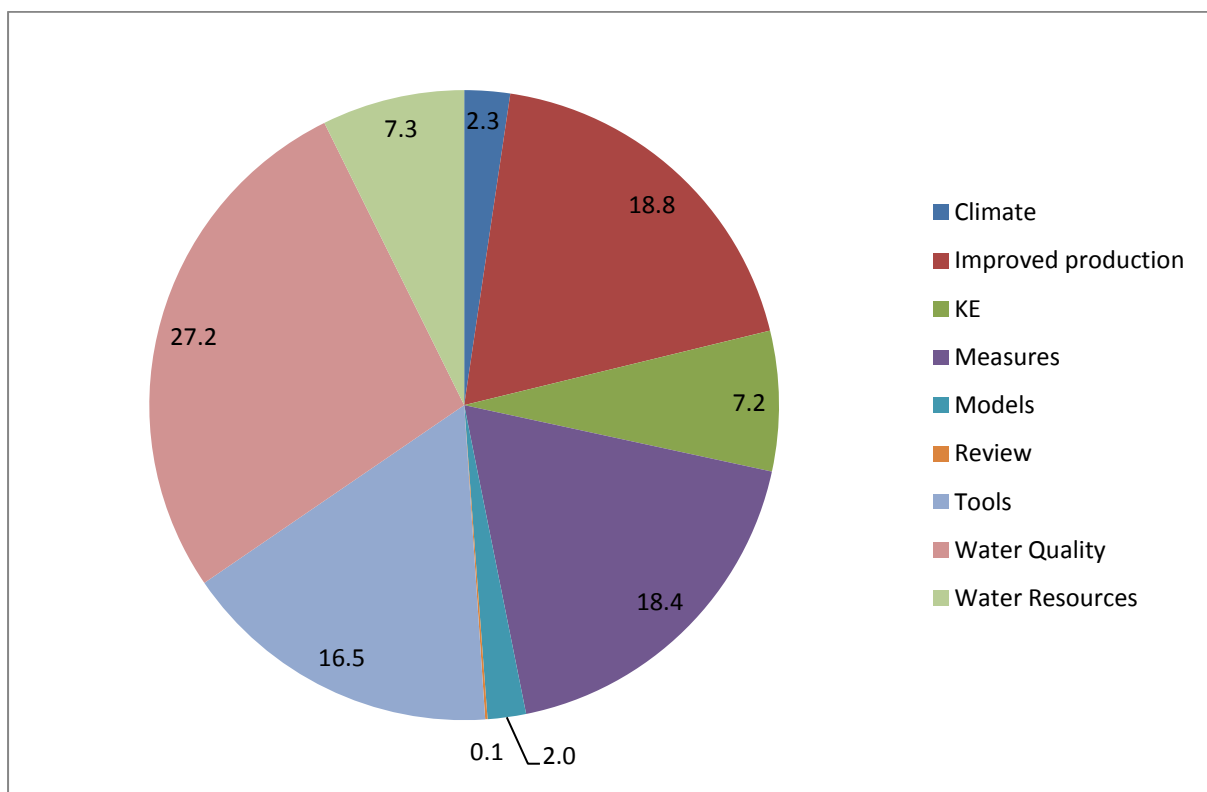


Figure 1. Direction of resource as a percentage of spend

Theme	Cost £	No of Projects	Main Output
Improved Production	13,167,557	37	Report
KE	5,020,246	9	Workshop/Report
Measures	12,893,747	23	Report/Workshop
Models	1,373,876	14	Report
Review	84,293	1	Report/Workshop
Tools	11,532,378	68	Report
Water quality	19,013,117	68	Report
Water Resources	5,114,382	19	Report
Climate	1,635,215	11	Report

Table 1 Individual projects by themes principally Defra projects ,(NB Subjective), cost No of projects and main output. For access to reports
<http://randd.defra.gov.uk/Default.aspx?Location=None&Module=FilterSearchNewLook&Completed=0>

2. Focus of Diffuse Agricultural Pollution Research

The main outcomes of research between 1999 and 2005 has been presented in Defra research project ES0127 (Defra Research in Agriculture and Environmental Protection Between 1999 and 2005: Summary and analysis). Much of the work during this period focused on process based studies such as nutrient mobilisation and transport and their impact on water quality. Findings in this report suggest that agricultural land is the major source of nitrates in waters from unused fertilizers, manures and other organic amendments, leys and legumes. Ammonium nitrite, BOD, and Pathogens are also transferred from agricultural systems to water courses. Phosphorus (P) is a limiting nutrient in eutrophication but diffuse P losses from agriculture can be difficult to quantify. Additional work has shown that field drains are often conduits for P and sediment loss. This is illustrated in Figure 1 and Table 1 with around 27 % of spend allocated towards water quality processes, principally towards nitrate presumably due to the implementation of the Nitrate Vulnerable Zones. Phosphorus has recently been the focus of attention but with fewer projects allocated and uncertainty on the behaviour of phosphorus in groundwater.

Much of the research has demonstrated reasonable confidence on our understanding of how nitrogen or phosphorus might be mobilised with subsequent transport and its impact on water

quality. However, during the last 5 years there has been a clear focus towards delivering evidence on what mitigation options may or may not work for the pollutant in question, especially differing farm types and catchments. Figure 1 demonstrates the more recent shift towards a focus on meeting the aims of the WFD with research undertaken on the estimating the effectiveness of measures with 18.4 percent of resource allocated.

Individual projects have focused on the effectiveness of measures at the plot or field scale. Here field trials were used to estimate nutrient retention within field systems by the placing of measures such as ponds and wetlands to retain nutrients for disposal back to land. While research continues there has been some success in demonstrating nutrient detention within the landscape. The results of this research and the implementation of the WFD directed policy to the need for an evidence base for the efficacy of multiple mitigation options measures at the catchment scale. One of the issues in the implementation of measures has been the identification of potential sources that contribute to catchment scale diffuse pollution. This led to further research on sediment particle tracking and source apportionment. While Defra have continued to fund research in this area, the Environment Agency has to a lesser extent funded research due to structural re-organisation within the last 2 years.

Key studies on diffuse pollution mitigation have evolved around catchment adaptation at the plot or field scale. These have generally focussed on source management, reduction in mobilisation potential, disconnection of pathways or protection of receptors. Fewer studies have dealt with mitigation of diffuse pollution at the catchment scale.

2.1 Source Mitigation Research

Recent research on the mitigation of diffuse pollution at source has demonstrated that the effectiveness of measures range from relatively easy to apply to difficulty in application and quantification. As expected, farm yard infrastructure can be readily adapted to capture nutrients and sediments. However, even where this is adapted considerable slurry effluent is still generated. Defra project WA0511 - An innovative approach to the treatment of farm effluent undertook research to identify an innovative approach. Methods identified showed effects on the dairy farm are typically a 2-15% reduction in nitrate leaching. While these diffuse pollution mitigation measures are readily identifiable, mitigating against fertiliser or pesticide application on arable crops is more difficult to control.

Arable crops cover approximately 4.5 million ha of the UK, approximately 30% of agricultural land, and so make a large contribution to the total amount of nitrate leached, and as expected is more prevalent in the east of England where arable farming dominates. Defra research project ES0127 suggests that ‘experiments on farms using ¹⁵N tracers and nutrient budgeting calculations on farms suggest that arable crops can use nitrogen very efficiently and take up the equivalent of 90-100% of the nitrogen applied from fertilisers (NT0106, 1840, KT0104). More usually, however, the Nitrogen Use Efficiency (NUE) is 50-70% and an amount equivalent to between 30% and 50% of the nitrogen applied is stored in the soil or lost by leaching, denitrification and volatilisation’.

Major adaptation measures such as the conversion of arable to unfertilised grass have been identified where significant reduction in nutrient loss was suggested with work reported by (Newell Price *et al.*, 2011 and Chambers, et al 2000. However, it was deemed in-practicable without incentives to land owners or farmers. The establishment of winter cover in reducing N leaching determined with was examined with Defra project NT0402. While Defra projects NT0401 and NT1508 – focused on preparing guidelines on the use of cover crops to minimise leaching. Much of this work was concluded in Newell Price *et al.*, 2011 where again nutrient loss was expected to decrease but not as significantly as reversion of arable land to grassland with no fertilizer inputs.

2.2 Mobilisation Mitigation Research

While source mitigation measures are often applied through regulation, (NVZ, Cross Compliance). Mitigation of diffuse pollution mobilisation is less regulated and applied more readily through stewardship schemes and CSF. However, much source measures can also be called mobilisation measures. However Defra have funded research on restricting mobilisation of N, P and sediments.

High stocking rates in wet fields are a major contributor to sediment and P loss. Defra commissioned several projects to support evidence that a reduction in stocking density would reduce mobilisation of P and sediments. Defra project NT1002 - Sheet erosion and phosphate loss. Evidence from Defra projects NT1004 - Phosphorus loss from agriculture, NT1005 - Phosphorus loss from grassland soils, NT1013 - Phosphorus loss in surface run-off from different land uses, NT1028 - Measurements of phosphorus loss from manures, PE0102 - Rationalising risk and scaling-up of on-farm practices to classify rates of phosphorus transfer

to grassland catchments was used to determine a decrease in diffuse pollution if stocking density was reduced.

2.3 Disconnection of Pathways Research.

On many farm systems source measures are ineffective across the farm and the only real option in diffuse pollution mitigation is to develop measures by dis-connection of pathways. Targeted interventions at the field scale such as in field buffers strips are available but much debate exists on the effectiveness of them. While the scale of pathways increases down the catchment measures such as wetlands and pond may be required.

Defra project PE0206 (MOPS1) showed that on a clay soil beetle banks can reduce total P and sediment losses via the surface pathway by 10-95%. This equates to an overall P and sediment reduction of approximately 5-35% on the impermeable (drained) soil and an estimated 30-50% on the permeable soil within the fields affected. However Newell Price *et al.*, 2011 report that the buffer strips will reduce the length of fields, but increase the time taken for field operations by around 10%. They are reasonably acceptable to farmers who are keen to improve the environmental potential of their farm. They are more likely to be adopted on fields that are longer across slope than in the upslope direction. They may be more effective when combined with additional riparian buffer strips.

Defra and the EA have funded both PE0206 (MOPS1) and SC060025 (Proactive measures to protect surface water quality and groundwater). Here considerable success has been shown that moderate scale intervention at the farm scale can have a impact on reducing the pressures of reducing P and sediments. SC060025 demonstrated a 90% reduction in sediment transport by installation of wetlands.

However, there was little reduction in N loss. One of the key conclusions from this work was that wetlands of a significant size were needed to reduce N concentrations in watercourses draining farmland.

2.4 Catchment Scale Mitigation

Very few studies have focused on catchment scale mitigation. However, some success with increasing our understanding of catchment behaviour was demonstrated with Defra funded projects such as PL0553 and ES0126. However, even less studies have examined the cost effectiveness of measures to be implemented at the catchment scale.

Environment Agency part funded projects such as SC030126 WaterCost (funded by the Interreg IIB North Sea Programme) This project demonstrated likely cost effectiveness of measures needed to meet a groundwater nitrate target of 50 mg/l NO₃ to reflect the quality standard set in the recent Groundwater Daughter Directive (2006/118/EC).

The selection of measures was based on discussions with stakeholders in the study area, findings from the previous Water4all project and a recent inventory of measures to control diffuse water pollution from agriculture produced for the UK Defra (Cuttle et al., 2006; 2007). Seven measures were examined in detail. These consisted of four measures primarily concerned with land management and three where arable land was converted to alternative uses. Overall costs and N input changes were then derived for each measure and the former divided by the latter to produce cost-effectiveness ratios (C/E, i.e. the cost (in £) per kg of N reduction). Costs and N reductions for individual measures were also summed to produce totals for each scenario package. Overall, the results of this study suggest that Cost effective analysis can be used to help identify a package of measures that could achieve potential groundwater quality targets under the Water Framework Directive.

3. Knowledge Exchange

Delivering effective Knowledge Exchange (KE) requires a coordinated and targeted policy to raise awareness of diffuse agricultural pollution, necessary measures to reduce pollution and bring about behavioural change. Within Defra and the Environment Agency the KE component of research projects has typically been in the form of project reports with a summary document. This within the EA at least is delivered through a communications team. Where the user is identified and then a suitable communications document is developed for that particular user or users. In some instances many research projects have been policy driven and managed from the initiation of the project allowing KE to begin with policy at an early stage while others KE was an added component at completion or near completion of the project. Figure 1 illustrates that around 7 % of funds have been allocated on the a greater understanding of required KE and the implementation of KE. Defra funded around 15 KE projects with additional projects funded by other government departments. These demonstrated a wide range of KE issues from influencing local farmers, changing end user behaviour, improving access for advice and identifying suitable communication methods. These are listed below in Table 2. Around £5.2 M was allocated towards these projects.

Cost	Project Title
256,000	Developing Knowledge Exchange Approaches to Secure Sustained Behaviour Changes to deliver Multiple Environmental Benefits through Sustainable Agricultural Land Management
125,000	Co-funding of RELU projects
119,190	Understanding and influencing positive behaviour change in farmers and rural land managers
300,000	EU-LIFE (WAgriCo) - Water Resources Management in Co-operation with Agriculture
19,835	Improving access to advice for land managers: literature review of recent developments in extension & advisory services
18,275	Best methods of influencing farmers & other land managers on environmental issues: barriers & means of overcoming them
67,108	Communication methods to persuade agricultural land managers to adopt practices to benefit environmental protection
15,000	Review of current and recent knowledge transfer activities in relation to environmental protection in agriculture
4,099,838	Knowledge Transfer Partnership
36,900	Technology transfer: effective nutrient use for arable crops
1	KT02 Projects
37,981	Nutrient Management Decision Support Systems: Process Improvement
84,983	Development of an interactive nutrient management website and knowledge transfer events calendar
24,473	An evaluation of WELL_N and 7th edition of RB209 for providing advice for good fertiliser practice in NVZ areas

Table 2 KE projects funded by Defra

Communication methods to persuade agricultural land managers to adopt practices to benefit environmental protection (KT0107) undertook a review of KE on several projects shown in Table 2 above. The outputs from that report and additional projects not covered are summarised in Table 3.

Project	Objectives	KE Methods used
Nutrient Demonstration Farms (NT2001)	Promote and demonstrate farm scale improved management practices	Farmer meetings, seminars, national events, conferences
Proactive Agricultural Runoff Management and Mitigation SC060025	Promote and demonstrate farm scale interventions	Farmers meetings, seminars, field workshops and national events
Nitrogen use workshop NT1211	Promote research outputs on improved use of N fertilisers	Workshops and booklets
Nutrient balancing for farm systems (NT1840, KT0104)	Development of nutrient budgeting	Workshops
Agricultural producer groups in Gloucestershire, GARD (LS1616)	Consideration of farm business changes after foot and mouth	Meetings, training days and technical reports
Demonstration farms database (KT011)	Awareness raising	Web
UK-ADAPT (KT0117)	Information repository/networking	Web based
Nutrient management website (KT0102)	Development of an interactive nutrient management website and knowledge transfer events calendar	Web based

Table 3 Defra projects focusing on KE and implementation

Effective KE is increasingly necessary to determine the success of project outputs and to influence future direction of research. Several Defra funded projects assessed the impact of KE. Questionnaires were completed by farmers and advisors to assess the use and impact of various recommendations. Meetings and conferences were the most chosen method of delivering advice, however, in respect of specific advice to a problem then one to ones were rated as the most effective. However, IT systems were also deemed effective. There is also targeted advice campaigns to inform and persuade farmers to adopt best practice these include the NVZ campaign and EDCSF campaigns.

4. Conclusion

While significant research has been undertaken by Defra and the Environment Agency on agricultural diffuse pollution, the majority until recently has focused on processes on nutrient mobilisation and transport in respect of water quality. More recently research has been directed by EU policy drivers such as the Water Framework Directive, the Groundwater Directive and the Bathing Directive. This has focused research towards a more catchment based approach for research, while still undertaking process based research where needed.

While process based understanding has been key in building on the conceptual understanding of how catchments function we have to integrate this across the catchment. This is necessary if we are to have the policy tools to deal with the consequences of our past adaptations to catchments through our drive for increased food production and subsequent increased pollution, extreme flows, failing ecological habitats and reduced natural resource. This evidence needed will give us the understanding to adapt our catchments through integrated measures for a new future to alleviate additional demands such as climate change. However, this must be undertaken in a holistic manner. While this is likely to be expensive in the short term long term goals need to be achieved to reduce the future costs to all. While catchment understanding needs to be undertaken in a holistic manner, subsequent knowledge from this research needs to be fed into funding strategies to allow multiple benefits to be achieved.

Direct UK agricultural Stewardship schemes, diffuse pollution management and flood reduction funding is occurring in rural and urban areas. Investment into waste reduction, carbon storage and renewable energy schemes are all offering more potential funding to catchments. The problem is that current approaches are either too restricted in their remit or they do not benefit from knowledge gained from other catchment related topics, i.e. they are anti-holistic.

The Knowledge Exchange (KE) component of research projects has typically been in the form of project reports with a summary document. In some instances many research projects have been policy driven from the initiation of the project allowing KE to begin at an early stage while others KE was a added component at completion or near completion of the project. Within the EA KE methods are similar to Defra with a communications group undertaking KE at project completion, however, often policy input was instrumental during the project life. The key to catchment research, knowledge exchange and therefore

successful adaptation is to join up strategies that allow multiple benefits from any investment for multiple stakeholders. Where catchment adaptation can be brought together, the potential to join up water pollution, flooding and ecological funding whilst working with stakeholders is the goal. At the same time intensive monitoring strategies are allowing us to prove the effectiveness of these interventions and gain some scientific estimate of the joint benefits. The most important factor is that the project schemes are being undertaken jointly by the English and Welsh Environment Agency (EA) pollution and flood managers, Catchment Sensitive Farming Officers, River Trusts and EA regulators at local and national level. This partnership creates the practical skills needed for underpinning holistic catchment management and will deliver the exchange of knowledge necessary to allow cost effective catchment adaptation.

References

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Newell Price, J.P. *et al.*, 2011. *An Inventory of Mitigation Methods and Guide to their Effects on Diffuse Water Pollution, Greenhouse Gas Emissions and Ammonia Emissions from Agriculture*. Report prepared as part of Defra project WQ0106, North Wyke Research and ADAS

Defra project ES0127 (Defra Research in Agriculture and Environmental Protection Between 1999 and 2005: Summary and analysis

Defra project ES0126 Integrated Catchment Management at Whittle Dene - Phase II

Defra project NT0402 To study the use of cover crops in reducing N leaching

Defra project NT0401 and 1508 To prepare guidelines on the use of cover crops to minimise leaching.

Defra project NT1002 - Sheet erosion and phosphate loss.

Defra project NT0106 To prepare nutrient balance sheets (P, K, Mg) for soils under organic farming systems

Defra project NT1004 - Phosphorus loss from agriculture,

Defra project NT1005 - Phosphorus loss from grassland soils,

Defra project NT1013 - Phosphorus loss in surface run-off from different land uses,

Defra project NT1028 - Measurements of phosphorus loss from manures,

Defra project PE0102 - Rationalising risk and scaling-up of on-farm practices to classify rates of phosphorus transfer to grassland catchments

Defra project PE0206 – Field testing of mitigation options (MOPS1).

Defra project PL0553 Whittle Dene Catchment Study

Defra project WA0511 - An innovative approach to the treatment of farm effluent, research to identify an innovative approach

Environment Agency project SC060025 (Proactive measures to protect surface water quality and groundwater)

Environment Agency project SC030126 Water Cost

Appendix A Defra water theme funded research 2000 – 2010

Project Code	Start Date	End Date	Total Defra cost	Project Title	Focus
WU0130	04/01/2010	03/04/2010	0	A pilot study to investigate the potential of mitigating global warming through increasing crop albedo	Climate
WQ0121	01/07/2007	31/01/2008	15,107	Upland agriculture – balancing productivity, water and soil quality	Climate
ES0113	01/04/2004	31/03/2007	257,884	UK Environmental Change Network	Climate
ES0117	01/01/2003	02/09/2005	349,684	The influence of store type and climatic variation on the nitrogen dynamics in stored farm slurries	Climate
ES0101	01/07/2001	30/06/2002	58,309	How far will medium term weather forecasts improve assessment of risks?	Climate
WA0806	25/01/2001	24/07/2001	149,984	Assessment of emissions and environmental impacts of animal incinerators in the UK	Climate
WA0717	01/04/2000	31/12/2003	365,140	Ammonia emissions and nutrient balance in weeping-wall stores and earth banked lagoons for cattle slurry storage	Climate
WA0719	01/04/2000	31/03/2003	177,204	Impact of vegetation and/or other on-farm features on net ammonia emissions from livestock farms (AMBER)	Climate
WA0723	01/02/2000	30/09/2002	11,400	Ammonia emissions from free range sows	Climate
WA0725	03/01/2000	02/04/2000	10,503	Factors affecting the urea content in milk and its potential as a predictor of ammonia emissions from slurry: a review	Climate
WQ0131	01/04/2008	31/03/2009	57,758	The effect of novel crops and livestock on UK agriculture: forecast for 2050	Improved Production
WQ0133	01/02/2008	30/06/2008	55,000	A review of the energy, protein and phosphorus requirements of beef cattle and sheep.	Improved Production
LK0989	01/04/2006	31/03/2009	134,933	Integration of precision irrigation and non-water based measures to suppress common scab of potato	Improved Production
LK0959	01/07/2004	30/06/2009	1,193,076	Genetic Reduction of Energy use and Emissions of Nitrogen in cereal production, GREEN grain	Improved Production
IS0214	01/04/2004	31/03/2007	446,603	New Integrated dairy production systems: specification, practical feasibility and ways of implementation	Improved Production
IS0215	01/04/2004	31/03/2007	468,927	Integrated production systems for outdoor pig breeding herds	Improved Production
SP0544	01/02/2004	30/04/2004	34,549	Development of performance criteria for soil monitoring schemes	Improved Production
NT2610	01/12/2003	31/03/2005	122,496	Spreading accuracy of solid urea fertilisers	Improved Production
SR0126	17/11/2003	29/02/2004	37,255	Evaluation of LANDIS	Improved Production
NT2605	01/11/2003	01/12/2005	2,789,531	The behaviour of some different fertiliser-N materials - Main experiments	Improved Production
NT2606	01/10/2003	31/03/2004	198,613	Ammonia Emissions from Nitrogen Fertilisers - Windtunnel Construction (support to NT2605)	Improved Production
SP0533	01/10/2003	31/12/2003	15,000	Initial assessment of projected trends of SOC in English arable soils	Improved

					Production
LK0652	01/09/2003	31/08/2007	644,086	Sustainable Systems for Weaner Management, Package 2, Nutritional management towards sustainable production	Improved Production
IS0212	01/07/2003	30/06/2007	1,417,136	Sustainable systems for pig weaner management (AGEWEAN)	Improved Production
IS0208	01/04/2003	30/04/2005	74,184	A theoretical analysis of how the protein requirements of livestock in England and Wales might be best met	Improved Production
NT2603	01/03/2003	28/02/2004	1,047,548	The behaviour of some different fertiliser-N materials - Initial field experiments	Improved Production
IS0202	01/01/2003	30/06/2003	22,711	Desk study to review literature on carbon and nitrogen efficiencies in venison production	Improved Production
IS0210	01/01/2003	30/06/2005	224,021	Yields of UK crops and livestock: physiological and technological constraints, and expectations of progress to 2050.(CTE0207)	Improved Production
NT2604	01/01/2003	31/03/2003	197,539	Ammonia emissions from nitrogen fertilisers: windtunnel construction	Improved Production
IS0213	01/12/2002	30/11/2003	40,000	Longevity and lifetime efficiency of dairy cows	Improved Production
NT2602	01/12/2002	31/08/2003	185,669	A scoping study to assess the feasibility of increasing the efficiency of use of nitrogen-based fertilisers	Improved Production
SP0130	01/07/2002	30/06/2006	485,829	Effects of sewage sludge on agricultural productivity and soil fertility (Phase III)	Improved Production
SP0133	01/07/2002	30/06/2006	333,029	Effects of inorganic metal salt additions to agricultural soils on soil microbial activity and long-term soil fertility: Phase III	Improved Production
SP0521	01/06/2002	30/09/2003	97,450	Changes in organic carbon content of non-agricultural soils	Improved Production
LS1616	01/04/2002	31/03/2004	91,125	Agricultural Producer Groups in Gloucestershire	Improved Production
SR0124	01/04/2002	30/09/2004	344,958	LandIS Reference Site Support	Improved Production
SP0520	01/01/2002	31/03/2002	26,128	Investigation into the spatial and temporal variation in the chemical properties of soil	Improved Production
SP0131	01/11/2001	28/02/2002	6,920	Long-term sludge experiments: Additional soil organic carbon analyses	Improved Production
SP0519	01/11/2001	28/02/2004	166,716	Critical levels of soil organic carbon in surface soils in relation to soil stability, function and infiltration	Improved Production
SP0518	01/09/2001	31/08/2002	72,326	The interaction of minimal cultivation regime and N fertiliser rate on soil C and N cycling: Ropsley	Improved Production
SP0510	01/08/2001	31/03/2005	353,386	The effect of crop rotation and rotational position on soil structure and structural resilience	Improved

					Production
SP0517	01/08/2001	31/10/2001	27,420	Soil management and cultivation publications	Improved Production
PE0108	01/07/2001	31/12/2001	23,807	Review of the response of potatoes to phosphate	Improved Production
SP0516	01/07/2001	30/06/2002	45,660	Heavy metal content of animal manures and implications for soil fertility	Improved Production
LS3601	01/09/2000	31/08/2005	989,491	Liquid feeding for pigs: Systems research	Improved Production
LK0641	01/04/2000	31/03/2003	435,000	Vitamin and mineral nutrition to optimise efficiency and quality in modern poultry genotypes	Improved Production
SP0508	01/04/2000	31/03/2003	261,677	Long-term sustainability of cereal yields	Improved Production
WA0720	01/07/2000	29/02/2004	240,000	Demonstrating opportunities of reducing ammonia emissions from pig housing (CTE 0003)	KE
WQ0218	01/12/2010	30/11/2012	256,000	Developing Knowledge Exchange Approaches to Secure Sustained Behaviour Changes to Deliver Multiple Environmental Benefits through Sustainable Agricultural Land Management	KE
WQ0122	01/04/2007	31/03/2011	125,000	co-funding of RELU projects	KE
WU0104	30/06/2006	30/11/2007	119,190	Understanding and influencing positive behaviour change in farmers and rural land managers	KE
WQ0114	01/04/2006	31/10/2008	300,000	EU-LIFE (WAgriCo) - Water Resources Management in Co-operation with Agriculture	KE
KT0110	01/12/2001	08/03/2002	19,835	Improving access to advice for land managers: literature review of recent developments in extension & advisory services	KE
KT0108	15/08/2001	31/10/2001	18,275	Best methods of influencing farmers & other land managers on environmental issues: barriers & means of overcoming them	KE
KT0107	01/06/2001	30/11/2001	67,108	Communication methods to persuade agricultural land managers to adopt practices to benefit environmental protection	KE
NT1857	01/01/2001	09/03/2001	15,000	Review of current and recent knowledge transfer activities in relation to environmental protection in agriculture	KE
MP0108	01/04/2000	31/03/2006	4,099,838	Knowledge Transfer Partnership	KE
KT0104	01/04/2001	31/03/2004	36,900	Technology transfer: effective nutrient use for arable crops	KE
KT0114	01/04/2002	31/03/2003	1	KT02 Projects	KE
KT0118	01/12/2003	31/03/2004	37,981	Nutrient Management Decision Support Systems: Process Improvement	KE
KT0102	01/07/2001	30/06/2005	84,983	Development of an interactive nutrient management website and knowledge transfer events calendar	KE
NT2502	01/10/2001	31/01/2002	24,473	An evaluation of WELL_N and 7th edition of RB209 for providing advice for good fertiliser practice in NVZ areas	KE
WQ0106	01/04/2006	31/03/2009	1,235,934	Cost curves for multiple diffuse pollutants - DP-ALL	Measures
ES0203	10/08/2005	04/11/2005	108,999	The cost-effectiveness of integrated diffuse pollution mitigation measures	Measures
ES0132	01/02/2005	31/03/2005	30,874	A review of 'soft engineering' techniques for on-farm bioremediation of diffuse and point sources of pollution.	Measures
ES0126	01/01/2005	31/12/2007	499,376	Integrated Catchment Management at Whittle Dene - Phase II	Measures
PE0206	01/01/2005	30/06/2008	532,804	Field testing of mitigation options (MOPS)	Measures
ES0121	01/11/2003	28/02/2005	233,792	Cost effective diffuse pollution mitigation	Measures

PE0205	01/07/2003	30/06/2006	239,300	Strategic placement and design of buffering features for sediment and P in the landscape	Measures
PL0553	01/09/2002	30/11/2004	409,534	Whittle Dene Catchment Study	Measures
ES0107	01/08/2002	31/03/2004	49,707	Quantifying uncertainty in the MEASURES framework	Measures
NT2507	01/02/2002	31/05/2002	49,462	A critical appraisal of measures for minimising diffuse pollution of water	Measures
ES0102	01/01/2002	31/12/2005	240,244	EUROHARP (UK) - Evaluating national methods for quantifying diffuse nutrient losses from land to water bodies	Measures
ES0109	01/01/2002	30/09/2002	23,289	Scoping the potential of farm ponds to provide environmental benefits	Measures
PE0203	01/11/2001	30/09/2003	134,474	Cost curve assessment of phosphorus mitigation options relevant to UK agriculture	Measures
ES0106	01/08/2001	31/03/2007	1,290,739	Brimstone-NPS: Integrated land use & manure management systems to control diffuse nutrient loss from drained clay soils	Measures
PS0430	01/06/2001	30/10/2001	20,000	Whittle Dene Catchment Project- Scoping Study	Measures
WA0656	01/11/2000	30/10/2001	65,050	Implications of potential measures to control pathogens associated with livestock manure management	Measures
PE0201	01/08/2000	30/09/2007	655,169	Impacts of targeted mitigation options on phosphorus loss at the field and catchment scale	Measures
WQ0208	01/01/2010	28/02/2014	0	Demonstration Test Catchments: Developing the evidence base on buffer strips and other options for sediment loss from agriculture	Measures
WQ0210	01/12/2009	31/03/2014	2100000	Demonstration Test Catchments: Catchment scale testing of measures to mitigate diffuse agricultural pollution on the Eden	MEasures
WQ0211	01/12/2009	31/03/2014	2100000	Demonstration Test Catchments: Catchment scale testing of measures to mitigate diffuse agricultural pollution on the Hampshire Avon	MEasures
WQ0212	01/12/2009	31/03/2014	2100000	Demonstration Test Catchments: Catchment scale testing of measures to mitigate diffuse agricultural pollution on the Wensum	Measures
WQ0209	01/09/2009	31/03/2014	50,000	Demonstration Test Catchments: Secretariat, conceptual modelling and coordination	MEasures
WQ0207	20/08/2009	31/10/2009	25,000	Demonstration Test Catchments: Design of a monitoring strategy for the Demonstration Test Catchments project.	MEasures
WQ0213	01/12/2009	31/03/2010	800000	Demonstration Test Catchments: Development of a Data Model	Models
WQ0123	01/01/2007	31/03/2007	49,000	Water models	Models
PE0207	01/10/2005	30/04/2006	99,000	PSYCHIC Follow-up - further development of model, testing in new catchment	Models
ES0205	01/09/2005	31/01/2006	77,877	A revised diffuse pollution inventory and scoping study on the use of catchment-base diffuse pollution models	Models
ES0204	01/06/2005	01/12/2005	17,988	Nil Impact - (CSF models project)	Models
PE0121	01/04/2005	30/06/2005	62,004	Further calibration of the DESPRAL test using field scale rainfall simulation techniques	Models
PE0122	01/04/2005	31/03/2009	352,487	Modelling the impact of sediment and phosphorus loss control on catchment water quality	Models
NT2517	15/02/2005	30/06/2005	25,981	Scientific and technical revision of IRRIGUIDE water balance model	Models
PE0212	01/04/2004	31/03/2005	25,700	Evaluation of the PSYCHIC Decision Support System using data from Unilever Colworth	Models
PE0112	01/11/2002	28/02/2005	180,700	Calibrating and validating the P indicators tool: Phase 2	Models
NT2503	01/10/2001	30/09/2004	194,402	MAGPIE: Updating and re-developing structure, data bases and models for wider application	Models
PE0109	01/10/2001	30/06/2002	42,350	Using the PSALM model to interpret the phosphate change-point and its relation with iron in the soil	Models
SP0511	01/01/2001	31/03/2003	90,971	UK soil database for modelling soil carbon fluxes and land use for the national carbon dioxide inventory	Models
NT1856	01/12/2000	31/03/2004	155,416	Integrated measurement & modelling of soluble N & P losses assoc. with arable & livestock mgmt in a mixed farm catchment	Models

ES0127	15/11/2004	31/07/2005	84,293	Defra research in agriculture and environmental protection 1990-2005; summary and analysis	Review
SP0413	01/07/2005	15/08/2008	414,227	Documenting soil erosion rates on agricultural land in England and Wales - Part 2	Tools
WQ0219	01/01/2011	31/12/2014	800,000	Demonstration Test Catchments: Data sharing and archival	Tools
WQ0214	01/09/2010	30/09/2012	200,000	Assessing the status of drainage in UK agriculture: A case study in the demonstration test catchments	Tools
WQ0126	01/04/2008	31/03/2013	931,359	Updating the User Manual (1) Modular approaches to the control of diffuse agricultural pollution: buffer zones, bioreactors, ditches and ponds	Tools
WQ0127	01/04/2008	31/03/2013	955,888	Updating the User Manual (2) Mitigation Options for Sediment and Phosphorus 2 (MOPS 2)	Tools
WU0117	01/02/2008	31/03/2008	93,793	Equipment Costs in support of projects: FO0305, HH 3230, HH 3608, HH3230, HH3231, HH3613, HH3615, HH3723, HH3728, IF0116, IF0125, PH0402, WQ0119 & WU0106	Tools
IF0134	01/04/2007	31/03/2010	75,000	Transferring improved hop germplasm for UK hop variety development to industry	Tools
WU0109	01/04/2007	31/05/2007	20,000	Crop Irrigation: A water audit toolkit	Tools
IF0111	01/02/2007	31/01/2008	60,149	Setting the priorities for future work on nutrient decision support systems	Tools
WQ0103	01/01/2007	31/12/2008	200,088	The national inventory and map of livestock manure loadings to agricultural land (Manures-GIS)	Tools
WQ0117	01/01/2007	30/06/2007	73,710	Calculator tool for estimating N and P outputs by livestock	Tools
WQ0116	29/08/2006	31/10/2006	18,000	Workshop presentation of a summary of MAFF/Defra research into agricultural environmental protection (1990 - 2005)	Tools
WQ0113	01/06/2006	31/03/2008	20,266	UK-ADAPT - Agricultural Diffuse Aquatic Pollution Toolkit:	Tools
MP0190	01/04/2006	31/03/2008	20,000	Contract for Services: Mrs Kate Sugden	Tools
WQ0105	01/04/2006	31/03/2009	30,000	Connectivity Proposal to NERC	Tools
ES03001	23/02/2006	31/03/2006	30,000	Environmental Law Foundation - Enforcement Research	Tools
IS0219	01/10/2005	30/09/2009	747,132	Underpinning the computer based decision support to agriculture - Agricultural decision support (ADS)	Tools
IS0222	01/10/2005	30/09/2009	406,491	Developing and delivering environmental Life-Cycle Assessment (LCA) of agricultural systems	Tools
ES0138	01/03/2005	30/04/2005	23,367	Review of livestock manure management options in European NVZs	Tools
ES0139	01/01/2005	31/03/2005	38,500	Solid Manures - Improving Land Spreading Practice	Tools
ES0202	01/07/2004	31/10/2004	29,764	A directory of activity in priority catchments	Tools
KT0120	01/07/2004	31/03/2007	113,782	Helpline support for PLANET Nutrient Management software	Tools
SP0531	01/03/2004	28/02/2006	251,023	Novel methods for spatial prediction of soil functions within landscapes	Tools
SP0529	05/01/2004	31/08/2004	102,984	SQID: Soil quality indicators - developing biological indicators	Tools
NT2611	01/10/2003	31/03/2005	60,000	Assess international fertiliser trading	Tools
PE0208	01/10/2003	31/05/2006	20,000	Development of operational guidelines to support safe application of industrial biosolids to agricultural land based on a phosphorus loss risk index	Tools
KT0117	01/07/2003	31/10/2003	8,658	Further development of the UK-ADAPT website	Tools
SP0411	01/07/2003	30/06/2005	214,991	Documenting soil erosion rates on agricultural land in England and Wales	Tools
KT0113	01/05/2003	31/03/2006	693,809	Nutrient management decision support system (PLANET)	Tools
NT2511	01/05/2003	31/07/2004	95,485	Cost curve of nitrate mitigation options	Tools

PE0114	01/04/2003	30/04/2004	39,652	Assessment of the implications of NVZ designations for P loss from agriculture to surface waters	Tools
SR0127	01/04/2003	31/03/2004	103,929	Representative Soil Sampling Scheme (RSSS)	Tools
SP0525	01/02/2003	31/05/2003	20,012	Use of geomorphological mapping and modelling for identifying land affected by heavy metal contamination on river floodplains	Tools
SP0524	14/10/2002	13/10/2003	64,952	UK soil research audit (CTE0211)	Tools
NT2508	01/10/2002	31/12/2004	111,733	Rapid, reduced cost analysis of manures by near-infrared spectroscopy	Tools
KT0111	01/09/2002	31/03/2003	53,409	A tool for land managers to access the English and Welsh Demonstration Farm Network	Tools
SP0523	01/06/2002	30/04/2003	30,000	Development of economically & environmentally sustainable methods of C sequestration in agricultural soils (CTE0205)	Tools
ES0112	01/04/2002	31/03/2004	70,565	Environmental benchmarks - arable	Tools
KT0116	01/04/2002	30/09/2002	104,445	NVZ - Decision Support System	Tools
NT2506	01/03/2002	28/02/2003	52,641	Evaluation of the NGAUGE DSS in the provision of guidelines for sustainable N management by livestock farmers in NVZs	Tools
NT2504	01/12/2001	31/03/2002	21,948	Desk study to evaluate the practical benefits and constraints of fertiliser placement	Tools
NT2505	01/12/2001	31/08/2002	27,858	Desk study to assess the potential for N and P pollution from glasshouse production in England and Wales	Tools
PE0202	01/11/2001	31/03/2005	1,010,444	Development of a risk assessment & decision-making tool to control diffuse loads of P & particulates from agric. land	Tools
WA0809	01/11/2001	31/03/2002	47,241	Research into sustainable options for the recycling of agricultural plastics	Tools
KT0101	01/10/2001	30/06/2003	88,003	Development of practical decision support tool for assessing economics & efficiency of manure spreading systems -SPREADS	Tools
NT2501	01/10/2001	31/03/2003	332,395	Development of a prototype soil nitrogen supply calculator	Tools
KT0105	01/09/2001	31/08/2004	206,170	Manure Nutrient Evaluation Routine (MANNER-NPK)	Tools
SP0310	01/09/2001	31/12/2004	395,576	To develop a robust indicator of soil organic matter status	Tools
WA0320	01/09/2001	31/08/2002	55,997	Development of a decision support system to evaluate methane, nitrogen and phosphorus outputs from dairy cows	Tools
KT0106	01/07/2001	30/06/2004	238,559	MANNER - Policy Support Model (MANNER-PSM)	Tools
SP0406	01/07/2001	31/03/2002	30,055	Upland soil erosion data analysis	Tools
IS0103	01/06/2001	28/02/2002	55,286	Scoping study to identify new research opportunities in the area of arable crops and environmental interactions	Tools
MP0125	01/04/2001	01/05/2001	48,956	Additional inflationary element for work carried out between April 1997 and March 2000	Tools
NT2010	01/04/2001	31/01/2002	46,115	Environmental impacts of solid and liquid manure systems	Tools
NT2009	01/02/2001	31/01/2004	158,317	Developing improved sampling guidelines for liquid and solid manures	Tools
NT1854	01/01/2001	31/12/2002	70,500	Development of indicators for nutrient management of dairy farms	Tools
NT1855	01/01/2001	30/06/2002	126,292	Application of the sustainable agriculture indicators at farm level for England and Wales	Tools
SP0515	01/01/2001	31/12/2002	172,786	Comparability of soil properties derived from different data sources	Tools
SP0512	14/12/2000	13/07/2001	28,000	Identification and development of a set of national indicators for soil quality (P5A(00)01)	Tools
SP0514	01/11/2000	31/10/2002	135,016	Sampling strategies and soil monitoring	Tools
LK0643	01/10/2000	31/01/2005	181,182	UK Poultry IPPC Compliance (UPIC)	Tools
SP0513	01/09/2000	28/02/2001	135,000	The development of national guidelines for sustainable soil management through improved tillage practices	Tools
PE0106	01/05/2000	31/03/2004	60,790	An environmental soil test to determine potential for sediment & P transfer in run-off from agricultural land (DESPRAL)	Tools
NT2008	06/01/2000	31/03/2004	247,963	Nitrogen value of solid manures - effects of contrasting manure management practices	Tools

NT2006	04/01/2000	31/03/2003	52,261	Manure Analysis Database (MANDE)	Tools
WQ021	20/09/2010	31/07/2012	0	Demonstrating the environmental and economic implications of reducing phosphorus excretion in pigs	Water Quality
WQ0220	01/09/2010	31/03/2011	0	Catchment Modelling Strategies for Faecal Indicator Organisms: Options Review and Recommendations	Water Quality
WQ0221	01/04/2010	31/03/2014	0	Demonstration Test Catchments: Research Advisory Group	Water Quality
HL0196	01/03/2010	30/06/2014	0	Developing precision irrigation for field scale vegetable production, linking in-field moisture sensing, wireless networks and variable rate application technology	Water Quality
WQ0125	01/04/2009	31/03/2012	450,000	Livestock production systems to control diffuse pollution	Water Quality
WQ0128	01/04/2009	31/03/2014	500,000	Sediment behaviour	Water Quality
WQ0129	01/07/2008	30/06/2013	591,343	Delivery of Phosphorus and Faecal Indicator Organisms from Agricultural Sources to Watercourses - PEDAL 2	Water Quality
WQ0134	01/04/2008	31/03/2012	149,407	FP7 - Tamar Lakes project (part of EU funded ALICE)	Water Quality
WU0114	01/04/2008	31/03/2009	59,331	The use of environmental footprints in horticulture: Case studies	Water Quality
IF0153	02/01/2008	31/03/2008	30,993	A literature review of the effects of pesticides on micro-organisms during composting, and of the degradation of biodegradable plastic films and packaging during composting	Water Quality
LK0676	01/10/2007	30/09/2010	302,654	Improved design and management of woodchip pads for sustainable out-wintering of livestock	Water Quality
LK0988	01/10/2007	31/12/2010	427,579	Reducing the risk of diffuse pollution by improved assessment of the nutrient content in farm manures and biosolids via Near Infrared Reflectance Spectroscopy (NIRS)	Water Quality
WQ0124	01/10/2007	31/03/2008	13,382	Land management options for improving water quality in the uplands	Water Quality
WQ0112	01/07/2007	31/12/2007	38,705	Understanding the Environmental Effects of Farming on Aquatic Ecosystems	Water Quality
HL0183LFV	01/04/2007	30/06/2009	171,955	Minimising environmental impact of weed control in vegetables by weed detection and spot herbicide application	Water Quality
LK0990	01/04/2007	30/06/2010	310,938	Predicting grain protein to meet market requirements for breadmaking and minimise diffuse pollution from wheat production	Water Quality
WQ0109	01/04/2007	31/03/2010	256,930	Coordination role for Defra land and water quality research (IWAM)	Water Quality
WQ0118	01/04/2007	31/03/2012	3,999,703	Understanding the behaviour of livestock manure multiple pollutants through contrasting cracking clay soils	Water Quality
WQ0119	01/04/2007	31/03/2011	554,232	Quantification of the genetic variation for phosphorus use efficiency in Brassica napus	Water Quality
WQ0120	01/04/2007	31/03/2008	17,005	Sediment sourcing in the Demer basin, Belgium - EU diffuse pollution project	Water Quality
WU0112	01/02/2007	31/03/2007	19,740	Contemporary livestock farming & watercourse pollution: a citizen	Water Quality
WQ0111	01/01/2007	31/03/2011	657,001	Faecal Indicator Organism Losses from Farming Systems	Water Quality
WT0742NVZ	01/12/2006	31/03/2007	49,000	Non-Agricultural Diffuse Water Pollution	Water Quality
WQ0101	02/10/2006	28/09/2007	103,855	Environmental Footprint and Sustainability of Horticulture (including potatoes) - a comparison with other agricultural sectors	Water Quality
WQ0108	01/09/2006	31/03/2007	70,937	Maintaining cracking-clay experimental platforms (Faringdon, Boxworth and Rowden).	Water Quality
WT0705CSF	01/08/2006	31/08/2008	238,457	Characterisation of rural phosphorus sources and their eutrophication impact in headwater streams (Linked to PARIS)	Water Quality
LK0979	01/07/2006	30/06/2011	483,674	Breeding oilseed rape with a low requirement for nitrogen fertiliser	Water Quality
WQ0104	01/06/2006	31/03/2007	20,820	Contribution of overland flow on grasslands to diffuse nutrient pollution	Water Quality
LK0973	01/04/2006	31/03/2010	385,287	Development and evaluation of low-phytate wheat germplasm to reduce diffuse phosphate pollution from pig and poultry production units	Water Quality

WQ0102	01/04/2006	31/03/2007	25,994	Biofiltration - farm based biofilters for air and water	Water Quality
ES0128	01/12/2005	30/09/2008	149,788	Agricultural Land and Organic Waste - A National Capacity Estimator: ALLOWANCE	Water Quality
IS0223	01/08/2005	31/03/2009	180,000	Leachable N levels after fertilising high yielding wheat varieties	Water Quality
ES0140	01/04/2005	30/09/2005	44,993	A Desk-Study Assessment of the Contribution of Agriculture to bathing water: Phase II	Water Quality
ES0133	14/02/2005	31/03/2005	22,818	Review of European/American catchment studies to control diffuse water pollution from agriculture	Water Quality
ES0130	01/02/2005	30/04/2005	36,499	A review of experimental equipment for water quality studies and catchment research	Water Quality
PE0120	01/02/2005	31/07/2008	885,908	Phosphorus mobilisation with sediment and colloids through drained and undrained grasslands	Water Quality
ES0124	01/07/2004	31/03/2005	83,629	Farm Nutrient auditing: Support to Planet (Benchmarking)	Water Quality
ES0201	01/07/2004	30/09/2004	83,370	Reviewing the Potential for Reductions of Nitrogen and Phosphorus Inputs in Current Farm Systems: A Specification of Project Requirements	Water Quality
PE0113	01/10/2003	30/09/2006	449,594	Delivery of phosphorus from agricultural sources to watercourses	Water Quality
IS0205	01/09/2003	31/08/2005	399,077	Determining the environmental burdens and resource use in the production of agricultural and horticultural commodities.	Water Quality
WU0131	04/01/2010	03/04/2010	0	A pilot study to investigate the potential of mitigating global warming through increasing crop albedo	Climate
WQ0122	01/07/2007	31/01/2008	367,778	Upland agriculture – balancing productivity, water and soil quality	Climate
ES0113	01/04/2004	31/03/2007	369,165	UK Environmental Change Network	Climate
ES0117	01/01/2003	02/09/2005	370,552	The influence of store type and climatic variation on the nitrogen dynamics in stored farm slurries	Climate
ES0101	01/07/2001	30/06/2002	371,939	How far will medium term weather forecasts improve assessment of risks?	Climate
WA0806	25/01/2001	24/07/2001	373,326	Assessment of emissions and environmental impacts of animal incinerators in the UK	Climate
WA0717	01/04/2000	31/12/2003	374,713	Ammonia emissions and nutrient balance in weeping-wall stores and earth banked lagoons for cattle slurry storage	Climate
WA0719	01/04/2000	31/03/2003	376,100	Impact of vegetation and/or other on-farm features on net ammonia emissions from livestock farms (AMBER)	Climate
WA0723	01/02/2000	30/09/2002	377,487	Ammonia emissions from free range sows	Climate
WA0725	03/01/2000	02/04/2000	378,874	Factors affecting the urea content in milk and its potential as a predictor of ammonia emissions from slurry: a review	Climate
WQ0135	01/04/2008	31/03/2009	380,261	The effect of novel crops and livestock on UK agriculture: forecast for 2051	Improved Production
WQ0137	01/02/2008	30/06/2008	381,648	A review of the energy, protein and phosphorus requirements of beef cattle and sheep.	Improved Production
LK0929	01/04/2006	31/03/2009	383,035	Integration of precision irrigation and non-water based measures to suppress common scab of potato	Improved Production
LK0899	01/07/2004	30/06/2009	384,422	Genetic Reduction of Energy use and Emissions of Nitrogen in cereal production, GREEN grain	Improved Production
IS0216	01/04/2004	31/03/2007	385,809	New Integrated dairy production systems: specification, practical feasibility and ways of implementation	Improved Production
IS0217	01/04/2004	31/03/2007	387,196	Integrated production systems for outdoor pig breeding herds	Improved Production
SP0545	01/02/2004	30/04/2004	388,583	Development of performance criteria for soil monitoring schemes	Improved Production

NT2611	01/12/2003	31/03/2005	389,970	Spreading accuracy of solid urea fertilisers	Improved Production
SR0127	17/11/2003	29/02/2004	391,357	Evaluation of LANDIS	Improved Production
NT2607	01/11/2003	01/12/2005	392,744	The behaviour of some different fertiliser-N materials - Main experiments	Improved Production
NT2608	01/10/2003	31/03/2004	394,131	Ammonia Emissions from Nitrogen Fertilisers - Windtunnel Construction (support to NT2605)	Improved Production
SP0534	01/10/2003	31/12/2003	395,518	Initial assessment of projected trends of SOC in English arable soils	Improved Production
LK0653	01/09/2003	31/08/2007	396,905	Sustainable Systems for Weaner Management, Package 2, Nutritional management towards sustainable production	Improved Production
IS0204	01/07/2003	30/06/2007	398,292	Sustainable systems for pig weaner management (AGEWEAN)	Improved Production
IS0200	01/04/2003	30/04/2005	399,679	A theoretical analysis of how the protein requirements of livestock in England and Wales might be best met	Improved Production
NT2604	01/03/2003	28/02/2004	401,066	The behaviour of some different fertiliser-N materials - Initial field experiments	Improved Production
IS0218	01/01/2003	30/06/2003	402,454	Desk study to review literature on carbon and nitrogen efficiencies in venison production	Improved Production
IS0226	01/01/2003	30/06/2005	403,841	Yields of UK crops and livestock: physiological and technological constraints, and expectations of progress to 2050.(CTE0207)	Improved Production
NT2605	01/01/2003	31/03/2003	405,228	Ammonia emissions from nitrogen fertilisers: windtunnel construction	Improved Production
IS0214	01/12/2002	30/11/2003	406,615	Longevity and lifetime efficiency of dairy cows	Improved Production
NT2603	01/12/2002	31/08/2003	408,002	A scoping study to assess the feasibility of increasing the efficiency of use of nitrogen-based fertilisers	Improved Production
SP0130	01/07/2002	30/06/2006	409,389	Effects of sewage sludge on agricultural productivity and soil fertility (Phase III)	Improved Production
SP0133	01/07/2002	30/06/2006	410,776	Effects of inorganic metal salt additions to agricultural soils on soil microbial activity and long-term soil fertility: Phase III	Improved Production
SP0521	01/06/2002	30/09/2003	412,163	Changes in organic carbon content of non-agricultural soils	Improved Production
LS1617	01/04/2002	31/03/2004	413,550	Agricultural Producer Groups in Gloucestershire	Improved Production
SR0125	01/04/2002	30/09/2004	414,937	LandIS Reference Site Support	Improved Production

SP0520	01/01/2002	31/03/2002	416,324	Investigation into the spatial and temporal variation in the chemical properties of soil	Improved Production
SP0131	01/11/2001	28/02/2002	417,711	Long-term sludge experiments: Additional soil organic carbon analyses	Improved Production
SP0519	01/11/2001	28/02/2004	419,098	Critical levels of soil organic carbon in surface soils in relation to soil stability, function and infiltration	Improved Production
SP0518	01/09/2001	31/08/2002	420,485	The interaction of minimal cultivation regime and N fertiliser rate on soil C and N cycling: Ropsley	Improved Production
SP0510	01/08/2001	31/03/2005	421,872	The effect of crop rotation and rotational position on soil structure and structural resilience	Improved Production
SP0517	01/08/2001	31/10/2001	423,259	Soil management and cultivation publications	Improved Production
PE0109	01/07/2001	31/12/2001	424,646	Review of the response of potatoes to phosphate	Improved Production
SP0517	01/07/2001	30/06/2002	426,033	Heavy metal content of animal manures and implications for soil fertility	Improved Production

Appendix B EA Science Group diffuse pollution theme funded

Code	Start Date	End Date	Title
SC030192	Apr 1, 2004	Mar 1, 2008	Ecosystem Impacts of Pesticides and the Effectiveness of the Voluntary Initiative
SC060021	Jun 1, 2006	Oct 1, 2011	Evaluation of the Environmental, Social and Economic Effects of New Agri-env Initiatives in a Typical Dairy Catchment
SC060060	Sep 1, 2006	Sep 1, 2011	Environmental Effects of Agriculture and Land Use
SC060034	Aug 1, 2006	Feb 1, 2009	Framework for Ecological Modelling
SC050029	May 13, 2005	Apr 1, 2009	Integrated Surface and Groundwater Assessment of Nitrate
SC050040	Nov 1, 2005	Nov 1, 2013	Integrated Water Resources Management (IWRM.net)
SC070014	Aug 31, 2007	Dec 31, 2009	Linking Farm and Field-scale Catchment Management to Catchment Scale Nutrient Monitoring Using Inverse Modelling
SC080031	Aug 15, 2008	Mar 31, 2012	Evidence to support selection of the most effective measures for the second round of River Basin Planning
SC060035	Aug 1, 2006	Dec 31, 2008	Making Information Available for Integrated Catchment Management
SC080041	6, Oct 2008	30-Sep-11	Integrated Assessment of Nitrate for NVZ Designation 2010
SC030154	Apr 1, 2003	Apr 1, 2009	Phosphorus from Agriculture: Riverine Impacts Study (PARIS)
SC060025	Jul 1, 2006	Jul 1, 2010	Proactive Agricultural Runoff Management and Mitigation
SC030113	Jan 1, 2004	Apr 1, 2008	Rising Groundwater Nitrate Concentrations in the Eden Valley
SC060039	Aug 1, 2006	Jun 30, 2009	Scoping Study for the Macro Ecological Model
SC060046	Sep 1, 2006	Sep 1, 2009	Surface Water Quality Monitoring Strategy for Diffuse agricultural pollution
SC080032	16, Oct 2008	31, Dec 2009	Evaluation of Ecosystem Approach to Fisheries Management
SC050046	Aug 1, 2005	Mar 1, 2009	Water Resources Management in Co-operation with Agriculture
SC050038	Oct 1, 2005	Mar 1, 2009	Water Resources Management in Co-operation with Agriculture (Nitrabar and WAgriCo)
SC050047	Oct 1, 2005	Mar 31, 2009	Water Resources Management in Co-operation with Agriculture (WAgriCo)

SC030126	Dec 1, 2002	Apr 1, 2008	Water4All (Interreg)
SC060097	Oct 1, 2006	Apr 1, 2012	Fluvial Audits: Compilation and Analysis of Existing Data
SC050035	Oct 1, 2005	Jun 1, 2009	Uncertainty Assessment of Phosphorus Risk to Surface Waters
SC080024	Oct, 1 2007	Dec 31 2008	Perspectives on the Mobilisation of Prioritised Contaminants in Soil
SC060020	Jul 1, 2006	Jul 1, 2009	Catchment Appraisal and Management Toolkit for Diffuse Agricultural Pollution Management

